

# Turkish Online Journal of Educational Technology

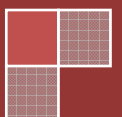
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## Message from the Editor-in-Chief

Dear Colleagues,

TOJET welcomes you. The Turkish Online Journal of Educational Technology, AECT, Governors State University, Sakarya University, Ohio University and other international universities will organize 15th International Educational Technology Conference (IETC-2015) between May 27–29, 2015 in Istanbul, Turkey ([www.iet-c.net](http://www.iet-c.net)). IETC series is an international educational activity for academics, teachers and educators. This conference is now a well known educational technology event. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities. Its focus is to create and disseminate knowledge about the use of instructional technology for learning and teaching in education.

TOJET is interested in academic articles on the issues of educational technology. The articles should talk about using educational technology in classroom, how educational technology impacts learning, and the perspectives of students, teachers, school administrators and communities on educational technology. These articles will help researchers to increase the quality of both theory and practice in the field of educational technology.

### Call for Papers

TOJET invites article contributions. Submitted articles should be about all aspects of educational technology and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should also discuss the perspectives of students, teachers, school administrators and communities.

The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET.

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## A DIGITAL EUROPEAN SELF-ASSESSMENT TOOL FOR STUDENT TEACHERS OF FOREIGN LANGUAGES: THE EPOSTL

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### ABSTRACT

The acronym “EPOSTL” stands for the “European Portfolio for Student Teachers of Languages”, which is a digital self-assessment tool for students in foreign language teacher training programs across Europe. It builds on insights from the *Common European Framework of Reference (CEFR)* and the *European Language Portfolio (ELP)* as well as the *European Profile for Language Teacher Education*. It also helps student teachers of foreign languages to monitor and reflect on their experiences, performance and progress in the course of teacher education in a purposeful way. This study discussed and put forward some practical suggestions on the functions and the effectiveness of the EPOSTL in English Language Teaching (ELT) and German Language Teaching (GLT) departments in a state university in Turkey. The results of the study revealed that the use of the EPOSTL is helpful in developing student teachers’ metacognitive strategies as autonomous learners, which is a key factor in becoming teachers of foreign languages adopting the CEFR and the ELP principles in their classes.

**Keywords:** CEFR, ELP, EPOSTL, self-assessment, student teachers of foreign languages

### INTRODUCTION

Self-assessment is one of the key practices to develop self-awareness in the educational process, and consequently is an effective method to promote autonomous learning procedure and metacognitive strategies both inside and outside of the classroom context (Vygotsky 1978; Wallace 1991; Kumaravadivelu, 2006). Functional and pragmatic methods may provide student teachers with a self-assessment tool comprising purposeful and well-developed common criteria for continuously monitoring, recording and assessing their own educational progress. Student teachers of languages may get regular feedback from instructors concerning their academic success through their achievement based self-reflection.

The European Center for Modern Languages (<http://www.ecml.at/>) and the Language Policy Division of the Council of Europe (<http://www.coe.int/t/dg4/linguistic/>) coordinate foreign language learning, teaching and assessment practices, projects, and related events and activities across Europe (Mirici, 2014). The Council of Europe introduced the Common European Framework of Reference for Languages (CEFR) as a European reference resource (CoE, 2001). Likewise, the European Language Portfolio (ELP) was developed as a standard European self-assessment tool for language learners (Little, 2005); and the European Portfolio for Student Teachers of Languages (EPOSTL) was created as a self-assessment tool for students in foreign language teacher training departments in European higher education system. Furthermore as a personal documentation system the Europass was introduced to keep record of and to reflect on individuals’ linguistic and professional proficiency levels in accordance with the European standard in a consistent manner.

The EPOSTL is based on a self-assessment system resembling the system in the ELP, which is based on the CEFR. The CEFR describes foreign language proficiency levels as A1- A2 (Basic users), B1- B2 (Independent users), and C1 - C2 (Proficient users). Each level has verbal descriptors in the form of can-do statements relating to five language skill areas; listening, reading, spoken interaction, spoken production and writing (Mirici, 2000; North, 2000; Little, 2005). The EPOSTL comprises 193 descriptors presented as can-do statements for the holder’s self-assessment of his/her core competences as a prospective language teacher. All these European materials are standardized and are user friendly and flexible enough to use in any educational system across Europe.

An effective teacher education program prepares aspirant teachers to seek higher knowledge through continuous self-reflection and research (Esau, 2013), This study aimed to provide information on how to adapt the EPOSTL effectively to the education system of a particular country in order to promote the standardization of the foreign/second language teacher programs through self evaluation of the student teachers in a functional, economic and feasible way .

## WHAT IS THE EPOSTL?

The EPOSTL is a standard self-assessment tool developed by the European Centre for Modern Languages (ECML) that enables student teachers of languages to analyze and reflect on the knowledge and skills needed to teach a foreign language (Krišjāne et al 2009, Newby 2012). The EPOSTL is accessible on the ECML website: <http://epostl2.ecml.at/> in most European languages. The main aims of the EPOSTL are as follows (<http://epostl2.ecml.at/>):

1. to encourage student teachers to reflect on the competences a teacher strives to attain and on the underlying knowledge which feeds these competences;
2. to help prepare student teachers for their future profession in a variety of teaching contexts;
3. to promote discussion between student teachers and their peers and between student teachers and teacher educators and mentors;
4. to facilitate self-assessment of student teachers' developing competences;
5. to provide an instrument which helps chart progress.

The EPOSTL consists of three components – a personal statement, self-assessment and a dossier. These components are also supplemented by an introduction, glossary of terms, an index and a user's guide (<http://epostl2.ecml.at/>).

**In the personal statement section** student teachers reflect on their experiences of teaching, focusing attention on questions that are important at the beginning of teacher education. Student teachers consider and analyze their own teacher education courses, their experience and expectations, and thus draw an overall picture of a good language teacher.

**In the self-assessment section** there are 196 'can-do' statements in seven categories such as context, methodology, resources, lesson planning, conducting a lesson, independent learning, assessment and reflection grid in order to raise awareness on planning and organizing the teaching and learning process as well as to help student teachers reflect on their achievements.

**In the dossier part** student teachers consider and reflect on their progress and development during teaching courses or practice through such evidence as lesson plans, lesson observations and evaluations, checklists, comments, objectives, case studies or action research, reflections, videos, examples of tasks, activities, and so on.

**The glossary of terms** is a tool for defining words used in the EPOSTL according to the specific content. **The index** is organized in the form of table where the EPOSTL student teacher can easily find the location of terms used in the descriptors. **The user's guide** is a helpful tool for introducing oneself to the EPOSTL, since this chapter contains information on the background of the EPOSTL, content, aims and brief overview of the content. In other words, it acts as a summary of the EPOSTL.

## PRACTICES IN THE TURKISH EDUCATION SYSTEM

Reflective and professional learning from a lifelong learning perspective plays a significant role in the future professional life of student teachers (Holmes, 2005; Hunt, 2006; Eryaman, 2007; Idalvichi, 2007; Molander, 2008). In the course and speed of everyday life, most educators do not have much time to pay attention to or notice the details of their area of practice. However, over time and with effort the picture can become clearer (Richardson, 2002). It is widely agreed that the best teachers are those who realize just how much they still have to learn (Hatton and Smith, 2005). When the purpose and the functions of the EPOSTL supporting English language teacher training programs are considered, it can be seen that ongoing assessment gives rise to personal reflections in the educational process which can serve as a key to autonomous learning for prospective teachers (Benson and Huang, 2008). These reflections occur both during and after experience of learning situations. Consequently student teachers' EPOSTL-based reflections can be called 'Reflection-in-action', 'Reflection-on-action', and as a guide to future actions they are 'Reflection-for-action' (Schön, 1983). This reflection is complex, rigorous, demanding and challenging. It is not a mere matter of sitting down and chatting about practice. Therefore, the EPOSTL serves as a good practical tool for student teachers' real reflection on their teaching practice (Fish, 2001).

As a member state to the Council of Europe since 1949, the Turkish Ministry of Education was a signatory to the treaty at the 20th Session of the Standing Conference of the Ministers of Education of the Council of Europe, Krakow, Poland, 15-17 October 2000. The CEFR is the reference framework adopted by the Ministry of Education for foreign language education curricula both in state and private schools throughout the country <http://ttkb.meb.gov.tr/www/ogretim-programlari/icerik/72>. Two ELP models, one for students aged 10-14, the other for students aged 15-18, have been validated by the CoE ELP Validation Committee on behalf of the Ministry of Education, and both are accessible free of charge via the Ministry website at <http://adp.meb.gov.tr>. The Vocational Qualifications Institution spreads EPOSTL use throughout Turkey [http://www.europass.gov.tr/index\\_en.html](http://www.europass.gov.tr/index_en.html). It is therefore a necessity to introduce the use of the EPOSTL to students in foreign language teacher training departments in Turkey <http://epostl2.ecml.at/>.

## A CASE STUDY IN A TURKISH UNIVERSITY

It is generally felt that people need to be competent speakers of at least two languages other than their native language to be able to access international resources as members of today's globalized society. Such plurilingual identity may be an important advantage to be able to communicate with the representatives of different cultural contexts. It is of great importance that all variables in foreign/second language programs be considered, planned, created and supplied accordingly. One of the permanent variables of language teaching programs is the teacher. Hence, the procedure in foreign/second language teacher training programs gains a significant role in every education system regardless of the language or the location in the world.

This study investigated the contribution of EPOSTL-based self-assessment practices to student teachers' self-awareness and academic achievements in the English Language Teaching (ELT) and the German Language Teaching (GLT) departments of Gazi University, in Turkey.

The research questions of the study were as follows:

- 1) Is there a difference between the student teachers' appreciation of the EPOSTL use as a standard self-assessment tool in ELT and GLT departments?
- 2) Is there a difference between the student teachers' self-assessment scores in ELT and GLT departments in terms of their foreign language teaching methodology skills?

Based on these two main research questions the following sub-problems are of the other concerns of the study:

1. Is there a difference between the academic success scores of student teachers in ELT and GLT departments?
2. Is there a difference between the self-evaluation scores of student teachers in ELT and GLT departments?
3. Is there a correlation between academic success and self-evaluation scores of ELT and GLT student teachers?
4. Is there a difference between the self-evaluation scores about teaching language skills (speaking, writing, listening, and reading) of ELT and GLT student teachers?
5. Is there a difference between the self-evaluation scores about teaching grammar and vocabulary of ELT and GLT student teachers?
6. Is there a correlation between the sub-scales of ELT and GLT student teachers?

## METHOD

Sixty student teachers, thirty from the English Language Teaching (ELT) department and thirty from the German Language Teaching Department (GLT) department participated in this study in the 2012-2013 academic year. They were all third grade students in a four year teacher training program in a leading university in Ankara, Turkey.

In the study student teachers in the ELT and GLT departments used the EPOSTL-based self-assessment checklist to record and reflect on their achievements in the methodology courses such as Teaching Language Skills, and Approaches in Teaching English/German as a Foreign Language.

Quantitative data were collected through a self-assessment checklist with 49 statements derived from the methodology section of the EPOSTL as a five-point Likert scale (see Appendix), and the qualitative data were collected via face to face interviews with randomly selected student teachers who participated in the research.

The data were analyzed with SPSS 15 for Windows. The differences between the academic success of student teachers at ELT and GLT departments were examined by independent sample t-test and correlations for each sub-scale were calculated using Pearson Product-Moment Correlation Coefficient.

## RESULTS

Student teachers participating in the research interview reported that the use of the EPOSTL is quite interesting and motivating since they have the opportunity to track their progress regularly and to determine individual goals for their own learning situations. The students also stated that they created a Europass CV and Europass Language Passport as a result of their awareness of European standardization concerning vocational and linguistic competences. Findings based on the student teachers' EPOSTL-based self-assessment were given below:

**Table 1**
*Results of the independent samples T-test of the academic successes of student teachers by department*

Department	N	$\bar{X}$	SD	Df	T	P
ELT	30	71.80	6.93	<b>58</b>	<b>.07</b>	.943
GLT	30	71.93	7.50			

As seen above in Table 1 academic success of the student teachers between departments was not significantly different.

**Table 2**
*Results of the independent samples t-test for the self-evaluation Scores of student teachers by department*

Department	N	$\bar{X}$	SD	Df	t	P	$\eta^2$
ELT	30	<b>199.73</b>	17.88	<b>58</b>	<b>2.55</b>	.013	.10
GLT	30	<b>209.97</b>	12.82				

Above, Table 2 shows that the self-assessment score of the ELT student teachers was significantly lower than those of the GLT student teachers.

**Table 3**
*Results of the Independent Samples t-Test for Speaking Scores by Department*

Department	N	$\bar{X}$	SD	df	t	P
ELT	30	<b>45.70</b>	5.51	58	.24	.808
GLT	30	<b>46.10</b>	7.10			

In Table 3 it is illustrated that the speaking scores did not differ significantly between the departments.

**Table 4**
*Results of the independent samples t-Test for Writing Scores by Department*

Department	N	$\bar{X}$	SD	Df	t	P	$\eta^2$
ELT	30	<b>48.13</b>	6.38	58	<b>2.30</b>	.025	.08
GLT	30	<b>51.50</b>	4.85				

Table 4 shows that the writing scores of ELT student teachers were significantly lower than those of GLT student teachers.

There was a non-significant positive correlation ( $r=.22$ ;  $p>.05$ ) between academic success and self-evaluation scores of ELT student teachers. Similarly, the correlation between academic success and self-evaluation was positive and non-significant ( $r=.008$ ;  $p>.05$ ) for GLT student teachers.

**Table 5**
*Results of the Independent Samples t-Test for Listening Scores by Department*

Department	N	$\bar{X}$	SD	Df	t	P
ELT	30	<b>33.53</b>	4.38	58	<b>1.53</b>	.131
GLT	30	<b>35.07</b>	3.30			

In Table 5 it is shown that listening scores did not differ significantly between departments.

**Table 6**
*Results of the Independent samples t-Test for Reading Scores by Department*

Department	N	$\bar{X}$	SD	Df	t	P
ELT	30	<b>38.30</b>	5.01	58	<b>1.98</b>	.053
GLT	30	<b>40.40</b>	2.97			

As Table 6 shows above there was no significant differences between the departments in terms of the reading scores.

**Table 7**  
*The Results of the Independent Samples t-Test for Grammar Scores by Department*

Department	N	$\bar{X}$	SD	Df	t	P	$\eta^2$
ELT	30	<b>20.67</b>	3.04	58	<b>4.02</b>	.000	.22
GLT	30	<b>23.23</b>	1.72				

Table 7 shows that the grammar scores of the student teachers in the ELT department were significantly lower than those of the GLT department student teachers.

**Table 8**  
*Results of the Independent Samples t-Test for Vocabulary Scores by Department*

Department	N	$\bar{X}$	SD	df	t	P
ELT	30	<b>13.07</b>	1.48	58	1.30	.198
GLT	30	<b>13.67</b>	2.04			

Table 8 shows that vocabulary scores did not differ significantly between departments.

For all the sub-scales, ELT student teachers gave themselves lower scores in the self- evaluation scale. However, the correlation was higher for ELT student teachers in terms of their academic success and overall self-evaluation, which indicated a higher awareness of their strengths and weaknesses in the field of methodology.

**Table 9**  
*Descriptive statistics of sub-scales concerning the self-evaluation scores of ELT student Teachers*

Sub-scales	N	Minimum	Maximum	$\bar{X}$	SD	$\bar{X}$ /Maximum
Speaking	30	37.00	60.00	45.70	5.51	<b>76.17</b>
Writing	30	29.00	60.00	48.13	6.38	80.22
Listening	30	23.00	39.00	33.53	4.38	83.83
Reading	30	28.00	45.00	38.30	5.01	85.11
Grammar	30	13.00	25.00	20.67	3.04	82.68
Vocabulary	30	10.00	15.00	13.07	1.48	<b>87.13</b>

Table 9 shows that ELT student teachers had the highest mean score from the sub-scale of vocabulary and the lowest mean score from the sub-scale of speaking. This can be explained by the fact that English is a foreign language for these learners and it has always been more difficult for them to articulate English statements accurately and fluently. This difficulty probably leads to a professional challenge in teaching speaking skills.

**Table 10**  
*Correlation of Sub-scales Concerning Self-evaluation Scores of ELT Student Teachers*

Sub-scales	Speaking	Writing	Listening	Reading	Grammar	Vocabulary
Speaking	1.000					
Writing	<b>.487**</b>	1.000				
Listening	<b>.321</b>	<b>.576**</b>	1.000			
Reading	<b>.083</b>	.220	<b>.631**</b>	1.000		
Grammar	<b>.450*</b>	.104	.234	<b>.448*</b>	1.000	
Vocabulary	.091	.276	.499**	<b>.577**</b>	.303	1.000

\* p<.05, \*\* p<.01

Table 10 shows that there were significant correlations between writing and listening; between reading and listening; between vocabulary and listening and between vocabulary and reading. In addition significant correlations were found between grammar and speaking and grammar and reading. No negative correlations were found between sub-scales.

**Table 11**  
*Descriptive statistics of sub-scales concerning the self-evaluation scores of GLT student Teachers*

Sub-scales	N	Minimum	Maximum	$\bar{X}$	SD	$\bar{X}$ /Maximum
Speaking	30	26.00	57.00	46.10	7.10	76.83



Writing	30	44.00	60.00	51.50	4.85	85.83
Listening	30	28.00	40.00	35.07	3.30	87.68
Reading	30	35.00	45.00	40.40	2.97	89.78
Grammar	30	19.00	25.00	23.23	1.72	92.92
Vocabulary	30	8.00	15.00	13.33	1.95	88.87

Table 11 shows that GLT student teachers had the highest mean score from the sub-scale of grammar and the lowest mean score from the sub-scale of speaking just like the ELT student teachers.

**Table 12**  
*The Correlation of Sub-scales Concerning the Self-evaluation Scores of GLT Student Teachers*

Sub-scales	Speaking	Writing	Listening	Reading	Grammar	Vocabulary
Speaking	1.000					
Writing	.201	1.000				
Listening	-.174	.605**	1.000			
Reading	.155	.283	.455*	1.000		
Grammar	-.373*	.135	.314	-.019	1.000	
Vocabulary	-.308	.378*	.595**	.321	.130	1.000

\*  $p < .05$ , \*\*  $p < .01$

Table 12 shows that there were significant correlations between writing and listening at a significance level of .01 and there were significant correlations between grammar and speaking; between vocabulary and writing; and between reading and listening at a significance level of .05. Correlations between the other sub-scales were low. Negative (reverse) correlations were found between the sub-scales of listening and speaking, grammar and speaking, vocabulary and speaking, and grammar and reading. The rise in one of these variables caused a decrease in the other variable.

The findings in Tables 9 and 11 show that from all the sub-scales, GLT student teachers had higher mean scores for self-evaluation than ELT department student teachers.

## CONCLUSION AND SUGGESTIONS

Classroom practices are mostly conducted by means of teachers' skill and knowledge of coordination, cooperation, organization and motivation. Teacher educators need to create opportunities and facilitate experiences that will develop the pre-service teacher's capacity to reflect on his/her practice (Frick, Carl & Beets, 2010). This can be considered as a key factor to promote learner autonomy, self-directed learning, and thus to facilitate developing metacognitive learning strategies. In many educational contexts evaluating student teachers' academic achievements is unlikely to be provided through standardized self-assessment descriptors. In most cases individual trainers have their own distinctive criteria to evaluate the success of their students based on their personal understanding of "priorities" for a good foreign language teacher.

In this study the result of the data analysis has revealed the facts that;

- a. student teachers of languages are in need of space and time to reflect on their achievements so that they personally experience self-directed learning as autonomous learners, and become teachers who can also provide autonomous learning facilities for the students in their future classes,
- b. the EPOSTL is a useful self-assessment tool to help student teachers reflect on the progress and potential of their learning and teaching,
- c. student teachers of languages can familiarize themselves with the Common European Framework of Reference for Languages and the European Language Portfolio oriented foreign language teaching practices when they personally experience using the EPOSTL as a standard European self-assessment tool,
- d. as the EPOSTL holders, student teachers of languages become efficient users of the Europass documentation system, and create their own Europass CV, Europass Language Passport and the supplementary documents even before they graduate from their department.

It can also be suggested that besides educating student teachers of languages in the higher education system in accordance with the principles and the guidelines developed by the Council of Europe, teachers in the system should be trained to use the CEFR and the ELP-based foreign language teaching practices in their classes by valuing autonomous learning, self-assessment and cultural diversity in a lifelong learning perspective. For this purpose it is also possible to develop a



“Professional Portfolio for Teachers of Languages” through which foreign language teachers can reflect on and self-evaluate their linguistic, communicative, intercultural and language teaching skills during their professional life. This will enable them to become autonomous teachers who are aware of their personal and professional strengths and weaknesses as well as to avoid the risk of becoming “slaves of the bureaucratic system”. Additionally, there is research evidence to show that the impact of ICT on educational activities gives rise to success in a variety of contexts (Aristovnik, 2012; Agostinho, 2005). Although the EPOSTL can be downloaded and printed out as a hard copy document, it is a fact that the use of the EPOSTL descriptors in digital form can save time and be economical and easily accessible for the students. It could also be a convenient way for student teachers or teachers in schools to keep records of self-observation and evaluation in their computers as a digital file, allowing them to see their own progress within a particular period of time. It could therefore be practical and environmentally friendly to make use of an online version of the portfolios as an E-EPOSTL for student teachers, and to develop a similar tool for teachers of foreign languages as well.

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**APPENDIX**

Please mark (X) your department and reflect your level of agreement for each descriptor below.

A. English Language Teaching (ELT)  B. German Language Teaching (GLT)

**A. Speaking/Spoken Interaction**

**B. Writing/Written Interaction**

Number	Descriptors	1	2	3	4	5
1	I can evaluate and select meaningful activities to encourage learners to develop their creative potential.					
2	I can evaluate and select a range of meaningful writing activities to help learners become aware of and use appropriate language for different text types (letters, stories, reports etc).					
3	I can evaluate and select texts in a variety of text types to function as good examples for the learners' writing.					
4	I can evaluate and select a variety of materials to stimulate writing (authentic materials, visual aids etc.).					

Number	Descriptors	1	2	3	4	5
1	I can create a supportive atmosphere that invites learners to take part in speaking activities.					
2	I can evaluate and select meaningful speaking and interactional activities to encourage learners of differing abilities to participate.					
3	I can evaluate and select meaningful speaking and interactional activities to encourage learners to express their opinions, identity, culture etc.					
4	I can evaluate and select a range of meaningful speaking and interactional activities to develop fluency (discussion, role play, problem solving etc.).					
5	I can evaluate and select different activities to help learners to become aware of and use different text types (telephone conversations, transactions, speeches etc.).					
6	I can evaluate and select a variety of materials to stimulate speaking activities (visual aids, texts, authentic materials etc.).					
7	I can evaluate and select activities which help learners to participate in ongoing spoken exchanges (conversations, transactions etc.) and to initiate or respond to utterances appropriately.					
8	I can evaluate and select various activities to help learners to identify and use typical features of spoken language (informal language, fillers etc.).					
9	I can help learners to use communication strategies (asking for clarification, comprehension checks etc.) and compensation strategies (paraphrasing, simplification etc) when engaging in spoken interaction.					
10	I can evaluate and select a variety of techniques to make learners aware of, discriminate and help them to pronounce sounds in the target language.					
11	I can evaluate and select a variety of techniques to make learners aware of and help them to use stress, rhythm and intonation.					
12	I can evaluate and select a range of oral activities to develop accuracy (grammar, word choice etc.).					
5	I can evaluate and select activities which help learners to participate in written exchanges (emails, job applications etc.) and to initiate or respond to texts appropriately.					
6	I can help learners to gather and share information for their writing tasks.					
7	I can help learners to plan and structure written texts (e.g. by using mind maps, outlines etc.).					
8	I can help learners to monitor, reflect on, edit and improve their own writing.					
9	I can use peer-assessment and feedback to assist the writing process.					
10	I can use a variety of techniques to help learners to develop awareness of the structure, coherence and cohesion of a text and produce texts accordingly.					
11	I can evaluate and select a variety of techniques to make learners aware of and use spelling patterns and irregular spelling.					
12	I can evaluate and select writing activities to consolidate learning (grammar, vocabulary, spelling etc.).					

**C. Listening**

Number	Descriptors	1	2	3	4	5
1	I can select texts appropriate to the needs, interests and language level of the learners.					
2	I can provide a range of pre-listening activities which help learners to orientate themselves to a text.					
3	I can encourage learners to use their knowledge of a topic and their expectations about a text when listening.					
4	I can design and select different activities in order to practise and develop different listening strategies (listening for gist, specific information etc.)					
5	I can design and select different activities which help learners to recognise and interpret typical features of spoken language (tone of voice, intonation, style of speaking etc.).					
6	I can help learners to apply strategies to cope with typical aspects of spoken language (background noise, redundancy etc.).					
7	I can help learners to apply strategies to cope with difficult or unknown vocabulary of a text.					
8	I can evaluate and select a variety of post-listening tasks to provide a bridge between listening and other skills.					

**D. Reading**

Number	Descriptors	1	2	3	4	5
1	I can select texts appropriate to the needs, interests and language level of the learners.					
2	I can provide a range of pre-reading activities to help learners to orientate themselves to a text.					
3	I can encourage learners to use their knowledge of a topic and their expectations about a text when reading.					
4	I can apply appropriate ways of reading a text in class (e.g. aloud, silently, in groups etc.).					
5	I can set different activities in order to practise and develop different reading strategies according to the purpose of reading (skimming, scanning etc.).					
6	I can help learners to develop different strategies to cope with difficult or unknown vocabulary in a text.					
7	I can evaluate and select a variety of post-reading tasks to provide a bridge between reading and other skills.					
8	I can recommend books appropriate to the needs, interests and language level of the learners.					
9	I can help learners to develop critical reading skills (reflection, interpretation, analysis etc.)					

**E. Grammar**

Number	Descriptors	1	2	3	4	5
1	I can introduce a grammatical item and help learners to practice it through meaningful contexts and appropriate texts					
2	I can introduce, and help students to deal with, new or unknown items of grammar in a variety of ways (teacher presentation, awareness-raising, discovery etc.).					
3	I can deal with questions learners may ask about grammar and, if necessary, refer to appropriate grammar reference books.					
4	I can use grammatical meta-language if and when appropriate to the learners' needs.					
5	I can evaluate and select grammatical exercises and activities, which support learning and encourage oral and written communication.					

**F. Vocabulary**

Number	Descriptors	1	2	3	4	5
1	I can evaluate and select a variety of activities which help learners to learn vocabulary.					
2	I can evaluate and select tasks which help learners to use new vocabulary in oral and written contexts.					
3	I can evaluate and select activities which enhance learners' awareness of register differences.					

## A REPLICATION STUDY ON THE MULTI-DIMENSIONALITY OF ONLINE SOCIAL PRESENCE

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### ABSTRACT

The purpose of the present study is to conduct an external replication into the multi-dimensionality of social presence as measured by the Computer-Mediated Communication Questionnaire (Tu, 2005). Online social presence is one of the more important constructs for determining the level of interaction and effectiveness of learning in an online environment. This study is unique as it provides the opportunity to replicate previous research on the dimensionality of the instrument and offers insight as to the nature of social presence among students enrolled in higher education postgraduate online courses.

**Keywords:** replication analysis, social presence, online learning

### INTRODUCTION

To frame good pedagogical practices for online learning, Garrison, Anderson, and Archer (2000) developed the community of inquiry model recognizing the transactional relationship between instructors and learners through the interaction of cognitive presence (of the learner), teaching presence (i.e. the structure and process), and social presence (i.e. affective interpersonal communication). According to Garrison et al. (2000), these elements, which define the community of inquiry model, are fundamental to a successful higher education learning experience. A key component in the model is the concept of social presence that refers to the affective domain as it relates to interpersonal communications. If social presence is absent, learner frustration develops because of the poor quality of interpersonal interactions (Rifkind, 1992). Conversely, a high degree of social presence in online learning is viewed as synonymous with an interactive environment (Lobry de Bruyn, 2004; McIssac & Gunawardena, 1996).

In assessing social presence within a text-based, asynchronous environment, three categories of communicative responses have been identified (Rourke, Anderson, Garrison, & Archer, 2001): affective indicators (i.e., values, beliefs, feelings, and emotions); cohesive indicators (i.e. group presence and commitment); and interactive indicators (i.e., attending in a socially meaningful way). Although Rourke et al. (2001) recognize that the coding and analyzing of CMC text-based transcripts using the aforementioned indicators provides a measure of the density of social presence, they also contend future exploratory studies including factor analysis would aid in further defining the construct.

The construct of social presence is the critical affective ingredient for online learning. Although earlier research on social presence has found it to be related to learner satisfaction (Gunawardena & Zittle, 1997) others such as Wise, Chang, Duffy and del Valle (2004) argue that it is more of a correlational than causal variable. Nevertheless, several researchers have demonstrated that social presence is one of the more important constructs to determine the level of interaction and effectiveness of learning in an online environment (Garrison et al., 2000; Gunawardena & Zittle, 1997; McIssac & Gunawardena, 1996; Lobry de Bruyn, 2004; Richardson & Swan, 2003; Rourke et al., 2001; Tu & McIssac, 2002). For example, Kim, Kwon, and Cho (2011) found that students who valued media integration, quality instruction and interactivity had increased social presence perception and heightened learning satisfaction While So and Brush (2008) demonstrated that in a distance learning environment, student perception and overall satisfaction of collaborative learning is associated with social presence (So, 2008).

Part of the difficulty in aggregating findings is the varying way that researchers have measured and reported social presence. For example, earlier efforts were found lacking because they were created for the face-to-face environment and then adapted to online learning without proper validation procedures. Recently, Sung and Mayer (2012) found a five-factor solution for the Online Social Presence Questionnaire that included social respect, social sharing, open mind, social identity, and intimacy. However, according to Sung and Mayer (2012) a limitation of their study is that it focused only on university students in Korea and consequently future research needs to examine if similar findings would be replicated in samples with different ages, genders, grades, intellectual levels, and cultural backgrounds.

Another instrument that has been developed to measure the construct, social presence, in a computer-mediated communication (CMC) environment is the Computer Mediated Communication Questionnaire (CMCQ; Tu 2005). The exploratory factor analysis of the CMCQ resulted in a four factor multi-dimensional model of online social presence (Tu & Yen, 2006). With the increased frequency of research reports using the CMCQ (Mykota & Duncan, 2007; So, 2008; So & Brush, 2008; Stein & Wanstreet; 2003; Tu & McIssac; 2002; Tu & Yen, 2007) the need to explore the multidimensional characteristics of the instrument with different samples in varying contexts (i.e. replication analysis) is warranted so as to advance understanding of the construct’s operationalization and interpretation.

Problematic to replication analysis are the lack of standardized metrics available to make informed comparisons of exploratory factor analysis (EFA) procedures conducted with separate data sets. Good EFA studies detail what might be expected for replication results. This can include the number of factors present, whether the factors are correlated or not, the factor loadings for the communalities that comprise the factor and the names of the factors as informed by substantive interpretation which includes the theoretical underpinnings for the factors identified (Osborne & Fitzpatrick, 2012). With the lack of standardized metrics, a similar procedure is advocated for EFA replication purposes whereby items are examined to see if they load to the same factors and if the individual item factor loadings are equivalent (Osborne & Fitzpatrick, 2012).

**PURPOSE**

With procedures for analysis having been reported in the literature and a basis for the interpretation of EFA replication data established it was decided to undertake a replication analysis. The main objective of the study then is to conduct an external replication (i.e. an independent external sample) of the CMCQ (Tu, 2005) using the same EFA procedures as previously reported by Tu and Yen (2006). By doing so a better understanding of the instrument’s (CMCQ; Tu, 2005) generalizability will occur while adding to the extant research on the measurement of the construct social presence in an online learning environment.

**METHOD**

The participant sample is derived from students enrolled in the postgraduate special education program offered at the University of Saskatchewan. The postgraduate program is comprised of 9 courses that are delivered over two years. Using convenience sampling, 275 students (90% response rate) enrolled in the postgraduate program participated in the study. Participants in the study voluntarily completed the computer-mediated communication questionnaire (CMCQ; Tu, 2005). The sentence stems on the CMCQ were used to identify social presence in a text-based system with the CMC tools (email, discussion, and chat) The respondent was asked to complete each of the instrument’s 24 items on the basis of a five-point Likert scale converted to a numerical weighting ranging in options from 0 (uncertain); 1 (strongly disagree); 2 (disagree); 3 (agree); and 4 (strongly agree). The frequency counts for the demographic variables age, sex, and numbers of online classes taken are reported in Table 1.

Table 1. Frequency Demographics, N=275

	Frequency	Percent
Sex		
Male	20	8.3
Female	254	91.7
Age		
18-25	39	14.1
26-33	95	34.3
34-41	84	30.3
42 or older	59	21.3
Number of Online Courses		
1 course	113	40.8
2-3 courses	78	28.2
4 or more courses	86	31.0

To determine the adequacy of the sample for factorial analysis the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (i.e. KMO) and Bartlett’s Test of Sphericity were calculated. The replication analysis of the CMCQ’s multidimensionality also included a reliability analysis of the instrument’s items. A visual inspection of the corrected item total correlations for the CMCQ was conducted with items below .10 deemed as outlier test items with a Cronbach alpha reliability coefficient value equal to or above .70 considered to reflect a high internal consistency. Following the procedures previously reported by Tu and Yen (2006) a principal components analysis with varimax orthogonal rotation was conducted on those items deemed to reflect high internal



consistency. Subsequent to the orthogonal rotation a principal axis factor analysis using a promax oblique rotation was undertaken. In determining what factors were to be retained a two-line scree test of those the factors with eigen values >1 was applied. The methods described for the exploratory factor analysis replicates the methods of the initial validation study conducted (Tu & Yen, 2006). By following the same procedure undertaken by Tu and Yen (2006) a comparative analysis of whether the same factor structure with equivalent factor loadings and item communalities of the CMCQ can occur. The methods outlined are consistent with procedural aspects of replication analysis as reported by Osborne and Fitzpatrick (2012). As an external replication of the previously reported EFA undertaken (Tu & Yen, 2006) the present study adds value as it aids in determining the degree to which the CMCQ factor structure generalizes to a new data set and if there are any items considered challenging or problematic.

## RESULTS

A reliability analysis for the instrument (i.e. 24 items) was conducted with two items deemed as outliers and removed (i.e. items 4 & 19), see Table 2. The 22 remaining items reflected relatively high internal consistency with a Cronbach alpha reliability coefficient calculated at .732. In determining the appropriateness of conducting a factor analysis the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett’s Test of Sphericity were calculated (Tabachnick & Fidell, 2007). For the data the KMO statistic is between .7 and .8 (i.e. .734) which is deemed as being good, this indicates the sample should be adequate for the conducting of a factor analysis (Hutcheson & Sofroniou, 1999). Bartlett’s Test of Sphericity tests the null hypothesis that the correlation matrix is an identity matrix, which implies the variables are uncorrelated. In this case, Bartlett’s Test of Sphericity was significant ( $\chi^2(754) = 231 p < .05$ ) which leads to the rejection of the null hypothesis and to the conclusion that there are correlations in the data set and that the data is appropriate for the conducting of a factor analysis.

Table 2. Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
q1	46.6606	87.463	.345	.719
q2	46.8358	89.588	.201	.728
q3	47.3321	86.977	.279	.723
q5	47.2226	87.221	.233	.727
q6	47.9343	86.897	.266	.724
q7	46.9088	88.464	.254	.724
q8	46.7482	89.237	.251	.725
q9	47.4197	85.285	.318	.719
q10	47.2080	85.374	.401	.714
q11	47.2810	82.086	.466	.706
q12	47.0620	85.912	.356	.717
q13	47.2847	88.842	.226	.726
q14	47.5328	85.700	.288	.722
q15	46.9197	85.788	.357	.717
q16	47.5328	88.067	.252	.725
q17	47.3905	87.748	.295	.722
q18	47.8978	88.671	.176	.731
q20	47.7263	85.328	.333	.718
q21	46.8686	89.052	.267	.724
q22	46.3102	91.021	.172	.729
q23	46.8029	85.023	.389	.714
q24	48.0073	88.601	.145	.736

Like the initial EFA validation study conducted by Tu and Yen (2006), a principal components analysis with varimax orthogonal rotation was used to explore the underlying factor structure. Using the Kaiser criterion the first stage of the analysis identified seven components with eigen values greater than 1. In total these components accounted for 51.4% of the variance in the test items. The five factor pattern that best met the criteria of simple structure (Thurstone, 1947) and was clearly interpretable, and in this instance replicable as reported in the previous EFA (Tu & Yen, 2006), was retained. In the rotated component matrix the five components were well defined by 3-4 test items that had high loadings ( $\geq .320$ ) on only one component with those items that did not have a high loading on any one component or loaded across components excluded, see Table 3.



In the previous EFA with the CMCQ (Tu & Yen, 2006) a promax oblique rotation was also conducted because aspects of the multidimensional construct social presence as measured by the CMCQ were correlated. For the second phase of the EFA replication analysis, a similar procedure was adopted to determine the degree of correlation between the factors. In the principal axis factoring analysis using a promax oblique rotation, seven factors with eigen values greater than 1 were extracted accounting for 51.4% of the variance. A process similar to that used for the identification of a simple structure that is clearly interpretable and replicable resulted in a five-component solution being retained. In the original EFA conducted by Tu and Yen (2006) the structure matrix was used for interpreting the oblique rotation. The structure matrix is a simple correlation of the variables with the factors. Following the procedures conducted in the original EFA, items with correlations  $\geq .320$  for a factor and not correlated with another factor were retained see Table 4.

Table 3. Principal Component Analysis Rotated Component Matrix

Item	Component				
	1	2	3	4	5
q7	.745			-.121	
q10	.654		.215		
q1	.559			.157	.101
q15	.539	-.144		.276	.160
q18		.770	-.106		.128
q14		.648	.211		.116
q24		.606		-.106	
q9	.293	.470	.131	.333	-.144
q3			.655		
q11	.266	.143	.636	.138	
q12	.236		.492		.381
q8	.152	.124	.489		
q16	.161	-.157		.754	
q20			.176	.609	.150
q6		.129		.513	
q22					.811
q23	.205	.253	.167		.636
q13			.189		.598
q2	.344		-.264		.229
q17	.134	.145	.217	.240	-.171
q5		.110		.207	
q21	.158			.247	.214

Table 4. Principal Axis Factor Analysis Structure Matrix

Item	Factor				
	1	2	3	4	5
q7	.698		.244	.109	.177
q1	.474		.322	.279	.235
q15	.412		.278	.270	.222
q18		.684			.194
q14	.119	.551	.311	.113	.236
q24		.396			
q11	.342	.167	.600	.217	.260
q3	.185		.464	.179	.150
q12	.297		.382	.157	.358
q17	.210	.139	.343	.288	
q8	.225	.147	.327	.164	.113
q21	.262	.131	.309	.268	.238
q10	.155		.292	.206	
q16	.216		.196	.624	.138
q20	.139	.116	.286	.453	.171
q6		.140	.287	.355	
q23	.375	.325	.390	.224	.658
q22		.121		.101	.571
q13	.502		.286	.230	.334
q9	.219	.349	.161	.252	

q5		.174	.202	
q2	.204	.138	.141	.135

Following the EFA procedures conducted by Tu and Yen (2006), both the item and factor loadings for the principal components analysis with varimax orthogonal rotation and the structure matrix for the principal axis factoring analysis using a promax oblique rotation were reported. In keeping with EFA replication practices (Osborne & Fitzpatrick, 2012) the factor structure and squared difference for item loadings on the factors for the orthogonal rotation and oblique rotation used in the original (Tu & Yen, 2006) and replication studies were compared. The factor structure and item loadings for the principal components analysis with varimax rotation are reported with the squared difference for item loadings determined, see Table 5. A similar procedure was used for the oblique rotation and is presented in Table 6.

Table 5. Principal Component Matrixes for CMCQ Factor Replication

Item	External Sample Factor Loadings					CMCQ Factor Loadings				Squared Difference
	F1	F2	F3	F4	F5	F1	F2	F3	F4	
q1	.559					.644				.007
q2										
q3			.655			.703				.002
q4								.516		
q5										
q6				.513						
q7	.745									
q8			.489				.369			.014
q9		.470								
q10	.654								.727	.005
q11			.636							
q12			.492							
q13					.598		.699			.010
q14		.648								
q15	.539									
q16				.754		.697				.003
q17										
q18		.770						.322		.201
q19										
q20				.609		.757				.022
q21										
q22					.811				.687	.015
q23					.636		.706			.005
q24		.606						.699		.009

Table 6. Principal Axis Factor Structure Matrixes for CMCQ Factor Replication

Item	External Sample Factor Loadings					CMCQ Factor Loadings				Squared Difference
	F1	F2	F3	F4	F5	F1	F2	F3	F4	
q1	.611					.523				.007
q2										
q3			.464			.604				.020
q4							.343			
q5										
q6				.355						
q7	.698									
q8			.327					.338		.000
q9										
q10									.612	
q11			.600							
q12			.382							
q13					.334			.616		.080
q14		.551								

q15	.412				
q16		.624	.740		.013
q17		.343			
q18	.684			.554	.017
q19					
q20		.453	.818		.133
q21					
q22			.571	.621	.003
q23			.658	.546	.013
q24	.396			.392	.000

In the replication analysis the five factor solution was comprised of the Social Form of Communication, Privacy, Intimacy, Social Context, and Interactivity factors, see Table 7. The Social Form of Communication factor was related to how CMC is viewed as a pleasant, social form of communication. The Privacy factor was related to the confidentiality of the CMC medium. The Intimacy factor describes the degree to which students express their personal stories and feelings. The Social Context factor related to the ability of CMC to build trusting, caring, social relationships. Finally, the Interactivity factor related to one’s CMC skill set and communication style.

Table 7. External Replication: Factors, Items, and Item Stems

Factor	Item	Item Stem
Social form of Communication	7	CMC is a pleasant means of communicating with others
	1	CMC are social forms of communication
	15	CMC allows realtionships to be based upon sharing and exchanging information
Privavcy	18	It is unlikely that someone might obtain personal information about you in CMC
	14	CMC is technically reliable (e.g. free from reliability errors).
	24	It is unlikely that someone might redirect your messages.
Intimacy	11	The language used to express oneself in CMC is meaningful
	3	CMC messages convey feeling and emotion
	12	The language used to express oneself in CMC is easily understood.
	17	The aggressive over-participation of others in CMC may cause to participate less.
Social Context	16	CMC allows me to build more caring and social relationships.
	20	CMC permits the building of trust relationships
	6	CMC is a sensitive means of communicating with others.
Interactivity	22	My keyboarding skills allow me to be comfortable participating in CMC.
	23	I am comfortable with the communication styles employed by CMC users.
	13	I am comfortable participating, even if not familiar with the topics.

**DISCUSSION**

The external replication failed the most basic tenant of internal consistency reliability analysis with the determination of outlier test items (i.e. items 4 & 19). Nevertheless the reaming 22 items did meet the threshold for retention with the Cronbach alpha reliability coefficient deemed as moderately good and the sample determined to be appropriate for factor analysis.

In assessing the congruence of the factor matrixes presented it is clear that the communalities and item loadings for the factors do not meet structural equivalence in the strictest sense. Although the factor structure and pattern for item loadings across factors differs from the original EFA validation study conducted by Tu and Yen (2006) there are some similarities that are worthy noting. As such, there is some evidence that the Privacy, Social Context and Interactivity factors and item loadings have moderate item equivalency.

In both studies the Privacy factor was the second factor retained in the factor matrix. In the original EFA oblique rotation it accounted for 7.241 percent of the variance (Tu, 2005). In the replication analysis the amount of variance accounted for was slightly higher at 8.106 percent. Items 24 and 18 in both studies loaded above the .320 correlation with the squared difference for the item loadings being low. The Social Context factor (i.e. factor 1), in the original EFA, accounted for the most variance at 24.042 percent (Tu, 2005) whereas in the replication analysis the amount of variance explained was 5.625 percent. For comparative purposes in the original EFA items 1, 3, 16, and 20 had item loadings that warranted retention. In the replication analysis the item loadings were mixed with 16 and 20 loading on the Social Context factor (i.e. factor 4), item 1 loading on the Social Communication factor (i.e. 1) and item 3 loading on the Intimacy factor (i.e. 3). In all instances the squared differences for the four items is low, however, only items 16 and 20 loaded on a single factor. The last remaining factor that exhibited moderate equivalency was the Interactivity factor. In the original EFA the Interactivity factor (i.e. factor 3) accounted for 6.839 percent of the variance (Tu, 2005) whereas in the replication analysis it accounted for 5.469 percent of the variance (i.e. factor 5). For comparative purposes two out of the three items from the original EFA loaded in the replication analysis. In this respect, items 13 and 23 had low squared differences whereas item 8 which loaded on the Interactivity factor in the original EFA validation did not in the replication analysis and instead had a relatively low item loading on Factor 3.

Further similarities between the original and replication EFA studies can be found among those items that did have component loadings above the absolute value. (i.e. .320). In this instance items 2, 5, 19 and 21 did not load on any communality in either study. Based then on the results of the replication analysis there is some evidence of moderate to low equivalency with the original EFA, however it would be erroneous to assume the strong structural equivalence exists. As to why this might have occurred it is important to understand that an EFA external replication analysis is specific to the context and sample from which the study originated. In the present replication analysis, limitations exist in the sample as it was drawn from those individuals who had little or no previous experience with online learning.

As well, the sample is from a different cultural context. In this respect, cultural mindset and native language communication patterns have been shown to shape computer mediated communication patterns (Yildiz, 2009). The degree of media integration in online learning has also been found to be a significant predictor of social presence (Kim, Kwon & Cho, 2011) and could be another possible explanation as to potential differences within the online programs from which the sample was drawn. Although the sample for the replication analysis is not heterogeneous in gender composition, research on the construct social presence has found that gender differences do not exist (Kim, Kwon & Cho, 2011; Tu, Yen & Blocher, 2011).

## CONCLUSION

In the external replication analysis convenience sampling was used, however, this is viewed as a limitation as it affects the generalizability of the results. Future research should continue external replication of social presence instrumentation in varying contexts and with more systematic sampling procedures. As well, refinement of the item pool and item construction of the CMCQ might alleviate some of the issues surrounding structural equivalence and the generalization of findings.

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## ADAPTABILITY AND REPLICABILITY OF WEB-FACILITATED, HYBRID, AND ONLINE LEARNING IN AN UNDERGRADUATE EXERCISE PSYCHOLOGY COURSE

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### ABSTRACT

The study aims to examine the effectiveness of web-facilitated, hybrid, and online learning modalities among undergraduate students in a public institution so as to determine the adaptability and replicability of these three learning modalities. This is a quasi-experimental study. A total of 103 undergraduate exercise science majors participated in the study. Students' learning outcomes were measured by mid-term exams, final exams, online journal entries, final course grades, and other in-class and online assignments, and compared among the web-facilitated, hybrid, and online course sections. The differences of the means of the three sections of the final exam, final course grade, and final letter grade were statistically significant. The mean scores of the final exam of the web-facilitated section were significantly higher than the means of both the hybrid and online sections. The means of the final course grade and final letter grade of the web-facilitated section were significantly higher than the means of the online section. Approximately 82.1% of the students in the web-facilitated section earned extra credits compared to about 37.5% of the students in the online section. Web-facilitated learning proved more desirable among undergraduate students than the other two modalities; hybrid learning, however, can serve as a viable alternative.

**Keywords:** Web-facilitated, Hybrid, Online Learning, Undergraduate, Exercise Psychology

### INTRODUCTION

According to the report, "Trends in Global Distance Learning," given the current growing demands in globalization in higher education and the revival of a global economy, the market for distance learning has been continuously prosperous and expanding (Hanover Research, 2011). Institutions of higher education are using various content delivery methods, including traditional face-to-face courses, hybrid or web-facilitated courses, and entirely online courses to address the needs of their students. By definition, a traditional course is typically taught face to face without using any online technology; web-facilitated courses use web-based technology, such as web-based learning management systems or electronic student response systems, up to 29% of the time to enhance classroom experiences and interactions; hybrid course formats typically utilize online or virtual capabilities 30-74% of the time, with a substantial portion of course content delivered through web-based software; and at least 75% of the coursework of an online course is delivered via web-based learning, and typically requires few to no face-to-face meetings (Allen & Seaman, 2004; Collopy & Arnold, 2009; Southern Illinois University Edwardsville, 2014).

Compared to the United Kingdom, distance learning has been more commonly applied to undergraduate education in the United States. But, trends indicate that the majority of fully online programs still target graduate or professional degree-seeking students. During the 2006-2007 academic year, among all fully online programs offered in the U.S., 41% were undergraduate degree programs, and 22% were undergraduate certificate programs. Larger-sized and/or 2- or 4-year public institutions were more likely to offer online/hybrid programs than smaller-sized and/or private institutions. Approximately 87% of 600 4-year public institutions and 93% of 500 institutions with enrollments of 10,000 or more students in the U.S. offered online, hybrid, or other format of distance learning courses (Hanover Research, 2011; National Center for Education Statistics, 2008). Though health professions and related science programs demonstrated the lowest enrollments of distance learning overall in 2009-2010, they also had the lowest decline in enrollment, when compared with other programs, including liberal arts and sciences, social sciences, psychology, business, education, computer, and engineering during that



same period (Hanover Research; National Center for Education Statistics). A 2012 study of over 210,000 undergraduates from the U.S and 13 countries, found that the students overall favored the use of information technology to facilitate learning (Dahlstrom, Walker, & Dziuban, 2013). They believed that information technology provided them with more opportunities to succeed and increased their likelihood of achieving success in the future. Further, the findings indicated that students appreciated that technology could provide availability and accessibility of various communication methods to meet the needs of a diverse learning population. (Dahlstrom, 2012; Dahlstrom, Walker, & Dziuban, 2013).

Over the past two decades, research regarding the effectiveness of web-based learning in diverse disciplines has increased dramatically. A majority of these studies have compared the effectiveness of traditional learning with either hybrid or online learning. One example is a six-semester long study at a large urban university, wherein the researcher compared exam and final grades of over 300 students enrolled in a traditional face-to-face exercise physiology lecture-style class with those who enrolled in its comparable hybrid online format (McFarlin, 2008). The results of this study found that the students enrolled in the hybrid class sections had significantly higher final grades than those enrolled in the traditional class. Similar results were found in two experimental studies conducted by Vernadakis, et al. (2011) with 172 freshmen in a computer science course and Melton, Graf, and Chopak-Foss (2009) with 251 undergraduates in a general health course. The students enrolled in the hybrid classes achieved higher grades than the students enrolled in the traditional classes. Moreover, several studies examined undergraduate student satisfaction in comparison to course delivery format. In general, these data indicate higher or equal overall student satisfaction with course quality and/or instructor-student interactions in either online or in a hybrid format in comparison to a traditional delivery format (Callaway, 2012; Campbell, Floyd, & Sheridan, 2002; Melton, Graf, & Chopak-Foss, 2009). Hybrid or online course delivery formats can appeal to students who are seeking some flexibility in their class schedule, or new ways of engaging in a class. In an attempt to increase attendance in large introductory natural resources and life sciences classes, Riffell and Sibley (2004) developed a hybrid introductory environmental science undergraduate course, which integrated the strengths of both traditional and online teaching. In this hybrid format, they replaced typical lectures, which were routine in the traditional format class, with online assignments. Using an experimental study design, they found that the students enrolled in their hybrid sections were more engaged, as measured by having a higher completion rate of online assignments than the class attendance rate of passive lectures among the students enrolled in their traditional sections.

Evidence concerning the effectiveness of online/hybrid learning, however, has been controversial. The debate regarding the assessment of outcomes of the formats is ongoing. Grades and academic performance are standard measurements that can be readily compared across platforms, while instructional effectiveness must also be examined. However, given the current emphasis on enrollment and retention among many institutions, student satisfaction cannot be ignored. Interestingly though, when compared with graduate students, undergraduates are more likely to prefer a traditional or hybrid learning format, rather than a fully online mode of delivery (Castle & McGuire, 2010). Scherrer (2011) compared traditional, hybrid, and online deliveries of an undergraduate introductory statistics course in the areas of the students' academic performance, assignment completion, and overall course satisfaction. The participants were overwhelmingly juniors and seniors majoring in industrial engineering, management, and information technology/computer science. Grades from mid-term exams, final exams, homework assignments, and instructors' course evaluations were used as measures. Results suggested that the students in the traditional section outperformed the students in both hybrid and online sections, and that the students were more likely to complete homework assignments. Instructors' course evaluations for the online section were the least favorable, while "responses for the traditional and hybrid sections were almost identical" (p.109). O'Brien, et al. (2011) studied how course delivery methods determined students' performance, as well as their perceptions of instructional effectiveness, and preparation for being future special education teachers. At this large public institution, 159 undergraduate education majors enrolled in a large traditional lecture section of an *Introduction to Students with Special Needs* class, while 69 students enrolled in a hybrid section, and 69 students in a fully online section. Results of this study found that students in the traditional section demonstrated a higher comfort-level in working with students with disabilities than the students in both the hybrid and online sections. Further, students in both the traditional and hybrid sections demonstrated greater confidence of success as future special education professionals. There was no significant difference suggested regarding the students' perceptions of effectiveness and usefulness of the three instructional strategies. These findings were consistent with several other studies among other disciplines (Castle & McGuire, 2010; Lovern, 2010; Mottarella, Fritzsche, & Parrish, 2004).

Given the inconsistency of current literature, and the paucity of research to demonstrate the value of hybrid or online learning among undergraduate students at public institutions (e.g., Collopy & Arnold, 2009; Scherrer, 2011), the proposed study aims to further examine the effectiveness of three learning modalities: web-facilitated,



hybrid, and online, for an undergraduate upper-level exercise psychology course in order to determine the adaptability and replicability of the course format.

**THE STUDY**

**Study Design**

The current quasi-experimental study evaluated and compared the effectiveness of three learning models (e.g., web-facilitated, hybrid, and online) of an upper-level undergraduate exercise psychology course taught at a 4-year public university located in the mid-west. Approximately 90% of the total 11,759 undergraduate population at the institution are residents of Illinois (Southern Illinois University Edwardsville, 2014). The course was designed to provide an overview of the major psychological determinants and consequences of exercise, as well as its impact on public health. Three sections of this class, which is required for all exercise science majors, were taught by the same instructor over the course of three semesters; the spring 2013 section was web-facilitated, the summer 2013 section was offered as a hybrid course, and the spring 2014 section was taught as an online class. The web facilitated section met face to face in class three hours each week, and used Blackboard Learning Management System (Blackboard 9.0 version) as an enhancement to the class; assignments, additional readings and other materials were provided to students through Blackboard to supplement traditional, in-class instruction. The hybrid section included 65% of coursework spent in a traditional face-to-face class setting, while additional web-facilitated lectures, assignments and activities were conducted using Blackboard. No face-to-face interactions were conducted for the online class, and all assignments, lectures and activities were presented via Blackboard.

All students self-enrolled into one of the three sections. All three class sections aimed to achieve the four common course objectives using the same textbook and the same or equivalent assignments and class activities. The overall objectives of the classes were: (1) understand the theories of the epidemiology of exercise behavior and their application for successful behavior modification; (2) compare and understand the various models of behavioral management strategies and techniques involved in exercise maintenance; (3) explain the role of exercise psychology in the adoption and adherence of physical activity; and (4) identify the numerous psychosocial antecedents and consequences of exercise behavior.

**Subjects**

A total of 103 undergraduate students, majoring in exercise science, at Southern Illinois University Edwardsville enrolled in one of the three sections and participated in this study. Sixty-two students were females, and 41 were males. About 66.7% of the students were seniors, and 25.6% were juniors. About 76.9% of the participants were White. The students’ overall average cumulative Grade Point Average (GPA) was 3.22 on a 4.0 scale. There was no statistically significant difference among GPAs of students enrolled in each of the three sections ( $p = .65$ ). Thirty-nine students enrolled in the web-facilitated section, 24 in the hybrid section, and 40 in the online section. Table 1 indicates the breakdown of the students’ characteristics for each section.

Table 1 Students’ Characteristics (Percentage in the Parentheses)

Characteristics	Web-facilitated (n=39)	Hybrid (n=24)	Online (n=40)
Gender			
Male	13 (33.3)	9 (37.5)	19 (47.5)
Female	26 (66.7)	15 (62.5)	21 (52.5)
Race			
White	30 (76.9)	18 (75.0)	32 (80.0)
Black	4 (10.3)	2 (8.3)	5 (12.5)
Hispanic/Latino	4 (10.3)	1 (4.2)	1 (2.5)
Multiethnic	0	2 (8.3)	2 (5.0)
Unreported	1 (2.6)	1 (4.2)	0
Year in school			
Freshmen	0	0	0
Sophomore	3 (7.7)	3 (12.5)	2 (5.0)
Junior	10 (25.6)	9 (37.5)	8 (20.0)
Senior	26 (66.7)	12 (50.0)	30 (75.0)
Average GPA	3.26	3.21	3.19

**Measures**

The effectiveness of the three learning models was evaluated by both the students’ academic achievement and their motivation for learning. Students’ academic achievement was measured using grades from mid-term exams, final exams, a total of four online journal entry assignments, a combined total of mid-term and final exams plus

four journal entry assignments, the final course grades, and the final letter grade earned for all three sections. Table 2 describes these six common measures and the instructor’s instructions for the students. Table 3 describes the measures for the activities that are common for either web-facilitated and hybrid sections or hybrid and online sections. In addition, assignment completion and rates of submission of extra credit assignments were determinants used to measure students’ level of motivation.

Table 2 Measures and Instructions for All Three Sections (Maximum Points in the Parentheses)

Measures	Web-facilitated	Hybrid	Online
Mid-term exam	There will be one mid-term examination. The exam will include multiple-choice, fill in the blank responses, short answer and essay questions. You will be responsible for all material covered in the readings, lectures, discussions and class activities for the exam. (50 points)	There will be one mid-term examination. The exam will include multiple-choice, fill in the blank responses, short answer and essay questions. You will be responsible for all material covered in the readings, lectures, discussions and class activities for the exam. This will be taken online and is open book/open notes, however you are strictly prohibited from consulting other students, faculty, friends, family, colleagues, or any other human being regarding questions on the exam. The mid-term exam will be given via Blackboard on Friday, July 12. You must log in between midnight Thursday night, July 11 and midnight Friday night, July 12 to complete the mid-term exam. The exam will be timed, and you will have one hour to complete it. (50 points)	There will be one mid-term examination (administered on Blackboard). The exam will include multiple-choice, fill in the blank responses, short answer and one essay question. Students will be responsible for all material covered in the readings, lectures, discussions and activities for the exam. The exam will be administered online, and students will have one hour to complete the exam. (50 points)
Final exam	There will be a final comprehensive examination. The exam will include multiple-choice, fill in the blank responses, short answer and essay questions. It will largely cover material from chapters 8-15; but there will be one comprehensive final essay. You will be responsible for all material covered in the readings, lectures, discussions and class activities for the exam. (75 points)	There will be a final examination. The exam will include multiple-choice, fill in the blank responses, short answer and essay questions. It will largely cover material from chapters 8-15; but there will be one comprehensive final essay. You will be responsible for all material covered in the readings, lectures, discussions and class activities for the exam. This will be taken online and is open book/open notes, however you are strictly prohibited from consulting other students, faculty, friends, family, colleagues, or any other human being regarding questions on the exam. The final exam will be given via Blackboard. You must log in between midnight Wednesday, July 24 and 12:00 pm Friday,	There will be a final exam. The final exam will include multiple-choice, fill in the blank responses, short answer and one essay question. It will be administered on Blackboard and cover material from chapters 8-15, but there will be one comprehensive essay. The exam will be administered online, and students will have one hour and 15 minutes to complete the exam. (65 points)

Measures	Web-facilitated	Hybrid	Online
<p>Total of four online journal entries</p>	<p><b>Journal entry 1:</b> As you read chapter 1, reflect upon your career or future path ahead. In the profession that you hope to pursue, how will your knowledge of exercise psychology help you in your career? (10 points)  <b>Journal entry 2:</b> Read and reflect upon the theories described in your textbook in chapters 3 and 4. Describe how you might be able to utilize the Transtheoretical Model (TTM) in your future career. Provide an example of either recommendations that you could make to a patient/client at each of the five stages, or behavioral/attitude clues that would lead you to know which stage that a patient/client was moving through. (10 points)  <b>Journal entry 3:</b> Choose one of the following groups to target for increasing physical activity:            -College age students at SIUE            -Rural schoolchildren aged 6-10 for an after-school program            -New mothers            -Group of retired, and relatively healthy, men for a community center based program            -Diverse group of teenagers for a month long summer camp            -Hospital outpatient outreach program for those who have recently been diagnosed with Type 2 diabetes            Your task is to develop an intervention program for one of the above groups to increase physical activity. Use what you have learned in Chapter 6 to create a plan that will incorporate specific behavioral and social approaches to increase the group's physical activity. Include at least five specific intervention techniques, including both</p>	<p>July 26 to complete the final exam. The exam will be timed, and you will have one hour to complete it. (65 points)  <b>Journal entry 1:</b> As you read chapter 1, reflect upon your career or future path ahead. In the profession that you hope to pursue, how will your knowledge of exercise psychology help you in your career? (15 points)  <b>Journal entry 2:</b> Read and reflect upon the theories described in your textbook in chapters 3 and 4. Describe how you might be able to utilize TTM in your future career. Provide an example of either recommendations that you could make to a patient/client at each of the five stages, or behavioral/attitude clues that would lead you to know which stage that a patient/client was moving through. (15 points)  <b>Journal entry 3:</b> Choose one of the following groups to target for increasing physical activity:            -College age students at SIUE            -Rural schoolchildren aged 6-10 for an after-school program            -New mothers            -Group of retired, and relatively healthy, men for a community center based program            -Diverse group of teenagers for a month long summer camp            -Hospital outpatient outreach program for those who have recently been diagnosed with Type 2 diabetes            Your task is to develop an intervention program for one of the above groups to increase physical activity. Use what you have learned in Chapter 6 to create a plan that will incorporate specific behavioral and social approaches to increase the group's physical activity. Include at least five specific intervention techniques, including both behavioral and social</p>	<p><b>Journal entry 1:</b> As you read chapter 1, reflect upon your career or future path ahead. In the profession that you hope to pursue, how will your knowledge of exercise psychology help you in your career? (10 points)  <b>Journal entry 2:</b> Read and reflect upon the theories described in your textbook in chapters 3 and 4. Describe how you might be able to utilize TTM in your future career. Provide an example of either recommendations that you could make to a patient/client at each of the five stages, or behavioral/attitude clues that would lead you to know which stage that a patient/client was moving through. (10 points)  <b>Journal entry 3:</b> Choose one of the following groups to target for increasing physical activity:            -College age students at SIUE            -Rural schoolchildren aged 6-10 for an after-school program            -New mothers            -Group of retired, and relatively healthy, men for a community center based program            -Diverse group of teenagers for a month long summer camp            -Hospital outpatient outreach program for those who have recently been diagnosed with Type 2 diabetes            Your task is to develop an intervention program for one of the above groups to increase physical activity. Use what you have learned in Chapter 6 to create a plan that will incorporate specific behavioral and social approaches to increase the group's physical activity. Include at least five specific intervention techniques, including both behavioral and social</p>

Measures	Web-facilitated	Hybrid	Online
	<p>behavioral and social approaches, to specifically target the group that you choose. Remember that these should be personally meaningful to the group members to be the most effective. You may use bullet points or number each intervention technique throughout your journal entry. (10 points)</p> <p><b>Journal entry 4:</b> Based on the information presented in Chapter 9, choose one of the scenarios listed below to design a program in which the individuals will feel comfortable and will lead to optimum adherence. What methods will you employ and why?</p> <p>1. You are a manager at a health club and wish to design a new "Get Fit, Get Moving" program that targets obese individuals who have little experience with working out.</p> <p>2. You are the coordinator of a community center sports program for middle school aged boys and girls. One of the goals of the program is to enhance body image through sport.</p> <p>3. You are working at a hospital as a community coordinator of health and wellness. The hospital administrator has asked you to create a 12 week exercise program aimed at women who have admitted to having low body image.</p> <p>4. As a university mental health counselor, your department has placed you in charge of implementing a program that addresses poor body image, including body dysmorphic disorder and health damaging behaviors. One facet of the program is a fitness program -- describe the program. (10 points)</p>	<p>approaches, to specifically target the group that you choose. Remember that these should be personally meaningful to the group members to be the most effective. You may use bullet points or number each intervention technique throughout your journal entry. (15 points)</p> <p><b>Journal entry 4:</b> Based on the information presented in Chapter 9, choose one of the scenarios listed below to design a program in which the individuals will feel comfortable and will lead to optimum adherence. What methods will you employ and why?</p> <p>1. You are a manager at a health club and wish to design a new "Get Fit, Get Moving" program that targets obese individuals who have little experience with working out.</p> <p>2. You are the coordinator of a community center sports program for middle school aged boys and girls. One of the goals of the program is to enhance body image through sport.</p> <p>3. You are working at a hospital as a community coordinator of health and wellness. The hospital administrator has asked you to create a 12 week exercise program aimed at women who have admitted to having low body image.</p> <p>4. As a university mental health counselor, your department has placed you in charge of implementing a program that addresses poor body image, including body dysmorphic disorder and health damaging behaviors. One facet of the program is a fitness program -- describe the program. (15 points)</p>	<p>approaches, to specifically target the group that you choose. Remember that these should be personally meaningful to the group members to be the most effective. You may use bullet points or number each intervention technique throughout your journal entry. (10 points)</p> <p><b>Journal entry 4:</b> Based on the information presented in Chapter 9, choose one of the scenarios listed below to design a program in which the individuals will feel comfortable and will lead to optimum adherence. What methods will you employ and why?</p> <p>1. You are a manager at a health club and wish to design a new "Get Fit, Get Moving" program that targets obese individuals who have little experience with working out.</p> <p>2. You are the coordinator of a community center sports program for middle school aged boys and girls. One of the goals of the program is to enhance body image through sport.</p> <p>3. You are working at a hospital as a community coordinator of health and wellness. The hospital administrator has asked you to create a 12 week exercise program aimed at women who have admitted to having low body image.</p> <p>4. As a university mental health counselor, your department has placed you in charge of implementing a program that addresses poor body image, including body dysmorphic disorder and health damaging behaviors. One facet of the program is a fitness program -- describe the program. (10 points)</p>
Total of mid-term, final, and	A total grade of mid-term and final exams and four online journal entries (165 points)	A total grade of mid-term and final exams and four online journal entries (175 points)	A total grade of mid-term and final exams and four online journal entries (155 points)

	Web-facilitated	Hybrid	Online
Measures			
online journal entries			
Final course grade	A total grade of all assignments, class activities, and exams. (300 points)	A total grade of all assignments, class activities, and exams. (300 points)	A total grade of all assignments, class activities, and exams. (285 points)
Final letter grade	A = 100-90% (300-269) B = 89-80% (268-239) C = 79-70% (238-209) D = 69-60% (208-179) F = 59% (178-0)	A = 100-90% (300-269) B = 89-80% (268-239) C = 79-70% (238-209) D = 69-60% (208-179) F = 59 % (178-0)	A = 100-90% (285-256) B = 89-80% (255-227) C = 79-70% (226-199) D = 69-60% (198-170) F = 59 % (169-0)

Table 3 Measures for Either Web-Facilitated and Hybrid Sections or Hybrid and Online Sections

	Web-facilitated	Hybrid	Online
Measures			
Total of two online activities	Not applicable	Physical activity epidemiology online activity (15 points) Personality and Exercise online activity (15 points)	Physical activity epidemiology online activity (10 points) Personality and Exercise online activity (10 points)
Total of two in-class activities	Transtheoretical Model in-class activity (10 points) Cognitive function in-class case study (10 points)	Transtheoretical Model in-class activity (10 points) Cognitive function in-class case study (10 points)	Not Applicable

### Procedures

All three class sections were taught by one instructor, who is a trained professional in both teaching pedagogy and exercise psychology. Blackboard 9.0 served as the intermediary platform for three learning models. Regardless of the learning models, all students completed the mid-term and final exams and four online journal entry assignments, which were almost identical for all three sections. Several other in-class assignments completed by the students enrolled in the web-facilitated section were also assigned to the students in the hybrid or online sections with modifications. In addition, the students enrolled in the online section participated in five Blackboard discussion postings during the semester. All students' grades were recorded via the student accessible grade book in Blackboard. The study was approved by the Institutional Review Board at Southern Illinois University Edwardsville.

### Analysis

SPSS statistics 19.0 software (IBM) was utilized for data analysis. Because of the slight variations of the grading scales used for some of the assignments/exams among web-facilitated, hybrid, and online sections, except for the mid-term exam scores, all other raw scores were converted into percentile scores to maintain consistency across all formats. Means and standard deviations were calculated for all the measures, including the GPA, the mid-term grade, the final exam grades, the total of four online journal entry assignment grades, the combined total of the mid-term, final exam, and four online journal entries, and the final course grade. One-way Analysis of Variance (ANOVA) was used to compare the means of the measures among all three sections, and then Tukey HSD post hoc tests were used to compare the means between sections. An independent-sample t-test was also used to compare the means for the assignments only common among the web-facilitated and hybrid sections or the hybrid and online sections. The statistical significance level of the *p* value is lower than 0.05 (one-tailed).

### FINDINGS

Table 4 presents the means and standard deviations for the measures applied to all three sections. Students in the web-facilitated section demonstrated higher grades, on average, on their final exams, total of four online journal entries, the combined total of the mid-term, final exams and four online journal entries, and the final course grade than those enrolled in the online section (.93 vs. .88, .93 vs. .91, .91 vs. .88, .95 vs. .89). The students enrolled in the hybrid section performed either the same as, or better than the students in the online section in all five measures (44.33 vs. 43.43, .88 vs. .88, .95 vs. .91, .90 vs. .88, .91 vs. .89). Compared to the other students in the study, those enrolled in the hybrid section achieved the highest average scores for both the mid-term exam and total of four online journal entries (44.33 and .95). However, overall, students in the web-facilitated section earned higher scores than the students in the hybrid section on their final exam, the combined total of mid-term,

final exams, and four online journal entries, and the final course grade (.93 vs. .88, .91 vs. .90, .95 vs. .91). In addition, more than 92.3% of the students in the web-facilitated section earned an overall grade of A, while 83.3% of the students in the hybrid section earned a grade of A, and only 62.5% in the online section earned a grade of A for the semester.

Table 4 Means and Standard Deviations of Measures for the Three Sections

Measures	N	Mean	Standard Deviation
<b>Mid-term exam</b>			
Web-facilitated	39	43.28	5.53
Hybrid	24	44.33	4.04
Online	40	43.43	4.60
<b>Final exam</b>			
Web-facilitated	39	.93	.05
Hybrid	24	.88	.08
Online	40	.88	.07
<b>Total of four online journal entries</b>			
Web-facilitated	39	.93	.12
Hybrid	24	.95	.15
Online	40	.91	.13
<b>Total of mid-term, final, and online entries</b>			
Web-facilitated	39	.91	.06
Hybrid	24	.90	.06
Online	40	.88	.06
<b>Final course grade</b>			
Web-facilitated	39	.95	.05
Hybrid	24	.91	.08
Online	40	.89	.08

Tables 5 and 6 present the results of the One-way ANOVA and multiple post hoc comparisons between means. Results suggest that there were statistically significant differences among the means of the three sections for the final exam, final course grade, and final letter grade ( $F(2,100) = 7.06, p < .05, F(2, 100) = 7.32, p < .05, F(2, 100) = 3.93, p < .05$ ). The mean of the final exam of the web-facilitated section was significantly higher than the means of both hybrid and online sections (mean difference = .05,  $p < .05$ , mean difference = .05,  $p < .05$ ). The means of the final course grade and final letter grade of the web-facilitated section were also significantly higher than the means of the online section (mean difference = .06,  $p < .05$ , mean difference = .42,  $p < .05$ ). The statistically significant differences among the means of three sections or between the means of any two of the three sections for the mid-term exam, the total of four online journal entries, and the combined total of the mid-term, final exams, and four journal entries were not revealed. Moreover, comparisons were also made between the means of the common activities applied to the web-facilitated and hybrid sections or hybrid and online sections only. No statistically significant differences were indicated.

Table 5 One-way ANOVA Comparing Means of Measures among the three sections

Measures	Sum of squares	df	Mean square	F	p value
<b>Mid-term exam</b>					
Between groups	18.04	2	9.02	.38	.68
<b>Final exam</b>					
Between groups	.06	2	.03	7.06*	.00
<b>Total of four online journal entries</b>					
Between groups	.02	2	.01	.62	.54
<b>Total of mid-term, final, and online entries</b>					
Between groups	.02	2	.01	2.22	.11
<b>Final course grade</b>					
Between groups	.08	2	.04	7.32*	.00
<b>Final letter grade</b>					
Between groups	3.53	2	1.77	3.93*	.02

\* indicates the statistical significance.



Table 6 Tukey HSD Post Hoc Multiple Comparisons of Means between Any Two of the Three Sections

Measures	Web-facilitated	Hybrid	Online
<b>Mid-term exam</b>			
Web-facilitated		-1.05	-.14
Hybrid	1.05		.91
Online	.14	-.91	
<b>Final exam</b>			
Web-facilitated		.05*	.05*
Hybrid	-.05*		.00
Online	-.05*	-.00	
<b>Total of four online journal entries</b>			
Web-facilitated		-.01	.02
Hybrid	.01		.04
Online	-.02	-.04	
<b>Total of mid-term, final, and online journal entries</b>			
Web-facilitated		.01	.03
Hybrid	-.01		.02
Online	-.03	-.02	
<b>Final course grade</b>			
Web-facilitated		.04	.06*
Hybrid	-.04		.02
Online	-.06*	-.02	
<b>Final letter grade</b>			
Web-facilitated		.23	.42*
Hybrid	-.23		.19
Online	-.42*	-.19	

Numbers indicate mean differences.

\* indicates statistical significance.

Table 7 presents the data of the completion rates for each of the assignments that were adopted by all three sections or any two of the three sections. None of these three sections consistently maintained a higher completion rate than any of the other two sections. However, students in the hybrid section had the highest completion rates for three of their four online journal entries, but they had lower completion rates of their in-class assignments than the web-facilitated students. Overall, for only half of the time, the students enrolled in the hybrid section were more compliant with completion of their online assignments than the online students were. Additionally, approximately 82.1% of the students in the web-facilitated section made the effort to complete an extra credit assignment to earn extra points compared to about 37.5% of the students in the online section.

Table 7 Completion of Class Assignments among the Three Sections

Measures	Web-facilitated	Hybrid	Online
Journal entry 1	94.9	95.8	90.0
Journal entry 2	94.9	95.8	95.0
Journal entry 3	97.4	91.7	97.5
Journal entry 4	92.3	100	85.0
Transtheoretical model in-class activity	92.3	83.3	---
Cognitive function in-class case study	92.3	91.7	---
Physical activity epidemiology online activity	---	91.5	97.5
Personality and exercise online activity	---	91.7	100

Numbers are percentages.

## DISCUSSION

In general, our study findings support that undergraduate students' academic performance and levels of motivation were higher in the web-facilitated class that mimics more traditional classroom style teaching formats. However, the data also show that hybrid learning, in many cases, can be an excellent alternative for undergraduates. These results are in alignment with a number of previous findings (e.g. Castle & McGuire, 2010; Collopy & Arnold, 2009; Lovern 2010; Mottarella, Fritzsche, & Parrish, 2004; O'Brien et al., 2011; Scherrer, 2011). Compared to the students in both the hybrid and online sections, students in the web-facilitated section were more likely to outperform in the majority of the measures included in this study, such as the final exam, final course grade, and final letter grade. Especially compared to the students enrolled in the online section, the



students in the web-facilitated section significantly increased their overall performance by the end of the semester, which was reflected on both their final course grade and final letter grade. Although on average, the students in the hybrid section achieved the highest scores on their mid-term exam and total of four online journal entries, the differences of the achievement among the three sections were not significantly significant.

For this design study, student motivation was measured by comparing the percent of students who submitted an extra credit assignment, and the percent of students who submitted the required journal entries and assignments. Although other extenuating factors might have an influential effect on these aspects of student behavior, it is believed that assignment completion and completing an additional assignment for extra credit are representative of student motivation for these sections. The students in the web-facilitated section were much more likely to complete the extra credit assignment than the students in the online section. Further, the number of students who did not submit journal entries was higher in the online sections, as demonstrated by the lower average scores for the assignment, since students who did not submit a journal entry received a grade of zero for the assignment.

El Mansour and Mupinga (2007) discussed the students' experiences in hybrid and online courses that may potentially lead to the ineffectiveness of these two teaching modalities for undergraduate students. In their study, 41 undergraduate students who were enrolled in either a hybrid or an online class from a mid-western 4-year college were surveyed. The main concerns raised by these students were: (1) lack of flexibility of schedule in a hybrid format, (2) technical difficulties for both hybrid and online deliveries, (3) lack of interactions with other students and instructors in an online format (Glanz, 2012; El Mansour & Mupinga, 2007), (4) lack of possibilities of receiving immediate feedback in an online format, (5) lack of a sense of belonging to a leaning community in an online format, and (6) lack of learning efficiency due to complicated communication processes (El Mansour & Mupinga, 2007). Students' motivation may also compromise their online learning outcomes. Branoff and Wiebe (2009) surveyed 68 undergraduate engineering students enrolled in a hybrid *Foundations of Graphics* course. The results revealed that a number of students were unwilling to view the online instructional videos.

Some developmental abilities or learned skills are helpful for students to achieve success in an online class. Online learning environments require that students are able to successfully work independently, with little to no prompting from an instructor, which they would receive in a traditional face-to-face course format. Additionally, students must be able to effectively use time management skills to judge deadlines and foresee upcoming exams and assignments. Undergraduate students may still be honing these skills, which can affect their overall performance in an online learning environment (Keramidas, 2012). Undergraduate students are less likely to have developed the maturity, confidence, and motivation that are more well-developed among graduate students, who have increased self-efficacy as a result of their prior successes in a collegiate academic environment; this can result in undergraduates' perceptions that online classes are less effective than traditional classes, simply because they have not developed the skills and attributes that lead to success in an online class format (Watters & Robertson, 2009).

In order to address undergraduate students' concerns and help their transition from a traditional learning format to a hybrid/online learning environment, an experiment was carried out with a group of senior undergraduate nurses enrolled in a hybrid leadership/management course. Throughout the course of the semester, the students were encouraged to provide questions and comments regarding the hybrid learning format, so that these issues could be addressed in a timely manner, rather than gathering feedback at the end of the semester. For instance, students expressed concerns that they might overlook assignments in the hybrid course format. To address this issue, the students were assured that they would be given consistent reminders of upcoming assignments, and were also provided their instructor's and teaching assistant's cell phone numbers for communication, to ease their worries of missing an assignment. Further, to address expressed anxiety involving technical issues, students were allowed to complete their first online quizzes twice to lessen the likelihood of encountering submission problems. A majority of the students in this experiment commented in the end of the semester evaluations that they had a positive experience with the hybrid learning model (Mueggenburg, 2003). Both Sapp and Simon's study (2005), and Letterman's study (2008) further emphasized the importance of frequent reminders to students regarding deadlines and ease of access to instructors for timely feedback, so as to improve students' online learning experiences. Others recommend that students voluntarily complete an online readiness assessment, to determine whether online learning is an appropriate choice for their course delivery, or provide them with adequate online course management training and round-the-clock technical support (Chenoweth, Ushida, & Murday, 2006; Xu & Jaggars, 2011).

Certainly, some student fears and anxiety can be lessened with appropriate support and training, but instilling motivation among undergraduates may prove more challenging. Bernardo, et al. (2004) suggested that

motivation can be linked to effective online teaching methods; they noted that utilizing innovative video quizzes can help increase students' attention and increase their interest in the class. To incorporate some of the positive aspects of a traditional face-to-face learning environment in an online format, Cameron (2003) introduced an interactive simulation software package for an online networking course, which allowed the instructor to offer immediate feedback to students; he further enhanced the class experience by using different problem-solving techniques which could potentially improve students' motivation in an online learning environment. Babb and her colleagues (2014) offered seven principles for successfully enhancing undergraduate education by blending positive aspects of all three learning environments. These strategies include: increasing faculty and student interaction; encouraging students' collaborative learning; engaging students in active learning activities; giving prompt feedback; emphasizing the importance of time management skills; clearly communicating with students their responsibilities and the proposed learning outcomes; respecting students' opinions and providing them with alternative assignment options.

### LIMITATIONS

Due to the dynamic nature of the varied course delivery methods, the three sections of the exercise psychology course did not implement the exact assignments. For example, a couple of the assignments were applied only to one of the sections or were shared by two of the sections, such as the in-class assignments, which were not utilized in the online course. Therefore, assessment tools among the three sections were not entirely comparable. It is likely that the students' overall learning outcomes were influenced by the differences of these assignments to some degree. Also, different point values were attributed to assignments, the mid-term and final exams; however, to lessen the implications of these variations, raw scores were converted to percentile scores for comparison. But, due to these differences between sections, data could be potentially statistically biased. Further, our current sample is somewhat uniform, and lacking in diversity. About 67% of the students were seniors, and 77% were Caucasian, with an average GPA of 3.22; given these factors, these results may exclude the population of students who are not represented among this sample. The results may not represent the adaptability of lowerclassmen and other ethnic groups with a lower GPA to a hybrid or online learning modality. Moreover, we were not able to collect feedback directly from the students concerning their hybrid or online learning experiences; this information could have held value in providing information about the students' motivation or their own perceptions regarding academic success.

### CONCLUSIONS

In sum, both web-facilitated and hybrid learning modalities demonstrated higher adaptability among undergraduate students than the online learning modality as reflected by their grades and the assignment completion rates. Hybrid learning can serve as a valuable alternative for web-facilitated learning, and it can be a viable alternative to achieving the balance between web-facilitated and online learning. By addressing the concerns in the areas of motivation, communication, interaction, technology, and time management, both effectiveness and efficiency of hybrid learning among undergraduate students will continuously be advanced.

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## ADULT LEARNERS' PERCEPTIONS OF DESIGNED HYPERMEDIA IN A BLENDED LEARNING COURSE AT A PUBLIC UNIVERSITY IN MALAYSIA

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### ABSTRACT

With the advent of the computer and the Internet, many higher institutions in Malaysia have begun to integrate conventional teaching with these two technologies. This approach in learning which is also called 'blended learning' offers significant benefits, namely time and location shifting. However, the principles applied to activities designed as a blended course must be taken into consideration—especially when the students are off campus adult learners with minimal opportunity to attend conventional tutorials. A study was conducted to look into this issue by seeking feedback from adult learners regarding blended learning within an academic reading course at a Malaysian public university, National University of Malaysia (UKM). The study was aimed at finding ways to improve the course offered to off campus students who were scattered throughout the country. The method of inquiry of this study is qualitative in nature and which utilizes observation, Think-aloud Protocol and semi-structured interviews as the research instruments. The subjects of this study were selected off campus students who were attached to various hospitals. The focus of this paper is to discuss the students' feedback pertaining to the designed hypermedia and comprehension questions. This paper also explains some pedagogic implications. The implications drawn is of great value to the students; teachers as the facilitators; teachers as the course designers and the administrators in improving blended learning course offered to UKM off campus students.

**Keywords:** hypermedia; adult learners; blended course; off campus students

### INTRODUCTION

Since the 1950's Computer Assisted Language Learning (Beatty, 2003) or CALL has been used as resource for language learning. Throughout the early years of CALL, students had to move to a computer lab or computer terminal for instruction, but CALL has progressed tremendously since then. Currently, with the advent of computer technology and the changes in government policy, English language lessons such as reading can now be conducted in virtual classrooms utilizing the computers and the Internet. Reading, as a skill, is an important component of language teaching and learning (Wallace, 2010). It is argued that when there is little reading especially in formal education, there would be little language learning taking place (Nuttall, 2005; Wallace, 2010). For that reason, many language programs incorporate reading lessons. In a conventional reading course, students obtain their input through lectures and tutorials in lecture halls and classrooms. If the students face any difficulties in their reading, they can always seek assistance from their respective teachers or their fellow classmates. With CALL, the traditional ways of learning has evolved to include the use of new technologies to enhance the teaching and learning, as well as the development of reading skills among learners. From 2008 to 2010 distance learners in the Allied Sciences Faculty at the National University of Malaysia (UKM) took English for Life Sciences which was a preparatory reading course to equip the students with relevant reading strategies for use in their coursework. The main objective is that by the end of the course, the students would be able to apply the appropriate reading strategies that can facilitate their reading of academic reading materials especially on Life Sciences. The course designers who were also the researchers, however, were aware that they should not be blinded with all the positive aspects of CALL as highlighted by various studies. Findings of studies suggested that students, particularly adult learners, faced many difficulties in comprehending hypermedia documents. Thus, the researchers felt that it was crucial to embark on a study to investigate the issue on local ground. The main objective of this study was to investigate the distance learners' perception of the reading materials in the course which is in the form of hypermedia documents. The major question for this study was: what are the learners' perceptions of the designed hypermedia? It is hoped that the findings of the study could guide and facilitate the course designers in designing better hypermedia documents especially for the teaching of English for Specific Purposes reading course.

### LITERATURE REVIEW

#### Integrating ICT in English for Specific Purposes Courses in a Malaysian Setting

Technology in a language course is used to tailor to the needs of specific groups of users. Some educators (Ramesh & Sanjaya, 2007; Wallace, 2010) categorize the purposes for reading into several categories, namely survival, educational, environmental, informational, occupational, recreational and ritualistic. In general, higher institutions in Malaysia try to equip their students for using English for environmental, occupational and



informational purposes (Halimah, 1998). The educators also try to create contexts so that the students could fully function in these three main areas. To date, higher institutions in Malaysia normally offer one or all three types of English courses: English for Proficiency, English for Specific Purposes or English for the Workplace to equip the students for the abovementioned purposes (Radha, 2007). It is argued that local tertiary students encounter problems when reading academic texts (Radha, 2007). This problem is a serious problem in the Malaysian context because most of the references at the tertiary level are written in English. Furthermore, with the advent of the Internet, many students at the tertiary level read from websites to equip themselves with relevant knowledge in completing their assignments and preparing for tests and examinations.

In Malaysia, the use of virtual classrooms in the teaching of English is quite new. Most virtual classrooms offered at higher institutions use the hybrid approach since most Malaysian educators as well as the students are still in the transition between traditional and e-learning mode (Rozhan & Helen, 2004). According to Keerti (2009), a hybrid program is a program which combines a myriad of methods namely face-to-face classroom (physical delivery), online programs and self-paced learning. Thus, the users, namely both the educators and the students, need to adapt to the new technology to gain the benefits that technology offers. As Dail (2004: 24) wrote in her doctoral thesis, “as the computer technology evolves to meet the demands of society, society must continue to adapt to changes in the technology”. Further to this, teaching and learning styles have been altered due to the widespread use of the Internet and the World Wide Web (WWW) (Grabe & Stoller 2002; Wallace, 2010). The teaching and learning in higher institutions in Malaysia is also very much affected by these developments, in addition to the government policy to promote lifelong education. Online learning through the utilization of the Internet is seen as the right move toward fulfilling both the needs of new media as language learning resource, and addressing lifelong education as envisaged by the government. However, in the Malaysian setting, online learning is closely associated with, or rather restricted to, distance learning whereby students take a particular course off campus, therefore, may not be at the same place to learn the subject, and the learning takes place via online (Norlida, 2006).

The English for Life Sciences course focused in the study employed blended learning approach but utilized the use of virtual classrooms for its reading component. Blended learning, as mentioned previously, is a combined instructional method, namely face-to-face instruction with computer-mediated instruction. It has been argued that one of the benefits of blended learning is an increased access to knowledge (Lee & Chung Hyun, 2013). The course designers were interested to see how far the use of online materials (heretofore known as hypermedia documents) that they designed or adopted were an efficient and a good way to help students develop their reading skills, according to the perceptions of the students. According to Beatty (2003), hypermedia refers to hypertexts but the links are not just from text to text but they also involve links to various media such as sound, images, animation and/or video. By conducting research on the users’ perceptions of the use of hypermedia, necessary improvements could be made to the designed hypermedia in order to tailor to the needs of many parties in their own institution namely the teachers, distance learners and the administrators.

#### **ADULT LEARNERS AND READING**

This study involved adult learners as research participants, thus, it is essential to describe the characteristics of adult learners since they have different characteristics in comparison to young learners. The participants in this study could be categorized as adult learners as they fulfill the definitions given by many scholars. Knowles and Holton (1998) defined adult learners as people who have arrived at self-concept. That is, they are able to be responsible and take charge of their own life particularly learning. They would tend to grow resentment to others who impose their wills on them. They prefer to be involved in the decision making process which involve their well-being. Carnine et al. (1997) emphasized that adult learners are capable of appraising, managing and regulating their own reading performance). Other scholars including Miller and Stine Morrow (1998) added that adults are able to conceptualize the content of what they have read. They could relate their prior knowledge to bring meaning and later to develop better understanding of the reading materials.

All the adult learners in the course offered at UKM possessed a Diploma in related fields of Life Sciences. Therefore, as far as reading is concerned, they could relate their academic knowledge and working experience toward enhancing their reading comprehension. Apparently, adults are capable of becoming self-directed learners as they possess the characteristics mentioned earlier and additionally, due to their greater sense of responsibility, are able to manage their time wisely in comparison to youths (Timarong et al., 2000).

Due to the above characteristics of adult learners, the course designers designed the course (English for Life Sciences) materials, activities and evaluations accordingly. This course which adopted a hybrid approach allowed the adult learners, as students of the course, to have more freedom in ‘managing, regulating and appraising their own reading and performance’ (Carnine et al. (1997), as mentioned earlier on in this article.

They were given ample time to navigate their own reading, and to complete their assignments. However, the adult learners were still provided with sufficient support with regard to resources, templates, guides and samples. The class instructor also served as a facilitator to guide them in reading the hypermedia documents, and in answering the reading comprehension questions. The class instructor also modeled the usage of hypermedia reading strategies (Corbel, 2004). They could also discuss with their classmates via online forum to complement each other's understanding of the reading materials and to provide social support. Social support is pivotal to create a sense of belonging among distance learners (Pica et al., 1989). The assistance of their peers through collaborative learning could help the students' maintain their motivation, attain/acquire new skills and reading strategies, check their understanding and share new ideas (Murphy & Gazi, 2003).

In many cases, adults relative to children can resist new reading strategies as they are already comfortable with their own reading strategies (Laird, 1985). Nevertheless, in the current scenario, adult learners do not have much choice but to adjust themselves to a new curriculum (Knowles & Holton, 1998). It is further explained that new information can also be perceived as a tool that leads to changes which some adults resist. In this instance, the process of unlearning the already existing reading strategies is a need even though the process is difficult. This process can also be lengthy because they need to learn new hypermedia reading strategies and unlearn the existing reading strategies at the same time. This could be problematic for some adult learners.

Another researcher, Tseng (2008) conducted an interesting research on learners' difficulties in reading websites. His participants were asked to do reading comprehension exercises on the Internet. His interviews show that readers faced some difficulties including eyestrain, the tendency to skip lines and getting lost on the computer screens. They also had difficulties in taking notes as well as in overcoming old reading habits, and had the tendency to get distracted by reading irrelevant websites. Based on his findings, he proposed some pedagogical suggestions accordingly. His suggestions included the need for the teacher to be cautiously selective in choosing educational websites for their students, and the need to train the students on how to adjust the computer screens and web pages on their own. His study also revealed that teachers should also teach their students how to read texts on the web.

It is safe to conclude that adult learners' ability to comprehend the hypermedia documents is heavily dependent on how they are capable of relating the information of the hypermedia documents to their existing knowledge and their capability of adapting themselves to the accompanying assignments given to them (Carrel, 1987; Yahya, 2008). Their inability to do so will lead them to feel unmotivated and inhibited to read (Laird, 1985). Hence, they need to be given appropriate scaffolding instructions and assistance to ascertain their success in learning particularly in a course which integrates a lot of reading activities using hypermedia documents.

## **THEORETICAL BACKGROUND**

### **Cognitive Theories**

Cognitivism is a study of what happens in the brain or the study of mental processes namely sensation, perception, attention, encoding and memory which behaviorists do not examine in their theories (Jordan et al., 2008). Cognitivists believe that human learn in linear form (Jordan et al., 2008), involving mental processes such as mental planning, goal-setting and organizational strategies. In this regard, the use of meaningful feedback is important in order to facilitate and support crucial mental connections that aid comprehension (of certain subject materials). Learners' data processing mechanism identifies a particular (language) learning opportunity, processes and retrieves the information for the purpose of gaining understanding of the information, makes the necessary connections for creating new knowledge and assimilating new information. Cognitivists believe that if educators are able to understand how the learning process (such as organizing and processing of information) takes place, they are able to design learning activities to optimize learning.

Cognitive theories are also relevant to adult learners. Adult learners also learn in linear form. Humans go through a few stages when they develop their intellectual capacity but it does not stop when the learners reach a certain age (Rogers, 2002) or a certain stage (Lantolf & Thorne, 2006). Rogers (2002) states that a person is more intelligent at the age of 50 than 30 as his intelligence is more developed at this point of time. He adds that in order for a person to learn, he must first need to understand. With reference to hypermedia documents, a question worth asking is how these kinds of documents present difficulties for adult learners? Rogers (2002) and Lantolf and Thorne (2006) suggest that learning materials in the form of hypermedia documents necessitates the application of certain guiding principles. One is that hypermedia documents should be divided into meaningful units and then mastered. The hypermedia documents should then be developed from simple to complex. Moreover, there is a need for hypermedia documents for adult learners to include practice of intellectual exercises. It is because at this age they prefer activities which challenge their intellectual capabilities. One of the activities that promote higher degree of comprehension is exploration. Unlike in traditional reading lessons



where the answers or responses are delayed, prompt answers should accompany the multimedia exercises so as to enable the readers to evaluate their abilities quickly. After assessing their reading comprehension level, they would then adjust their hypermedia reading strategies to improve their reading comprehension.

The design of the reading component comprising hypermedia documents in the course offered to the Life Sciences students at UKM was based on the suggestions given by Rogers (2002) and Lantolf & Thorne (2006). Nevertheless, it is not possible for the course designers to speculate on the perceived usefulness of the documents, or the reasons behind any difficulties encountered in using the hypermedia documents among the relevant students. In this respect, although the principles behind its design were adhered to during the design stage, it was felt necessary to conduct a study that seek the adult learners' perceptions of the designed hypermedia in order to shed light on the issue that may arise in the use of the documents among adult learners. It is hoped that this study could provide some insights for the course designers to improve upon the designed hypermedia and ultimately enhance the students' reading comprehension of English for Life Sciences materials.

### **RESEARCH METHODOLOGY**

The research design employed by the researcher in this study is a case study in order to conduct an intensive study of a specific group of people. Merriam (2009) defines a case study as a study which is aimed at gaining a comprehensive understanding of a situation and it is a process rather than the outcome or product of the phenomena. Under the umbrella of a case study, this study is known as an intrinsic case study which intends to catch the complexity of a single case. Thus, the findings could not be used to generalize to the general population (Stake, 1995). The findings could only be applicable to a group of people which possesses the same characteristics or traits (Miles & Huberman, 1994). This complies with the objective of the researchers whereby there was no intention to study this specific case to understand other cases.

Trochim (2006) and Merriam (2009) proposed that in a case study, a combination of research instruments should be used to corroborate the data evidence or to serve the purpose of triangulation. By adopting a few research tools, the findings of each research tool will at the end be able to cross-illuminate each other (Perakyla, 2000). The research tools employed in this study were observations, semi-structured interviews, and Think Aloud Protocol (TAP). If there are any discrepancies among these sources of data, the researcher asked the participant/s further questions in the following meeting so as to resolve the discrepancies. The researcher has taken some necessary measures to ascertain the validity and reliability of this study. The measures include expert validation of questions for the semi-structured interview questions, member checks/participant validation and audit trail. These measures are proposed by Uma Sekaran (2004:3) in that, "... the reliability measures indicate the extent to which it is without bias and hence ensures consistent measurement across time and across the various items in the instrument". The measures utilized are also recommended by Creswell (2003), in particular the need for researchers to be honest since the researcher is the main instrument. Yin (2009) notes that in a case study, all measures must be applied throughout the conduct of the case study.

In order to observe qualitative research etiquettes, the data was arranged according to the participants' pseudonyms. The participants were assured that their real names would not be revealed so as to not to breach their privacy (Angrosino, 2000). In addition, the researcher also sought consent from the participants. Only participants who volunteered were accepted as the participants of the study. The researcher made prior appointment according to the participants' convenience. The interview responses were transcribed verbatim.

### **DATA COLLECTION TOOLS**

In order to obtain the answers to the research question posed in the study, observation, TAP and semi-structured interviews were utilized. The participants were observed individually for five times. The researcher went to the participants' workplace or homes in order to observe them reading the prescribed hypermedia documents. Each observation lasted between 60 to 80 minutes. While reading, the participants also employed Think Aloud Protocol to express their perceptions of the hypermedia documents uploaded earlier onto the UKM website. The TAP was then followed by semi-structured interviews which lasted about 30 minutes each participant.

### **PARTICIPANTS & SETTING**

First year students registered in the Allied Sciences Faculty were required to enroll in an English course namely English for Life Sciences. The course focuses primarily on reading life sciences hypermedia documents from diverse sources namely books, journal, newspapers, websites and magazines. These hypermedia documents were adapted and uploaded as the prescribed reading for this course.

The designed hypermedia documents were used by the distance learners; all of whom were adult learners with at least a few years working experience in health related organizations. At the time of the study, the learners were

attached to hospitals, municipal councils and universities. Their ages ranged between 30 and 45 years old. The students had limited face-to-face meetings with their facilitators and fellow classmates, that is, they only saw one another during the initial two weeks. For the remaining twelve weeks of the semester, the students studied at home or workplace. They became ‘self-directed learners’ until Week 15 when they gathered at UKM to sit for the final exams. There were eight participants in this study.

## FINDINGS AND DISCUSSION

In general, when the participants were asked about the contents of the hypermedia documents prepared by the course designers, the interview responses were varied. First, most of the participants viewed that the number of reading articles was sufficient. Second, two of the research participants regarded the contents as being good, relevant and beneficial for their studies and work. The participants INTAM and INTFA (pseudonyms) stated that: *“Some of the contents are good. I could obtain a lot of knowledge from the reading materials”* and *“I believe the hypermedia help me since they are related to medical science. They are also relevant because they discuss updated issues and general knowledge”*. As adult learners, it is very essential for the learning materials to be relevant and directly applicable to their working environment (Akyel & Ercetin, 2007). Adult learners do not learn for the sake of learning but to perform a task, to solve a problem or to lead a more satisfying life (Laird, 1985).

The above participants also mentioned that the teacher should select credible websites as they had found a few inaccurate statements in the hypermedia documents. The participants in the study were adult learners who possessed a Diploma in health sciences and had a few years of working experience. There is, therefore, a good likelihood that they could identify credible sources and those which were not credible such as texts from the Wikipedia, newspaper articles and blogs whose writers are people who may or may not come from a medical background. It is also possible that the respondents were able to identify inaccurate information which appeared in some of the hypertexts using previous schemata.

With reference to contents, in contrary to INTAM and INTFA, many of the other participants commented that the contents of the hypermedia documents were uninteresting which caused them to read only 40% to 60% of the uploaded hypermedia documents on the UKM website. When probed further, the participants cited reasons such as the presence of a large number of unfamiliar words especially jargons and terminologies (*“some of the words are too high level for me as I regard my English as at moderate level. When the contents contain many unfamiliar words, I would feel bored”*). However, for INTAM, the hypermedia documents were not difficult. This difference in opinion could be due to a few reasons. One is that INTAM was used to reading journal articles in the Life Science discipline, as expressed in the following statement: *“I’m used to reading journals so I don’t have much problem thus far”*. It could be said that participants would find the contents to be difficult unless they had experience reading journal articles written in the life sciences. Another reason for the difficulty can be said to be language related. Evidence of this comes from some participants’ suggestion concerning the use of glossary to accompany the hypermedia documents. The participants expressed preference for a bi-lingual glossary, such as English and Bahasa Melayu to aid understanding. This evidence is taken from INTSA, *“I prefer to get the translation from English to Malay. Straightforward”*.

In addition, the glossary should be in the form of hyperlink (*“I could easily use the hyperlinks to the glossary. It enables me to make quick reference on the words that I’m not familiar with”*). The glossary should consist of important words in the hypermedia documents. Acknowledging that there are terms in Malay that do not have one-to-one relationship with the terms in English, one participant suggested in the interview that the English teachers should work collaboratively with content lecturers to produce a glossary of terms. However, it is difficult to ascertain if this is a language problem or issues pertaining to accuracy of information since the participant was able to identify two wrong translations (*“There are translated words which are inaccurate like ‘chronic’ and ‘acute’. I suggest that the English instructors seek assistance from the content lecturers to ascertain the accuracy of the translation”*). Related to the accuracy problem could be the credibility of the online sources as reading for adult learners who are professionals in their own field.

Moreover, individuals’ attitude also affected their interest in reading as admitted by INTRA and INTLI, *“OK, by nature I feel lazy to read or refer to reading materials”* and *“It is because by nature I don’t enjoy reading. I prefer the hypermedia but reading takes a long time”*.

From the observations and participants’ TAP, it is found that visual design and effect played a role in the participants (losing) interest in reading. The participants tend to skip the hypermedia documents which were regarded as being ‘too long’, and perhaps too taxing to read as the result of the size of the words being ‘too small’ and the gaps between the lines as being ‘narrow’. When enquired further, the participants stated that,

*“Sometimes, the website contents make me confuse lah. Some of the reasons are the arrangement is too compact, the words are too small, or the paragraphs are too long. I would prefer if the contents are in point forms and they are put into simple sentences”*. It was also reported by the participants that when the hypermedia documents were too long, the size of the words too small and there existed narrow gap between the lines, the participants would experience eye and mental fatigue easily. INTLI stated, *“I could not concentrate for a long period of time”*. Another participant, INTNI, gave similar view, *“As I mentioned earlier, my retention power is limited I could only read one or two paragraphs then I quit reading”*. When they experienced eye and mental fatigue, they tend to skip lines and got lost on the computer screen.

When discussing these ‘on the screen’ reading difficulties, all the participants admitted facing the same problem. The findings of this study are almost similar with Tseng’s (2008) study. When reading printed texts, readers tend to move their eyes from left to right, in a straight line. However, when reading a hypermedia document, readers read information in scattered bits and pieces and not as a textual whole. Their eyes move in circular motion (Nelson, 1992). These difficulties progress with age. These participants, being adults, were used to reading printed materials during their schooling years unlike younger learners who are very exposed to the Internet at an early age, and therefore are very well accustomed to the digital print. Design issues come into play at this point. Rightly so, hypermedia documents are designed as they are because they are meant to be interactive and allow for links to other sources, as most other texts online. This particular issue calls for design considerations, on the part of website designers or those more specialized in IT, but as language teachers and designers of digital language learning materials, there is a need to be aware of potential challenges associated with physically reading hypermedia documents among adult learners. On that note it may be possible to engage in prior training for both teachers and learners in terms of dealing with new media and how that might conflict with using traditional texts. It is worth noting at this point that sufficient user training or preparation has been found to be very important toward ensuring success for an e-learning endeavor (Sami & Mohd Mudasir, 2013).

In addition to the situations surrounding most of the participants, one other issue is degree of familiarity. It was reported by the participants concerned that their working environment did not require them to access and use hypermedia documents. It took them a longer time to adapt to the ‘new reading environment’. It could be possible that some degree of motivation was lost in the process because of the challenges associated with adapting themselves to the new environment (Laird, 1985). The participants’ actual reading environment, as it was encountered at work, appears to be in contrast to the reading they were expected to do in the course. In this instance, there was a need for the participants to learn new reading strategies involving hypermedia documents.

With respect to retention power, Tseng (2008) stated that the retention power of adults is also lower than children’s resulting in faster eye and mental fatigue). In many cases, adults relative to children resist new reading strategies as they are already comfortable with their own reading strategies (Laird, 1985). Nevertheless, in the current scenario, adult learners do not have many options but to adjust their reading strategies. It is important that the course designers make necessary improvements to the designed hypermedia documents to facilitate reading.

Some other issues require consideration as well. ‘Dullness’ of the contents of the hypermedia documents were mentioned, and this was attributed to the ‘size of the words’; or font size; (*“The size of the words is too small therefore, it is less attractive”*) and the lengthiness of the paragraphs, including aspect of color. (*“Limited colors on the pages”*). Three of the participants stated the font size should be 16. Being adult learners, they tend to shoulder multiple responsibilities (family, work and study), so it is possible that lengthy articles were viewed as ‘cumbersome’ because they faced the problem of time constraints. The participants further commented that when the selected article was too long, the participants lost interest in reading even at first glance (*“I quit reading immediately when I see the article is too long”*). Continuous forty-five minutes of reading was reported by the participants to be physically demanding as it put a strain on the eye, subsequently causing them to lose concentration. Added on to these challenges were issues such as not owning a laptop, not having Internet connection and having short retention power (*“At times we do not have sufficient time, do not have a laptop and others to access the website”*).

The textual organization of hypermedia documents was also commented on. It seems that the participants preferred hypermedia documents with subheadings; citing constant disturbances from family members at home and work demands. In that respect, it could be said that they needed a text which was easier for them visually. According to the participants, the subheadings should be of different colors to enable them to distinguish between subheadings and paragraphs. This can be illustrated by a statement obtained from interview responses given by INTAM and INTLI,

*“The texts should be designed in such a way that could ease our reading like putting in the subheadings and mark them in different color”*

And

courses in UKM have started to integrate IT and use its potential for academic or professional purposes”. Currently, very few teachers in UKM are tech savvy in the area of learning management systems (LMS). They need to be more computer savvy before they could train the students. They need to be exposed to a different set of language pedagogy for hybrid teaching and to be trained on how to exploit the potential of course management systems before designing a course. She also wrote that the facilitators and course designers need to be trained on course management systems, ethics and conventions that govern the use of online information before designing the course. “The trainings must be conducted continuously, as attitude change would not occur overnight (Norizan 2003, p. 205)”. The teachers who often are also the course designers must be knowledgeable and efficient to manage and deliver suitable course materials. Without sufficient knowledge and support, both parties, the teachers and the students, could easily become technophobic and frustrated as designing and using hypermedia documents, for instance, is a complicated and demanding task (Moras, 2001; Dudeney & Hockly, 2007).

### CONCLUSION

It is only through research that the details of the needs can be revealed. It is hoped that the findings of this study which are derived from the students’ responses are able to provide some guidance especially for the course designers and also the teachers. These findings could facilitate the course designers to improve the designed hypermedia documents especially for use in English for Specific Purposes course, such as the one offered for Life Sciences students in the study. It is also hoped that efforts would be focused on developing more online materials to fulfill the needs of Malaysian distance learners. It is because with respect to language skills in the Malaysian scenario, the students considered reading as the most important skill (Radha, 2007).

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## DESIGN OF GUIDELINES ON THE LEARNING PSYCHOLOGY IN THE USE OF FACEBOOK AS A MEDIUM FOR TEACHING & LEARNING IN SECONDARY SCHOOL

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### ABSTRACT

Use of Facebook in education is an innovation that is very suitable for getting the benefits of ICT to improve the quality of learning in Malaysia. Although Facebook is much applied in the teaching and learning process, no guidelines exist in Malaysia as a reference for teachers to develop teaching and learning effectively with Facebook. This study is aimed at developing a design for guidelines on the learning psychology in the use of Facebook as a medium for teaching and learning in secondary school. This research is a quantitative study using the Fuzzy Delphi Method. A design for guidelines on the learning psychology in using Facebook as a medium for teaching and learning has been developed to serve as a guide for teachers so that their teaching and learning on Facebook can become more attractive and effective.

**Keywords:** Facebook, Learning Psychology, Fuzzy Delphi Method, Educational Technology

### INTRODUCTION

Based on the data released by internetworldstats.com, Malaysia's population as at February 2013 reached 28.859 million people; out of these, a total of 13.085 million people are Facebook users.

According to statistics released by SocialBakers.com, students aged 18-24 years and 25-34 years are the two biggest users of Facebook in Malaysia, accounting for 33.6% and 31% of users respectively. The class of students aged 13-17 years rank as the third biggest users of Facebook in Malaysia, namely 14.1%. In the beginning of 2013, Malaysia ranked 18th out of total Facebook users around the world.

It is known that Facebook is so popular among pupils and students. This popularity should be leveraged by educators to take advantage of Facebook as a tool that can contribute to the quality of education in Malaysia. This is because Facebook holds potential benefit for students, especially in overcoming low motivation (Mazman & Usluel, 2010).

The fact that Facebook played the main personal and social roles in daily life of students has led some educators to use it as a primary site for student learning. Facebook is built with many desirable features of an effective educational technology in the use of reflective elements, and peer feedback mechanism so suited in the context of social learning (Mason, 2006). Facebook has features offering educational experiences that build connectivity while maintaining privacy and security (Blatter & Fiori, 2009).

Facebook is said to enhance teacher-student interaction by web-based communication. Many research studies have been done on Facebook and the increased academic achievement among Facebook users. As a creative teacher, the teacher should take advantage of ICT development, including social sites such as Facebook and Twitter which are becoming a craze for students, to improve teaching methods (Rosaffari & Shabariah, 2011).



Although Facebook gives a lot of benefit to teachers and students, there is no guide as a reference for teachers to develop a learning environment in social networking sites such as Facebook. Since a study conducted by researchers on guidelines for Facebook use in education is still lacking in Malaysia, this study is carried out; it is hoped that the findings can be a source of reference for teachers and researchers in future. It is also hoped that this study will contribute to the diversification of effective teaching methods.

### **The Needs of Design Guidelines on the Learning Psychology In The Use Of Facebook As A Medium For Teaching & Learning**

Applying the psychological aspects of teaching media in Facebook is very important to produce effective teaching and learning using learning theory. This is because teaching strategies or methods present in the design of learning in Facebook as a medium for teaching and learning is based on these theories. This statement is supported by Bucci, Copenhaver, Lehman, and O'Brien (2003) who stated that technology integration into learning should be appropriate to the source, goal-based learning and learning theories. According to them, if technology use does not take into account the theoretical foundations of learning, it does not help to meet learning goals.

According to Okojie, Olinzock, and Okojie-Boulder (2011) teachers need to understand the pedagogical principles governing technology use in teaching and learning. This is because it will be crucial for teachers to see technology in education as part of their pedagogy. Thus they encourage teachers to see technology integration from a broader perspective; this is because teachers use technology aims to support and facilitate teaching.

The findings of Rafiza and Maryam (2013) suggest that a low understanding of the psychological aspects leads to a lack of application of this aspect by respondents in developing multimedia-based instructional media. Similarly, the findings of media content analysis show the development of psychology is not applied to the material. This suggests that teachers do not realize the importance of learning theories in designing learning materials. Development of teaching and learning based on the latest technology such as Facebook should also take into account the role of learning theory in the development process. Thourbun (2004) supported this view by stating that the technology will have a positive impact if the teachers know the right way to integrate elements of pedagogy and learning theory in producing digital teaching and learning materials.

### **Constructivism Learning Theory**

Constructivist theory emphasizes the importance of knowledge, beliefs and skills brought by an individual to the learning experience. It also recognizes the construction of new understanding as a combination of prior learning, new information and willingness to learn (Ormrod, 2008). In addition, social constructivism acknowledges the role of culture in the construction of knowledge (Pountney, Parr, & Whittaker, 2002).

The proposed guidelines in designing instructional multimedia applications proposed by Jamalludin Harun and Zaidatun Tasir (2003) have been modified by the researchers. According to them, theory of constructivism can be used in multimedia applications because using problems that occur in everyday life in the teaching and learning process is encouraged in constructivist teaching and learning. In addition, the emphasis on divergent thinking also applies. Therefore, students should be guided by the teacher or the learning material provided for the understanding of a concept from multiple perspectives in order to expand their thinking. The concept is easy to explain in a learning environment that leverages the use of technologies such as multimedia and social networking sites such as Facebook.

Jamalludin Harun and Zaidatun Tasir (2003) noted that constructivist theory also provides guidelines and principles for consideration when developing a technology-based learning environment. One set of guidelines is to provide authentic learning environments presented in a meaningful context (Ally, 2004; Brown, Collins, & Duguid, 1989; Cognition and Technology Group at Vanderbilt, 1992). In the context of learning through Facebook, students will be guided to actively participate in the learning environment provided for solving problems.

Constructivist theory also involves knowledge or intelligence that guides and structures the learning process. On the other hand, situations, and other amenities are to be provided to stimulate students to use their cognitive potential for optimization (Ally, 2004; Scardamalia, Bereiter, McLean, Swallow, & Woodruff, 1989) and is able to meet the individual learning needs as well as providing social activities. Social sites like Facebook offer facilities to encourage social activities such as private message facility, discussion forums, electronic smart partnerships and so on. This in turn enables students to work cooperatively and share ideas while challenging their thinking through discussion activities.

Teachers are suggested to provide learning materials to encourage pupils to develop their own knowledge. Teachers should also emphasize active learning among students. This can be done by discussion tools. The discussion method using Facebook can activate the learning environment and enhance student interest (Rossafri Mohamad & Shabariah Mohamad Shariff, 2011). According to Rossafri Mohamad and Shabariah Mohamad Shariff (2011) learning using discussion method has advantages over other methods. This is because the discussion method is applied in a student-centered learning environment and can provide opportunities for students to plan their own learning.

**OBJECTIVES OF THE STUDY**

Based on the research problem statement, this study is based on the following research objective:

- a) Identify the characteristics of the domain of the learning psychology required in Facebook as a medium for teaching and learning in secondary school.

**RESEARCH QUESTION**

Based on the research objective, this study was conducted in order to answer the following research question:

- a) What is the domain of the learning psychology required in Facebook as a medium for teaching and learning in secondary school?

**THE RESEARCH METHODOLOGY**

This study aims at developing a design for guidelines on the learning psychology in the use of Facebook as a medium for teaching and learning in secondary school. The methodology of this study is aimed at answering the research question.

The design of this study is based on the fuzzy Delphi method (Chang, Hsu & Chang, 2011). In this study, researchers used questionnaires as a research instrument. The questionnaire is designed to identify the learning psychology domain characteristics required by Facebook as a medium for teaching and learning. The characteristics of the domain will be identified by distributing questionnaires and responses will be analyzed using a Fuzzy Delphi technique to obtain a consensus view among experts selected.

According to Adler and Ziglio (1996), the appropriate number of experts in the Delphi method is between 10 and 15 if there is a high degree of uniformity among the experts. While Jones and Twiss (1978) suggest as much as 10 to 50 specialists.

In this study, the researcher will select a total of 30 experts. The samples used in this study are expert teachers, university lecturers, lecturers in teacher training colleges and ICT experts. Rationale for sample selection is based on the skills and knowledge they have in pedagogy and technology. Respondents can voluntarily cooperate in ensuring the success of this study. Table 1 shows the number of selected experts in the field

Table 1: *The Number of Experts in Each Field*

Field	Number of Experts
Expert teachers	15
University lecturer	5
Lecturers in training teachers college	5
ICT experts	5

The sampling process will involve the use of a questionnaire distributed to the experts. Among the criteria required to become experts in this study are;

- 1) The expert must have at least a bachelor’s degree in their respective fields.
- 2) The expert has expertise in the field of IT or technology education for at least five years.

**Or**

- 3) The expert must have experience in their field for at least ten years.

**DATA ANALYSIS**

Table 2 shows the threshold (dm, n) for each item based on the expertise and the overall percentage threshold for the consensus group of experts on the psychological constructs of learning. Overall, based on a percentage of the experts agreed to show all items agreed upon by experts.

Table 2: *Threshold Value and Percentage Consensus by Experts on Psychological Learning Constructs*

EXPERTS	LEARNING PSYCHOLOGY CONSTRUCT				
	A1	A2	A3	A4	A5
1	0.09	0.07	0.12	0.09	0.06
2	0.09	0.07	0.12	0.09	0.06
3	0.09	0.07	0.12	0.21	0.06
4	0.09	0.07	0.12	0.09	0.06
5	0.21	0.07	0.18	0.21	0.24
6	0.21	0.23	0.18	0.21	0.24
7	0.09	0.07	0.18	0.21	0.24
8	0.21	0.23	0.18	0.09	0.06
9	0.09	0.07	0.12	0.09	0.06
10	0.09	0.07	0.12	0.09	0.06
11	0.09	0.07	0.12	0.09	0.06
12	0.21	0.07	0.18	0.09	0.24
13	0.09	0.07	0.12	0.09	0.06
14	0.09	0.07	0.18	0.21	0.06
15	0.09	0.68	0.12	0.09	0.06
16	0.09	0.23	0.18	0.09	0.24
17	0.21	0.07	0.18	0.09	0.24
18	0.09	0.07	0.12	0.09	0.06
18	0.09	0.07	0.18	0.09	0.06
20	0.09	0.23	0.12	0.09	0.24
21	0.09	0.23	0.12	0.09	0.24
22	0.09	0.07	0.12	0.09	0.06
23	0.21	0.23	0.18	0.21	0.67
24	0.21	0.23	0.18	0.21	0.24
25	0.09	0.07	0.12	0.09	0.06
26	0.09	0.07	0.12	0.09	0.06
27	0.09	0.07	0.12	0.21	0.06
28	0.21	0.23	0.12	0.09	0.06
28	0.21	0.23	0.12	0.09	0.36
30	0.09	0.07	0.18	0.21	0.06
<b>DEFUZZIFICATION</b>	<b>19.80</b>	<b>19.40</b>	<b>20.40</b>	<b>19.80</b>	<b>19.20</b>
Percentage consensus expert group to construct learning Psychology: 98.6%					
* Value ( $d_{m,n}$ ) for each $\leq 0.2 = 148$ items, then $(148/150) * 100\% = 98.6\%$					

Table 3 shows the defuzzification scores for the domain characteristic learning psychology. Based on the defuzzification score the position of each item according to priority is given; this will enable every teacher to focus on the relevant domain characteristics in the process of teaching and learning using Facebook.

Table 3: *Scores Defuzzification for Learning Psychology*

Item	Domain Characteristics	Defuzzification value	Ranking
A1	Driving students to actively participate in learning.	20.40	1
A2	Use of the facilities provided by Facebook such as Chatroom to allow students to learn cooperatively.	19.80	2
A3	Emphasis on brainstorming.	19.40	3

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A4	Provide strategies that focus on actual experiences that occur in human life.	19.20	4
A5	Providing learning materials that encourage students to form their own knowledge.	19.00	5

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As a result of the defuzzification score for each domain characteristic of Learning psychology appears to be on the value agreed upon by experts. It is hereby found all of the items can be used in the process in designing guidelines on the learning psychology in the use of Facebook as a medium for teaching and learning in secondary school. Table 3 shows that driving students to actively participate in learning with the defuzzification score 20:40 is in the first ranking. This is followed by use the information provided facilities provided by Facebook such as Chatroom to allow students to learn cooperatively with the defuzzification score of 19:80; next in rank is emphasize on brainstorming with the defuzzification score of 19:40; this is followed by the item provide strategies that focus on actual experiences that occur in people’s lives with the score of 19:20 and the last, provide learning materials that encourage students to form their own knowledge with a defuzzification score of 19.00.

### DISCUSSION AND CONCLUSIONS

After the defuzzification score analysis was conducted, the researchers found that the characteristics of a domain that has high defuzzification score is concerned with driving students actively involved in learning with the defuzzification score of 20.40. In the context of learning through Facebook, students will be guided to actively participate in the learning environment if space for problem solving is provided. According to the researcher, when teachers present the theme or issue on Facebook this will drive students to collaborative activities or projects. This is because, according to Jamalludin Harun and Zaidatun Tasir (2003), the theory of constructivism provides guidance and principles that should be considered when developing a technology-based learning environment. One set of guidelines is to provide authentic learning environments presented in a meaningful context (Ally, 2004; Brown et al., 1989; Cognition and Technology Group at Vanderbilt, 1992).

The second characteristic is the domain use the facilities provided by Facebook such as Chatroom to allow students to learn cooperatively with the defuzzification score of 19.80. The researchers argue that social networking sites such as Facebook are suitable for encouraging social activities such as private message facility, discussion forums, electronic smart partnerships and so on. This in turn enables students to work cooperatively and share ideas while challenging their thinking through discussion activities. This opinion is supported by Rossafri Mohammad and Shabariah Mohammad Shariff (2011) who stated that the discussion method using Facebook can activate the learning environment and enhance student interest. They said learning to use the discussion method has advantages over other methods. This is because the method is applied to a discussion of student-centered learning and will provide opportunities for students to plan their learning.

The third characteristic is the emphasis on brainstorming that has the defuzzification score of 19:40. Jamalludin Harun and Zaidatun Tasir (2003) noted that the theory of constructivism can be used in multimedia applications to generate the divergent thought. Therefore, the researcher suggests that students taught by teachers or learning materials provided on Facebook are able to develop understanding of a concept from multiple perspectives in order to enhance their thinking.

The fourth characteristic is to provide a strategy that focuses on the real experiences that happen in people’s lives with the defuzzification score of 19:20. This opinion is in line with that of Jamalludin Harun and Zaidatun Tasir (2003) stating that the theory of constructivism can be used in multimedia applications because the use of problems that occur in everyday life in the teaching and learning process is being encouraged in constructivist teaching and learning.

The last characteristic is to provide learning materials that encourage students to create their own knowledge with defuzzification score of 19:00. This opinion is supported by constructivist philosophy which states that the constructivist theory of knowledge or intelligence does not involve a rigid or structured learning process. On the other hand, situations, and other amenities are to be provided to stimulate students to use their optimal cognitive potential (Ally, 2004; Scardamalia et al., 1989). Therefore, the researcher suggests that teachers provide learning materials in the form of encouraging pupils to develop their own knowledge. Teachers should also emphasize active learning among students.

Thus, referring to expert assessment, constructivist principles are best suited for developing a design of guidelines on the learning psychology in the use of Facebook as a medium for teaching and learning in secondary school.

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## EFFECTIVENESS OF E-LAB USE IN SCIENCE TEACHING AT THE OMANI SCHOOLS

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### ABSTRACT

Computer and information technology can be used so that students can individually, in groups, or by electronic demonstration experiment and draw conclusion for the required activities in an electronic form in what is now called "e-lab". It enables students to conduct experiments more flexibly and in an interactive way using multimedia. It helps them to achieve electronic practical training, skills, and tendencies. This paper focuses on describing the design and procedures of a nation-wide research project financed by The Research Council and conducted to measure the effectiveness of the e-lab on Omani students' acquisition of practical abilities and skills. The research project, in particular, examines the effectiveness of the e-lab in science teaching, the skills acquisition, and basic education students' appreciation of classroom environment. It also aims to know the students' attitudes towards the use of e-Lab technology and its employment. The paper will draw prospective recommendations for the field work derived from literary evidence.

**Keywords:** e-lab, Oman; science education; practical skill; technology

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### 1. INTRODUCTION

Last decades have witnessed unprecedented revolution in the field of technological applications specifically in the teaching and learning process. Technology has become an essential component of this process in a way it does not affect the teacher, student or course materials but it connects all these elements and makes the output of the educational process of high quality. In particular, science education was greatly affected by technology in terms of the nature of the laboratories' work, equipment, and media.

Many methods and tools used in the traditional lab no longer meet the needs of learners for many reasons. There is a need to activate and utilize the latest technological techniques to achieve effective science teaching/learning process. By using innovations facilitated by the possibilities of information and communication technologies in science education and practices, we can utilize the advantages of safe interactive learning that simulates real laboratory work.

### 2. LITERATURE REVIEW

Technology integration in teaching and learning process is no longer a luxury but has become a vital requirement to develop educational infrastructure/structures. Technology offers qualitative leap in reformulating all educational process components. E-Learning technology and its applications have become an integral part of communities' lives. A set of applications in education such as: mobile learning, virtual reality and electronic museums have begun (Sharples et al., 2007). The use of technology implies great importance and many advantages, including:

- Dealing with some of the phenomena that are difficult to apply in a traditional laboratory.
- Implementing many difficult and dangerous experiments through simulations.

In the following sections, we will review literature on the concept, definition, importance, types, and obstacles of e-labs.



### 2.1 Concept and Definition

Science education is closely linked to experimentation and laboratory work. Recent literature confirms the important role of experimentation in increasing students' active and vital participation in the learning process, as well as it helps students to acquire different skills and form positive attitudes towards science learning (ICSU, 2011).

Laboratories developers have focused to take advantage of computer applications to create safe/active interactive learning environment that simulates lifelike e-laboratory. This lab is "one where the student interacts with an experiment or activity which is intrinsically remote from the student or which has no immediate physical reality" (Hatherly, n. d.). It can be defined as "a tool consists of interactive computerized software linked with sensitive connector endings called sensors, where the components of practical sciences experiments are integrated with computers as a measurement instrument to collect and analyze data." (Al-Shaiey, 2006).

### 2.2 Objectives

Objectives of e-labs are as follows (Shaheen and Khattab, 2005, p. 206):

- Update laboratory work and its applications to keep pace with technological advances.
- Take advantage of computer in employing scientific and educational software in the educational process.
- Compensate for the shortfall in some laboratory equipment through the use of ready-made computer software.
- Help students to deeply understand scientific concepts.
- Correct many of the misconceptions held by students about science and technology.
- Develop students' positive attitudes towards the study of science and the use of technology.

### 2.3 Components

E-lab consists of major components as mentioned in Al-Bayati (2006, pp 28-32):

- Laboratory devices and equipment: by integrating a number of traditional laboratories with some additions and enhancements necessary to help in their use inside the laboratory and e-lab.
- Computers and servers: e-labs need to provide a computer connected to the local network or the World Wide Web to enable individuals to work directly in the lab or remotely at any time and place as well as special software to access the network. Laboratory servers must be loaded with software and simulation programs that allow correspondence between individuals and devices.
- Communication network and hardware: in the case of conducting experiments remotely by connecting all users with the laboratory through digital communication, then all hardware interfaces should be connected with computer network and servers. Communication lines should be secured and highly reliable as required by the experiment in terms of capacity of the channels of communication. Users should be provided with a reasonable capacity of communication channels to enable them to communicate with the laboratory through a local network or the World Wide Web. It is necessary to provide these facilities with affordable cost in order to establish interaction between the users and the e-lab in which they can perform all the required experiments.
- Special e-lab programs: these can be divided into two types: the first through which the users learn to perform experiments and provide them with experiments requirements in terms of information and special program; the second manages laboratories by including special e-lab software and simulation programs prepared by specialists in this field in addition to the initial training of the users on how to use these software/programs to easily implement the required experiments.
- Participation and administration programs: the other part of the programs is related to how to manage the lab and the students/researchers participation. These programs register the students in the laboratory and determine the types of access rights that must be met for each user to work in various experiments. The importance of such programs lies in their ability to allow each group of students to work on the experiment according to certain levels such as allowing students to work at a certain stage on some experiments and devices that suit them. (Al-Shahri, 2009, p. 72).

### 2.4 Benefits and Advantages

E-lab is a revolutionary technologic way in the field of science laboratories through which the student is accustomed to computers not only as a means of calculation or information storage but as a laboratory tool used for measurement and control. Moreover, it becomes a tool to study and clarify the experiments and their relation to theory so the student can understand the meaning of conducting practical experiment while doing them. The

student can use the e-lab as a means to conclude the laws through real measurements during the experiments. Therefore, e-lab serves as a tool to understand and convince through viewing, experimentation and conclusion. Other benefits can be summarized in the following points (Zaitun, 2002, p.164):

- E-lab is an excellent substitute for traditional laboratory as it offers students experience of skills close to the direct experience.
- It contributes to overcoming the obstacles that prevent the students from conducting actual experiments.
- It provides learners with an interesting interactive scientific environment.
- It allows students the possibility to conduct scientific experiment step-by-step with immediate feedback.
- It enriches curricula by providing students with experiences that would be too hazardous or prohibitively expensive in a conventional setup (Coble, et al., 2010)
- It can use unique visualizations to provide insight not available in conventional labs; this is particularly the case for phenomena that are not directly observable (Coble, et al., 2010).

### 2.5 Types of Integrated Technology

There are several types of integrating technology in laboratory practices (Zaitun, 2002, p. 165; Farooq et al, 2013):

- Computerized science labs: two-dimensional treatment that relies on sensors for testing and conducting experiments. It includes the design of a number of laboratory experiments available on computers or stored on DVDs and CDs. This type does not provide the proper atmosphere for the student to engage into the electronic environment.
- Online simulation labs: traditional two-dimensional laboratories containing labs' experiments, offering a number of experiments and experiments in the form of video clips. This software is available on the Internet so that anyone in the world can watch and deal with them. However, the level of the learners' interaction with the experiment elements and their ability to change them is limited.
- E-laboratories: aim to provide practical experiments closer to reality. The programs are presented in two-or-three dimensional forms accompanied by sound, image and movement. Their environments/components are modifiable and controllable. They offer a great deal of interaction between the student and the electronic environment and enable more than one person to navigate in the lab and interact with others.
- Three-dimensional e-laboratories: software simulation of real experiments. They are similar to the previous e-laboratories but they use new presentation technologies such as: head-mounted display, data glove, and tracking system. They allow the student to engage in such VR environment. They provide three-dimensional panoramic presentations associated with three components: eyes, ears and hands. Attempts continue to link all parts of the body through a full body dress that connects senses and nerves areas with feedback devices to make direct contact with the skin surface of the user resulting in a complete and direct individual interaction with electronic reality experiment.

### 2.6 Obstacles of Use

Obstacles to the use e-labs are (Zaitun, 2002, p. 165):

- It requires computers and equipment with special specifications for clear representation of complex phenomena.
- Its design and production need a specialized team of experts in computers, curriculum and psychology; and specialists in different branches of science.
- E-labs rely on languages (specifically, Arabic) are still rare.

## 3. PREVIOUS STUDIES IN THE ARAB WORLD

There are many studies related to e-lab, its role and importance in the Arab World. In this section, we will present findings of some of these studies.

- Al-Mutairi study (1998) entitled “the impact of using science computer software on the achievement of sixth grade students. The researcher used the experimental method with a sample consisted of 60 students distributed to a group of 20 students studied using a computer software and another group of 30 students studied using the traditional method. The study showed statistically significant differences in student achievement between the two groups in favor of the group that studied using the computer software, in memorization and understanding levels, but did not show differences in the level of the application.
- Al-Anzi, study (2003) entitled “the impact of using online science educational unit on the achievement of second preparatory class students”. The sample consisted of (30) students as experimental group

using online science educational unit, and (30) students as a control group. The main results showed significant differences between the achievement means of the experimental and traditional groups in levels of memorization, understanding, and application; and between the two groups in the overall level of post-test in favor of the experimental group.

- Al-Shaiey study (2006) entitled " Status of using computerized science labs at secondary stage and teachers/students' attitudes towards them". The study used the descriptive method and included 118 teachers and 580 students. The main results showed that 37.7% of the teachers sample did not use computerized science laboratories at all, whereas 62.3% used them once at least during the semester. There were positive attitudes among the teachers and students towards these laboratories with statistically significant differences in teachers' attitudes in installing, using, and teaching through computerized labs. Statistically significant differences existed in favor of teachers and students attitudes towards these labs in favor of highly skilled students in the use of computers.
- Saleh et al study (2004) entitled "the Effectiveness of computer simulation programs on the achievement and laboratory skills acquisition of students at the secondary level". The results indicated the effectiveness of simulation software, when used alone to achieve the instructional objectives related to the achievement and laboratory skills.
- Shabbat study (2005) entitled "the effectiveness of electronic computerized training and its adequacy on some biology laboratory experiments in the second secondary class of Daraa province and its impact on student achievement and their attitudes towards it. The researcher used the experimental method and prepared a questionnaire especially for the sample of the experimental group to find out their attitudes towards the e-lab. The study sample consisted of two groups (24 students) experimental studied in computerized training environment, and (24 students) studied in a traditional laboratory. The findings showed statistical differences between the mean scores of the two groups in the overall post-test in favor of the experimental group with positive attitudes among students towards the use of biology e-labs.
- Al-Qarni study (2006) entitled "the impact of using computer simulation in teaching science on scientific concepts achievement among students of Bisha governorate second preparatory class". The researcher produced a computer simulation program and applied a pre-post achievement test of scientific concepts as a tool for the experimental study. The study findings showed that statistical differences between the mean scores of students of the two groups on the achievement of scientific concepts in posttest at three levels of: memorization, understanding, and application in favor of the experimental group.
- Al-Shannaq et al study (2004) entitled "the impact of using the dry laboratory strategy on the achievement of science students at the University of Jordan". The researchers used the experimental method with a sample consisted of 142 male and female students who were divided into two groups, experimental (84) students and control (59) students. The findings showed statistically significant difference at the level of (0.05) in academic achievement in favor of the experimental group.
- Al-Khalaf study (2005) entitled "the effect of using the dry and wet laboratory in teaching chemistry on the achievement of the basic ninth class students and the performance of their science processing skills". The study sample consisted of 116 students divided into two groups: experimental (57) students and control (59) students. The researcher prepared achievement test and a dry laboratory software. The results showed statistically significant differences in student achievement in favor of the experimental group. The study also showed statistically significant differences attributed to the impact of interactive between teaching method and gender in the achievement test, and in the performance of the science processing skills test in favor of experimental group. A positive statistical correlation between achievement and performance of science processing skills in both groups.
- Al-Radi study (2008) entitled "the effect of using virtual laboratories technology in chemistry on the achievement of the third secondary class students of Qaseem region". The study used quasi-experimental approach. The study sample consisted of 85 students and divided into two groups: experimental (43 students) taught using e-lab and control (42 students) taught using traditional lab. The researcher constructed an achievement test as a tool for the study. The results showed a statistically significant difference between the experimental and control groups in favor of the experimental group demonstrating the effectiveness of the e-lab in improving achievement.
- Al-Balushi study (2009) entitled "the effectiveness of chemistry e-lab on the development of practical skills and achievement of students at the post basic education in the Sultanate of Oman and their attitudes toward it". The researcher used the quasi-experimental approach. The study sample was (120) students from the eleventh grade of post education stage equally divide into two experimental and control groups. The researcher prepared an achievement test, an observation scheme, and an attitudinal

scale with other training materials and guides as study tools. Findings showed statistically significant differences between the mean scores of pre-posttest in terms of academic achievement in the experimental group in favor of the posttest. They also showed statistically significant differences between the mean scores of the experimental group and the control group in the observed practical skills in favor of the experimental group. Both results demonstrate the effectiveness of the e-lab to improve the achievement level. Statistical significant differences were also found between the mean scores of pre-post application of the attitudinal scale toward chemistry e-lab in the experimental group in favor of the post application demonstrating the positive attitudes towards this lab.

- Redha study (2010) entitled “effective use of e-lab for enquiry and demonstration in teaching chemistry on the development of scientific thinking”. The researcher used quasi-experimental approach. The study sample consisted randomly of 91 students distributed into three experimental groups: (30 students) in experimental group (1), (30 students) in experimental group (2), and (31 students) in the control group. The researcher has designed a test of scientific thinking in chemistry and e-lab as study tools, in addition to enquiry and experimentation worksheets. The results pointed out the effectiveness of the e-lab investigating and demonstrating role in the development of scientific thinking. They also showed that the effectiveness of the e-lab varied according to its type in favor of the enquiry-based e-labs.
- Ahmad study (2010) entitled “the effect of using a e-lab on the physics concepts achievement, acquisition of higher-order thinking skills and motivation toward science learning among students of the third preparatory class”. The researcher pursued quasi-experimental approach. The study sample consisted of 90 female students randomly selected from the third preparatory class and equally distributed to two: experimental and control groups. The researcher prepared study tools: achievement test in physics concepts and achievement test to measure the acquisition of higher-order thinking, and constructed a motivation scale towards science learning. The researcher used multi-media software adopted by the Ministry of Education in teaching ‘sound and light’ unit for the third preparatory class. The results indicated statistically significant differences in favor of the e-lab, where the study pointed out the effectiveness of the e-lab in the development of thinking skills in addition to raising the level of achievement in academic concepts. The results also indicated the impact of the e-lab in the motivation toward science learning.

Drawn from the previous reviewed literature and research, this paper focuses on describing the design and procedures of a nation-wide research project financed by The Research Council and conducted to measure the effectiveness of the e-lab on Omani students' acquisition of practical abilities and skills. In the following sections, we will describe the project objectives, study questions, research methodology and design.

#### 4. PROJECT OBJECTIVES

The project short-term goals are as follows:

- Study the effectiveness of the e-lab in teaching science on a set of teaching-learning variables such as: academic achievement, science processes, scientific attitudes, attitudes towards the use of e-lab technology, estimation of the classroom environment, visual thinking, and laboratory skills among fourth grader students in basic education.
- Detect positive points and obstacles of e-lab employment at the basic education schools in the Sultanate of Oman.

In addition, the long-term objectives are as follows:

- Develop practical and mental skills of students in the science using e-lab.
- Encourage science teachers to employ modern technology in the field of science laboratories.
- Develop the scientific thinking skills and procedures among students through active electronic interaction.
- Develop teaching science through enquiry by employing e-lab in science lessons.
- Develop classroom environment that enhance science learning by employing e-lab.
- Develop students' attitudes toward studying science and its branches in basic and post education in Oman.

#### 5. Project Questions

1. How effective is the e-lab on the basic education school students' achievement?
2. How effective is the e-lab on the development/acquisition of the followings among students in basic education schools: logical thinking; acquisition of science processes; scientific attitudes; visual thinking?
3. What are the attitudes among students in basic education schools towards the employment of e-lab in science teaching?
4. Are there statistical differences among students' attitudes towards e-lab in terms of gender, technological expertise, the scientific level?

5. Are there statistical differences among students' attitudes towards science in terms of gender, technological expertise, the scientific level?

## 6. RESEARCH METHODOLOGY

In this project, we will use quantitative research methodology in particular experimental design to measure the effectiveness of the e-lab towards the study variables (academic achievement, science processes skills, scientific attitudes, logical thinking, visual thinking, and attitudes towards e-lab)

### 6.1 The design of the research project

The research project examines the effectiveness of the e-lab in science teaching, the skills acquisition, and basic education students' appreciation of classroom environment. It also aims to know the students' attitudes towards the use of e-lab technology and its employment.

### 6.2 Study population and sample

The study population consists of all students who are studying science in the first basic education. The study sample includes (40%) of the research population in three Omani educational regions. The two groups (experimental and control) in each field treatment should be equivalent in the terms of study variables; and pre and post application. Each field experiment will have different type of e-lab: 3D, 2D, and online based labs.

### 6.3 Study Tools

To achieve the objectives of this study, the following tools were used:

1. Achievement test: the achievement test to be prepared by science teachers in light of the subject plan. It consists of questions item covering most aspects of the scientific material that is supposed to be studied by experimental and control groups' students. The total score is used as an indicator of a student's academic ability in science. The test is conducted and corrected, and students' scores are recorded for both groups by their teachers.
2. Science processes test: to measure the basic and integrated processes of science.
3. Attitudinal scale towards science: to measure the cognitive, behavioral and affective aspects.
4. Visual thinking scale: to measure the effectiveness of the e-lab in the development of visual thinking among the sample study.
5. Estimation of classroom environment scale: this is a scale adapted to the Omani context to measure the study sample estimation of the real and preferred classroom environment.
6. Practical skills test: to be prepared by science teacher in light of the subject plan. It consists of practical experiment covering most aspects of the scientific subject that is supposed to be studied by experimental and control groups' students. The total score is used as an indicator of a student's academic ability in science. The test is conducted and corrected, and students' scores are recorded for both groups by their teachers.
7. Attitudinal scale towards e-lab: this is a standardized scale. It consists of statements (negative and positive), with alternatives for answer (agree, neutral, not agree). Positive statements are given the following scores (1,2,3); whereas negative statements are given reverse scores (3,2,1).

### 6.4 Experimental design of the study

This study design adopts true experimental design with Pre-Post Test Control Group Design, where the experimental and control groups have to conduct achievement and practical tests. The experimental group is characterized by experimental treatment as it will be taught using the e-lab aided by teacher who should participate, be trained to use it, select what fits for the science lessons, and then implement it in the classroom. The students should use computer tablets to connect to the e-lab software and network while conducting experiments in the classroom (under teacher supervision). The following table is a summary of the design.

Table 1 Summary of research design

Group	pretests	experimental treatment	posttests
Experimental	achievement test	use e-lab in teaching	achievement test
	science processes test		science processes test
	attitudinal scale towards science		attitudinal scale towards science
	practical skills test		practical skills test
	visual thinking scale		visual thinking scale
	Estimation of classroom environment scale		Estimation of classroom environment scale
	environment scale		environment scale



Control	achievement test science processes test attitudinal scale towards science practical skills test visual thinking scale Estimation of classroom environment scale	use traditional methods in teaching (no e-lab)	achievement test science processes test attitudinal scale towards science practical skills test visual thinking scale Estimation of classroom environment scale
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### 7. PROSPECTIVE STEPS FOR THE FIELD WORK

With an amount USD118,257.00 allocated by The Research Council to continue this research project in its second year, the research team plans to:

1. Contract an external experienced consultant to ensure the application procedures of the e-lab field work.
2. Prepare the research tools, tests and scales.
3. Prepare for the field application by:
  - contracting (3) science teachers in (3) schools from (3) different educational regions; and
  - Installing the required technological infrastructure for the field work (e-lab, software, equipment, licenses...etc.).
  - Training the (3) teachers on the use of research tools and software.
4. Ensure the equivalency of the experimental and control groups.
5. Contract (8) teachers to help in data collection from the (3) schools.

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## **iPAD USE AND STUDENT ENGAGEMENT IN THE CLASSROOM**

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### **ABSTRACT**

iPads and handheld digital devices have been securing their place in educational institutions surrounded by debates between advocates and skeptics. In light of not enough evidence supporting the use of iPads in education, this study examined the ways that college students in two foreign language classrooms perceived the influence of the use of iPads on their learning and engagement with classroom activities. The participants, students enrolled in two foreign language classrooms at a college in the Southwest of the US, responded to a 5-point Likert type questionnaire. The data analysis and results showed that students believed that the iPads played a significant role in their learning engagement thus promoting active learning in the classroom and paving way for student success.

### **INTRODUCTION**

Handheld devices especially iPads have been finding their places in schools all over the world. While the number sold to educational institutions is not known, since their launch in 2010 and by October 2013, Apple had sold 170 million iPads (Jones, 2013). It is clear that these handheld devices have not only become part of our daily lives but are likely to stay with us and in our schools for a long time.

Many educators are enthusiastic about the use of iPads in education; they rave about their versatility, connectivity, mobility as well as the potential benefits of thousands of educational apps. However, there has not been consensus among educators regarding the benefits of these devices in education; some educators remain skeptical, wary that the iPad may become the center of the classroom instead of being used as a tool for learning (Hu, 2011). Nonetheless, in this mixed atmosphere of anticipation and skepticism, the number of American colleges and k-12 schools that have launched iPad pilot studies or/and adopted 1:1 iPad initiatives is on the rise (Diemer, Fernandez & Streepey, 2012; Hu, 2011).

In light of the lack of inconclusive evidence of the influence of iPads in education, and with the high expectations of their potential influence on transforming education; in this study, I investigated the impact of the use of iPads in the classroom at the college level. In particular, I investigated students' perceptions of the influence of the use of iPads on their learning as well as on their engagement with classroom learning in two foreign language classrooms in a university in the Southwest of the US.

### **REVIEW OF THE LITERATURE**

Research has shown that student engagement is linked to positive learning outcomes (Diemer et al., 2012) and “is positively related to both grades and persistence” (Kuh, Kinzie, Buckley, Bridges & Hayek, 2006). While there have been many definitions of student engagement, there is no consensus among scholars as to what exactly counts as such. In this study, student engagement refers to “the extent to which [students] take part in educationally effective practices,” (Kuh, as cited in Axelson and Flick, 2011, p. 40) in the classroom. Student engagement is multilayered and includes different categories that are equally salient. Fredricks, Blumenfeld and Paris (2004) include the following categories within the concept: behavioral, cognitive and emotional. Behavioral engagement includes involvement in activities related to academic success and take place when students are physically involved in effective learning practices and activities. Emotional engagement is thought to occur when students have a positive attitude and enjoy what they are doing; while cognitive engagement is thought to take place when students invest into learning in a focused, self-regulating and strategic way (Fredricks et al., 2004). It is important to note that all these layers are equally important and are all present when students are actively engaged in educational activities (Fredricks et al., 2004). Active learning is closely connected to student engagement; it takes place, as Prince (2004) explains, when students are doing meaningful activities in the classroom while thinking about what they are doing, hence “the core elements of active learning are student activity and engagement in the learning process” ( p. 223)

While there are research studies which have yielded inconclusive results of the impact of the use of iPads in education (see for example Falloon, 2013 and Crichton, 2012), through a review of the literature, Clark and Luckin (2013) reported that studies have “overwhelmingly” reported that “tablet devices have a positive impact on students' engagement with learning” (p. 4). Similarly, Diemer et al. found that the use of iPads in the

classroom increased students' perception of their engagement and in turn left a positive effect on students' active and collaborative learning (2012). In another study, Hargis, Cavanaugh, Kamali and Soto (2014) reported that students who used iPads gained empowerment as they became researchers and more independent learners.

Swan, Hooft, Kratoski and Schenker (2007) investigated the effect of the use of technology including handheld devices on student learning in 1-1 computing classes. Their results showed increased student motivation and engagement in comparison with students who attended regular classrooms. They also found that teaching and learning in the computing classes were more “student-centered, collaborative, project-oriented, constructivist, and flexible” (p. 509).

Instead of focusing on students' perceptions, Benton studied teachers' perceptions of the use of iPads in education. The k-20 teachers in his study reported that the device had a positive impact on student learning and engagement. The teachers' perspectives were based on improvements they noted in their students' quality of work and their time on task (Benton, 2012).

Student perception of learning is an important indicator of student success. According to Kuh et al. (2006), students' perceptions affect student satisfaction and the way students approach their studies in terms of the time and effort they “expend on educationally purposeful activities, which consequently have direct effects on their learning and personal development” (p.40). Moreover, the more students are motivated and the more they enjoy the class, the more they perceive gains in their learning (Gurung & Vespia, 2007).

## RESEARCH QUESTIONS

The purpose of this study was to investigate the effects of the use of iPads on students' active learning according to students' perspectives. I specifically investigated students' perceptions of the influence of the use of iPads on their learning of Arabic as a foreign language, on their learning engagement as well as their collaboration with their classmates.

The main questions of the study were the following:

1. How do students perceive the impact of the use of iPads on their learning of Arabic?
2. How do students perceive their engagement with learning during classroom activities when using iPads?

## METHOD

### PARTICIPANTS

The participants in the study were thirty five students from two college level classes of Arabic in a university in the Southwest of the US. The students were enrolled in two classes of first year Arabic as a foreign language during the 2013/2014 academic year. Students in both classes were taught by the same instructor and all used iPads in their learning of Arabic according to activities that were pre-designed by the instructor. On average, the students used the iPads once a week for 30-45 minutes for duration of 10 weeks. All students were given surveys to fill in by the last week of classes to gauge their perception of their learning and engagement while using the iPads.

The iPads that the students used were property of the foreign language department in the university. Students could also check them out from the language lab of the same department. Each week, the instructor gave instructions for an activity directly related to the lesson covered during that week, explained its objectives and then pointed the students toward the app to be used for that activity. Student then worked collaboratively on the assignments before submitting them electronically.

Students used the iPads for different classroom activities that involved the creation of mini projects that combined visual, aural and oral practice. The mini projects aimed at offering hands-on practice that combined speaking, listening, reading and writing skills as well as promoting collaboration and creativity. The apps that were used included the following: Educreations, Doodle buddy, Aviary, StoryKit, ShowMe, Screen Chomp, and Comic Life. Students could also consult internet resources for their assignments if they chose to.

Because the aim of the activities was not only to facilitate learning, but also to encourage creativity and collaboration, students were given guidelines that were flexible enough to allow them the freedom to innovate and explore different ways to conduct the projects that were assigned to them. During the first two weeks, students were given extra time to get acquainted with the devices and were handed written as well as verbal instructions for assignments. In subsequent weeks, the instructor gave students verbal instructions, explained the objectives and expected outcome of each activity, and gave instructions for project submission. Most of the

activities involved group work and students had the freedom to choose any of the apps they had learnt about. Except for the writing and typing practice, all the projects and activities were submitted online.

**QUESTIONNAIRE INSTRUMENT**

The questionnaire items were developed by the researcher and were derived from Diemer et al.’s (2012) student engagement questionnaire. Three items in the questionnaire aimed at exploring students’ perceptions of their learning (see Table 1). The six other items aimed at gauging students’ perceptions of their engagement in classroom activities. As was mentioned earlier, student engagement is multidimensional. While these dimensions cannot be separated, and notwithstanding the overlap between these dimensions, the first four items in Table 2 are geared more toward investigating behavioral and cognitive engagement while the fifth and sixth items aimed at giving feedback on students’ emotional engagement.

A 5-point Likert-type questionnaire was used in this study. Participants were instructed to state their level of agreement with each questionnaire item ranging from 5= Strongly Agree (SA) to 1= Strongly Disagree (SD).

**ANALYSIS, DISCUSSION AND RESULTS**

For the purpose of this analysis, data were divided into two parts. The first part included questions that aimed at gauging students’ perceptions of their learning when using the iPad, and the second part aimed at investigating their engagement with classroom activities when using the iPad. The analysis of the questionnaire data was performed using Excel. Means and standard deviations were calculated for descriptive data.

To answer the first research question regarding students’ perceptions of the impact of the use of iPads on their learning, means and standard deviations were calculated. As mentioned earlier, students indicated their level of agreement with each questionnaire item on a scale that ranged from 5= Strongly Agree (SA) to 1= Strongly Disagree (SD). Three items on the questionnaire were related to the first research question. The means of the students’ responses to these items ranged from 4.14 to 4.21 (see Table I), with an overall mean of 4.18.

TABLE 1. STUDENTS’ PERCEPTIONS OF THE IMPACT OF I-PADS ON THEIR LEARNING

	Item	Mean	SD
1	The use of iPads helped my learning in this class	4.14	.81
2	The iPad served as a learning aid	4.2	.90
3	Using the iPad helped me understand the learning material	4.21	.93
Overall mean		4.18	

The overall mean (Table 1) indicates that students found the iPad an effective tool that helped them learn. This result agrees with the results of other studies that investigated students’ learning and engagement when using iPads (see for example; Diemer et al., 2012 and Benton, 2012).

In terms of students’ perceptions of their engagement and involvement with classroom activities, collaboration with others, as well as their enjoyment of the use of iPads in the classroom (see Table 2), the means of the responses of the first four questions (4-7) ranged from 4.18 to 4.43 which indicates a positive impact on student engagement. The mean for item 9, was 1.69 which agrees with the results above since this question asked about students’ perception of the iPad as a distraction in class. A mean of 1.69 indicates that most students strongly disagreed (1) or disagreed (2) with the statement “the iPads distracted me from classwork”. Out of the 35 participants, only one indicated that iPad use distracted him/her from class work. The item that yielded the lowest mean (3.67) asked students whether or not they agreed with the statement “I concentrated better on my language learning when using the iPads to accomplish a language task”. Most of the students agreed or strongly agreed with that statement. However, many of them were neutral or undecided while four of the students disagreed (2) or strongly disagreed with that statement (1). While students’ engagement with the iPads was high as indicated by the rest of the questionnaire, many students were undecided regarding whether or not the iPads allowed them to concentrate more on their language tasks.

TABLE 2. STUDENTS’ ENGAGEMENT IN THE CLASSROOM

	Item	Mean	SD
4.	Use of iPads helped me participate in class activities	4.4	.81
5.	Use of iPads in the classroom facilitated my collaboration with other students	4.43	.98
6.	I enjoy using the iPads for class activities	4.31	.87
7.	iPads allowed me more creativity in designing class projects and assignments	4.18	1.07
8.	I concentrated better on my language learning when using the iPads to accomplish	3.67	1.1

	a language task		
9.	The iPad <u>distracted</u> me from class work	1.69	0.93

The highest means were for items related to student participation and collaboration with each other. The mean for item 5 which aimed at investigating the influence of the iPads on student collaboration in class was 4.43. Second to that was the mean of the item investigating the influence of the iPads on student participation in class (4.4) followed by students' enjoyment of the use of iPads for class activities (4.3). While the differences between the means of the items in Table 2 are minimal, nevertheless, these agree with what the researcher observed in class; students' participation in class activities and their interaction with each other were remarkably enhanced when using the iPads to work on common projects. The researcher noted that inter- as well as intra-group relations were enhanced during that time. As students worked together to solve a common problem, they were quick to share with each other what worked and what did not as they fulfilled the requirements of a certain project. Student enjoyment of using the iPad was noted in the classroom which agrees with students' responses to item 6 in Table 2 "I enjoy using the iPads for class activities"; as the means to that question was 4.31. In fact, only one person strongly disagreed with the statement while three students' responses were neutral.

These results are very significant since as was discussed earlier, students' satisfaction with their learning experiences is important for their success in college. This is especially salient here that students' enjoyment also went hand in hand with their perceptions of the positive impact of the iPads on their learning; students not only enjoyed using the iPads but also saw them as effective learning tools. As mentioned earlier, there is an indirect effect of students' perceptions on their actual learning. Positive perceptions lead to more student engagement which, in turn, is linked with higher achievement and persistence; two important components for student college success (Kuh et al. 2006).

## CONCLUSION

This study investigated student engagement when using the iPads in two foreign language classrooms at the college level. The results indicated that students not only enjoyed using the iPads but also believed that the iPads helped them learn. Students also believed that the devices facilitated their participation and collaboration in class. These results are significant because as was stated earlier, the more students are engaged with their learning, the more they are likely to succeed in college as there is a link between engagement and students' academic achievements and persistence in college (Kuh et al.). Collaboration is also linked with student success as it "enhances academic achievement, student attitudes, and student retention" (Prince, 2004, p. 5). Hence, in this study, iPads according to students' perceptions were found to enhance students' learning and engagement with classroom activities facilitating students' collaboration between each other and their participation in classroom activities.

This study is not without limitations. It was conducted on a limited number of participants and only on first year students of Arabic as a foreign language. It should also be noted that the nature of the activities that the iPads were used for were carefully designed to enhance engagement in the classroom by providing students with iPad tasks and activities that allowed them to: collaborate, use their talents, assume responsibility and ownership of their work as well as provide for fun opportunities, which are all part of what is important for learning engagement (Fredricks et al., p. 79).

It should be emphasized here, as was expressed by other academics (see for example Clark and Luckin, 2013), that the iPad is a tool and not an end in itself and should only be used as such by learners who must always be at the center of the classroom.

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## PERSONALIZATION OF STUDENT IN COURSE MANAGEMENT SYSTEMS ON THE BASIS USING METHOD OF DATA MINING

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### ABSTRACT

Individualization of learning through ICT allows to students not only the possibility choose the time and place to study, but especially pace adoption of new knowledge on the basis of preferred learning styles. Analysis of learning processes should give the answer to difficult questions from pedagogical and psychological theory and practice. Count of scientific studies that should represent the results of systematic and long-term oriented studies in this area is still few. With the Learning styles and possibilities of their application in the context of e-learning addresses many experts. These experts predict that student should know, which Learning style is best for him, or predict that alone student knows when is the right time to try it differently. For determination of learning styles and personalization of student in Course Management System are used various techniques. In the paper we present the use non standard of techniques of data mining - data mining based on the use of interactive animations in e-learning courses. With this method of data mining we can get a complete overview of the activities of the student and on the basis of the definition of so-called social rules we know adjust to educational content.

### INTRODUCTION

Mass education in a classroom or with the help of classic e-learning is not able to respond to individual needs of a studying individual. Some students are restrained and bored by it, for some, on the other hand, it is too quick and they do not manage understand everything or the education style of each teacher does not have to be suitable for them (Balogh et al., 2011). Other students are satisfied with the pace of education, but they may not be satisfied with the teaching style of a particular teacher. Therefore, such students come to dislike the teachers and subjects they teach, which results in them having worse results (Brusilovsky, 2003; Chang, Kao and Chu, 2009). The suggested reasons lead to the idea of the optimization of the learning process through the use of individualization of education. Individualization of education represents each student's way of learning with regard to their previous knowledge, skills and their learning style (Kolb, 1984; Jeong, Choi and Song, 2012). A set of attitudes and behaviors which determine an individual's preferred way of learning is considered as a learning style (Honey and Mumford, 1992).

Learning styles have been a subject of extensive research (Coffield et al., 2004; Cohen and Weaver, 2006; Robinson, 2002), however the research focuses predominantly on their identification and classification. A team of experts dealt with the research and processing of the theory of learning styles in the Czech Republic (Takacs, Sarmanova and Kostolanyova, 2011; Simonova and Poulouva, 2013). In Slovakia there exist only a few experts dealing with this sphere of pedagogy (Burgerová, 2001; Turek, 2002). The work by (Mares, 1988) served as a basis for the research of the Czech and Slovak experts.

In general, the purpose of the theory of processing and evaluation of individual styles of teaching is the proposal and solution of the problem of individualization of educational process. If we put together the essence and principle of e-learning and the request for personalized learning, we gain a relative new research area – adaptive learning. Optimal adaptive process will respect students' differences based on their learning style and with regard to their changing knowledge and skills during the course of the study in the course. On the basis of identification of personal characteristics and qualities, the students will be provided with a study material that suits them the most (Kostolanyova, Sarmanova and Takacs, 2011). We assume that personally tailored education accenting student's requirements, preferences, and positive sides of learning (we do not support surface learning, remembering without understanding, etc.) will become an optimal and effective form of education. It will make new knowledge easier to remember and more permanent.

### ADAPTIVE EDUCATIONAL THEORY (LEARNING STYLES IN E-LEARNING)

Quantum of pedagogical and didactical principles (rules) form the theoretical basis for the formulation of adaptive educational theory (AET). These rules are based first of all on the following approaches:

- Komensky – systematic and methodical approach,
- Gagne – result can be accomplished by elementary steps,
- Bloom's taxonomy – 6 levels of knowledge (remembering, understanding, applying, analyzing,

synthetizing and the ability to evaluate information) for successful realization of partial obligations, which are intensified during the course of education as to their degree of difficulty,

- Theory of program teaching (Skinner) – division of the contents of education into smaller wholes, their verification and reaction to the comprehension of the contents of education,
- Adaptive hypermedia systems (Brusilovský) – feedback and evaluation of behavior of the student during the process of education – journaling the process of teaching.

By reason of inconsistently processed classification of learning styles it is possible to meet with various models of classification of learning styles in the area of AET (most frequently Shulman's or Felder-Silverman's model). **Shulman's model (TPCK)** – Conjunction of the pedagogical and contentual dimension means understanding and solving the particular pedagogical situation with the use of suitable learning methods and forms with the aim to accomplish effectiveness of the educational process.

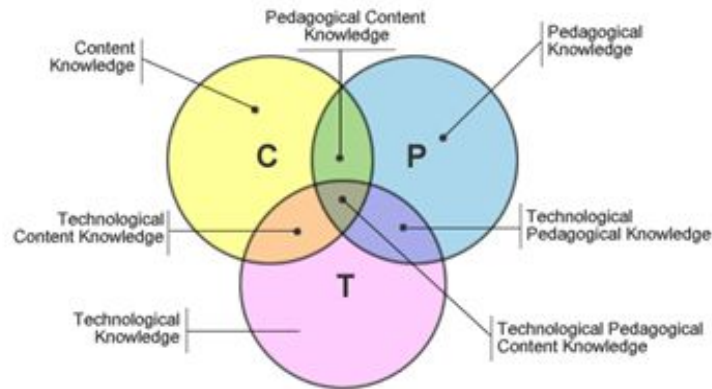


Figure 1: Shulman's model TPCK (Mishra and Koehler, 2006).

Based on the initial version (1986), Mishra and Koehler gradually extended it by a new dimension – technological aspect in 2006. Conjunction of all 3 dimensions is the defined work of the teacher with the current ICT with the aim to optimize and increase effectiveness of the educational process.

Felder-Silverman' model (FSLSM) - Felder and Silverman (1988) advocate that students learn in different ways: by hearing and seeing; by reflecting and acting; reasoning either logically or intuitively; by memorizing and visualizing and drawing analogies; and, either steadily or in small bits and large pieces. They also advocate that teaching styles vary, such as an educator's preference for lecturing or demonstrating, or for focusing on principles or applications.

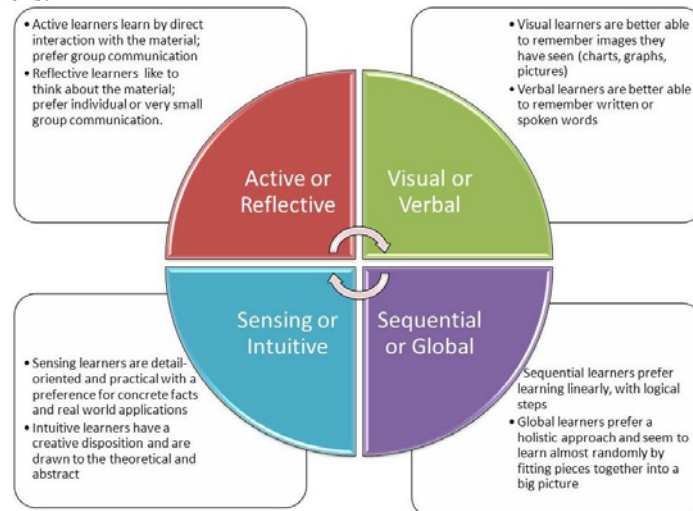


Figure 2: Felder-Silverman's model (Cater, 2011).

According to (Nakic, Graf and Granic, 2013) for assess students' learning style according to FSLSM, the Index of Learning Styles (ILS) is generally used (Felder and Soloman, 1997). It contains 44 two choice questions distributed along the four learning style dimensions, where one choice increments and the other decrements the score of the particular dimension. The resulting index of preference for each dimension is expressed by an odd

integer, ranging [-11, +11] since 11 questions are posed for each dimensions. The ILS questionnaire provides a very precise quantitative estimation of a learner's preference for each dimension of FSLSM.

### **MEDIA ELEMENTS AND METHODS OF DATA MINING**

Learning management systems are commonly used in e-learning, but provide low level of adaptivity. By combining adaptation and personalization into LMS, a new kind of tailored learning environments which motivate learners can be built (Stefanovic, Stefanovic and Arsovic, 2013).

In case of utilizing e-learning systems, it is inevitable to utilize various techniques of data mining in order to expressly define fruitfulness of the continuous study (increment of knowledge, skills and experiences of the students) and based on the results to design a suitable learning style for the student.

Moodle accumulate amount of information which is very valuable for analyzing students' (Mostow et al., 2005). For example they can record student activities, academic results, user's interaction data, etc. Although some platforms offer different reporting tools, do not provide however specific tools which allow educators to thoroughly track and assess all the activities performed by their learners and to evaluate the structure and contents of the course and its effectiveness in the learning process. Very promising area for attaining this objective is the use of data mining.

Educational Data Mining (EDM) is an emerging discipline, concerned with developing methods for exploring the unique types of data that come from the educational context (Romero, Ventura and Garcia, 2008). Methods of EDM is the automatic extraction of implicit and interesting patterns from large data collections. This methods is mainly used in the last decade for improve e-learning systems (Romero and Ventura, 2006). Data mining can be applied to explore, visualize and analyze e-learning data in order to identify useful patterns, to evaluate web activity to get more objective feedback for teachers' instruction and to find out more about how the students learn.

According to Romero and Ventura (2006) EDM is an iterative cycle which consists of the same four steps in the general data mining process as follows:

1. Collection data,
2. Preprocessing data,
3. Application of methods data mining,
4. Interpretation, evaluation and implementation the results to the pedagogical praxis.

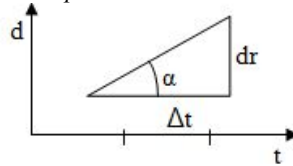
Moodle logs activities including views and posts for all learning objects hosted in the system and provides „Reports“ and statistics to help the content experts to improve the quality of eLearning courseware (Nagi and Suesawaluk, 2008). The records of the students' proceedings, created based on their activity in the course, however, do not contain information on the way of student's utilization of the material. The systems use log files to archive only data about the behavior of particular students in the course, which sources and activities s/he worked with, in what time periods, where from, etc. We can only find out whether the student has opened the material.

However, to get an idea of real transition of the students throughout the e-learning course, we need to consider several other important factors, one of them being the usage of implemented multimedia elements (e.g. interactive animations). All available electronic systems are able to record the time at which the student opened the website where the animation is situated and when he/she moved to another website. None of them, though, was concerned with the activity of the student from the point of view of manipulation with interactive media elements. Thus, the systems only stated the time that the students spent at the website where the media element was placed but the question if the student really worked with the element still remained unanswered. Therefore, it is only adequate to ask how to verify the activity/non-activity not only based on the transition throughout the course (opening the lesson, filling-in the quiz), but also via the detection of mouse movement or stating the interactivity of the student with the study material.

In the literature it is possible to meet with various attitudes to the definition of the concept multimedia. According to Neo and Neo (2004): „*medial elements can be differentiated as to the ability of perception (sentience) and control into text, graphic, animation, video and sound*“. Rahman et al. (1996) extended this definition as follows: „*multimedia represent technology allowing for introducing text, sound, pictures, animations or video using interactive method*“. In connection with learning styles Sonwalkar, however, uses 6 medial elements (the sixth being simulation), while these elements are interconnected by interactive aspects of

learning (Sonwalkar, 2001). Learning styles can be characterized according to Sonwalkar based on: L1 = apprenticeship; L2 = incidental; L3 = inductive; L4 = deductive; L5 = discovery.

If we reflect on interactivity as a medial element, it is interesting to read the statement of Shterev (2005): „Any media element is presented by its start and also by its duration. It may be nominal, maximal and minimal. The starting time and duration define 2D temporal space“.



**Figure 3:** Temporal-spatial dimension of medial element from the point of view of 2D temporal space (Shterev, 2005).

$\Delta t$  – time of duration of medial object

$dr$  – real time of duration of the object

The correlation  $dr/\Delta t = tg\alpha$  expresses the rate of speed of playback of the medial object, i.e. speed of reproduction. Besides temporal-spatial dimension, interactivity can be evaluated also based on these three viewpoints:

1. Frequency (how frequently can the user react),
2. Possibilities of choice (how many choices can the user have at his disposal),
3. Significance (to what degree the decision of the user will influence the fact which will happen).

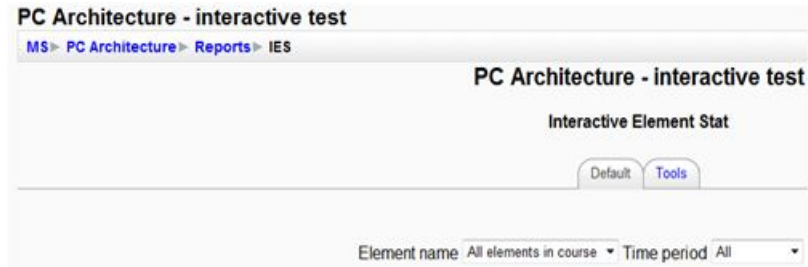
### APPLYING DATA MINING TECHNIQUES ON THE BASIS USING INTERACTIVE ANIMATIONS IN LMS MOODLE

The reasons described above led us to develop a module which would, together with the original module “Reports”, supply a complete report on student’s activity even in cases when interactive media elements are implemented into the study material. We named it Interactive Element Stat (IES). The module was being developed since 2010 and was designed and programmed at the Department of Informatics at the Faculty of Natural Sciences, Constantine the Philosopher University in Nitra as the supporting system for the area of the analysis of educational activities of the students in LMS Moodle. Researching the current state of the issue, we found that no such kind of module has yet been developed, one that would be strictly aimed on evaluation of student’s work with implemented interactive media element.

Main requirements on the module:

- the option of results display selection (whether the statistics is to be done for all the interactive media elements in the e-learning course or only for a particular interactive element),
- in statistics for the entire course, it is necessary to display a list of all the interactive course elements that were worked with, number of accesses to each of the elements, number of clicks, total time of student’s work with the element,
- in statistics for a particular interactive element, it is necessary to display the name of the student who worked with the element, time spend on the work, student’s way of manipulation with the element, what buttons were pressed, etc.,
- in statistics display, the option of time period selection is necessary,
- the statistics has to enable export into MS Excel format for further processing of the data,
- the teacher has to be able to delete the created statistics and start gathering new data from the beginning.

The standard module in development Course Report was enhanced by a mod.php file, which includes an assigned reference to the module itself, which is displayed in the Module report list. The file is designated to control whether the user has sufficient privileges to display the reference, if so, the reference will be displayed. After clicking the link, the module itself will open, specifically the index.php file. This file represents the main screen of the graphic module with two tabs. The Default tab contains a form for choosing the type of statistics and the time period. The Tools tab contains two buttons to delete the recorded statistics (Figure 4).

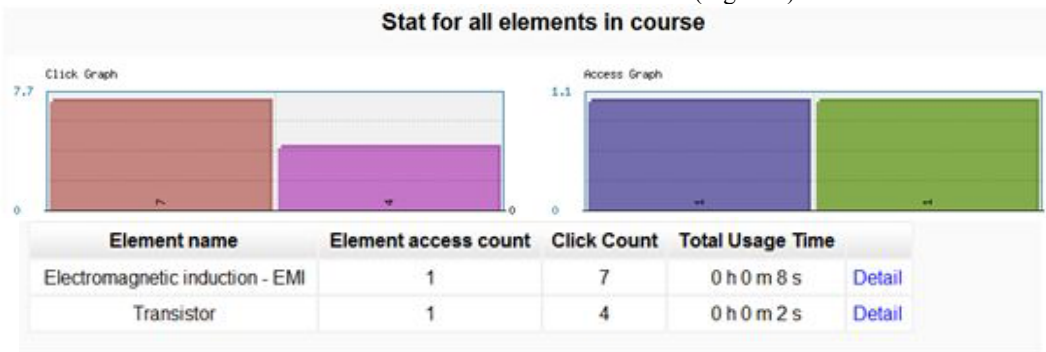


**Figure 4:** Module Interactive Element Stat

The module form displays the two standard Select boxes. The first one contains a list of all the course elements that were a part of any activity. The second one is used to choose the time period of statistics record. The form can be submitted using the Submit button. An important part of the index.php file is a safety control, in which we determine whether, the user:

- is working with an existing course,
- is currently logged in,
- has sufficient privileges to work with the module.

The statistics display itself uses a table format; it is possible to display the main statistics for all the course elements using graphs. Designing and developing the module, we decided for two graph display, in which the first graph shows the number of interactions with a particular media element and the second one shows the number of accesses to the element in the framework of the whole course (Figure 5).



**Figure 5:** Stat Results statistics and graphical evaluation Axis x: interactive element name, axis y: total number of accesses or the number of performed actions during the accesses.

The structure of the file exported to MS Excel is unified for all types of statistics provided by the module; it contains the name of the statistics, statistic data from the table and informative foot with the name of the module and time of the export itself.

### CASE STUDY OF APPLICATION OF THE METHODS OF DATA MINING IN THE SPHERE OF PERSONALIZATION OF STUDY MATERIAL FOR THE STUDENT

According to Romero, Ventura and García (2008) Moodle does not provide a basic statistics module in which the teacher can obtain specific reports about detailed statistics about every single student's performance (how many hours on the site, how much time at every activity, etc.).

This problem we partially removed using module IES. Using information obtained from module IES we can detect more easily students with some learning problems, for example, students with a very low number of accesses and offer them a suitable learning style.

Therefore, we introduce so called association rules. Association rule mining is one of the most well studied mining methods (Ceglar and Roddick, 2006). Agrawal et al. (1993) defined rules for techniques of data mining in this way: given a set of transactions, where each transaction is a set of items, an association rule is a rule of the form  $X \rightarrow Y$ , where X and Y are non-intersecting sets of items. Each rule is accompanied by two meaningful measures, confidence and support. Confidence measures the percentage of transactions containing X that also contain Y. Similarly, support measures the percentage of transactions that contain X or Y.

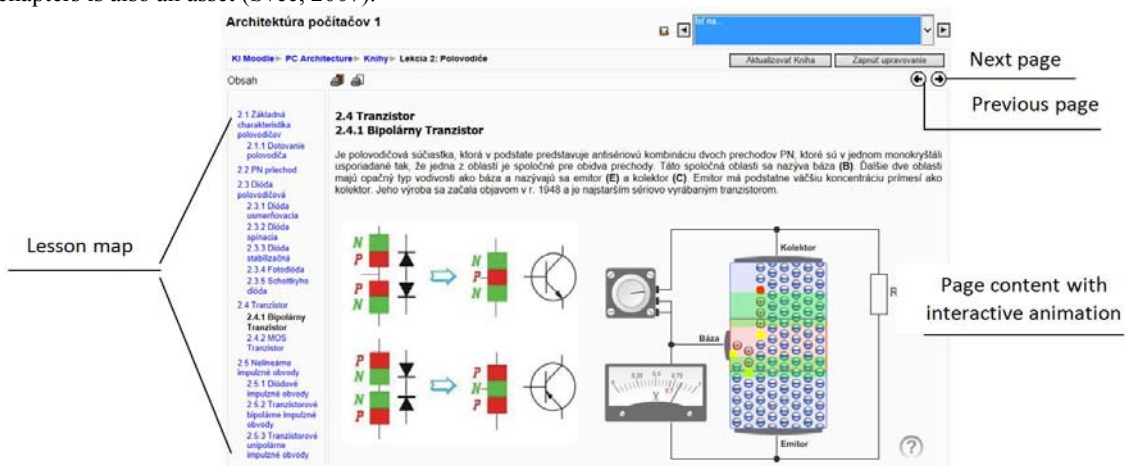


These rules of data mining have been applied to different learning management systems for building a recommender agent that could recommend on-line learning activities or shortcuts (Kapusta, Munk and Turceni, 2009), for automatically guiding the learner’s activities and intelligently generating and recommending learning materials (Lu, 2004), for determining which learning materials are the most suitable for students (Kostolanyova, Takacs and Sarmanova, 2013).

Rules are often applied to the whole system, which becomes adaptive at the personalization of the student, or to the particular part of the e-learning system, most frequently to the teaching part offering study material based on a suitably designed learning strategy (of the suitable learning style). In this case, the model FLSM applied to the conditions of creating and providing the study material in the system Moodle is most frequently used.

The Learning Management System (LMS) Moodle enables teachers to create a lesson in form of a series of HTML pages. Lessons are created through the Lesson module or module Book. These modules are modules of third pages.

The module Book allows for simply creating multi-page texts, similarly as we are used to do it from printed books. We are not pressed to create many sources in HTML format of page; we can put all into one, thus at the same time increasing lucidity of the course. Possibility to create hierarchical structure of chapters and sub-chapters is also an asset (Svec, 2007).



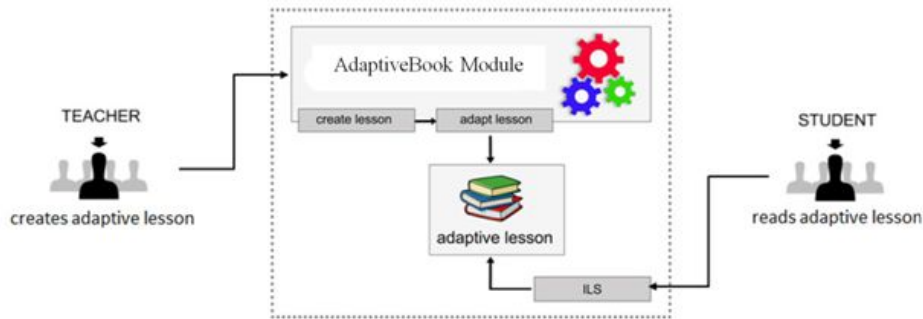
**Figure 6:** Stat Interface and typical content page created by the module Book with implemented interactive animation (Transistor), from original course in Slovak language.

The teacher decides how many buttons will be on each content page and for each button what is the target page (“jump to”). The “Next page” button allows direct guidance of a student, i.e. he/she will follow the default path determined by the teacher. The other buttons along with map of the lesson allow the students to create their own path through the lesson (Nakic, Graf and Granic, 2013). The module Book is therefore not adaptive. For providing advanced adaptive behavior, we modified the original module and this module has name AdaptiveBook. This module enables the creation of lessons adapted to the learning styles of students according to FLSM.

The module AdaptiveBook was used in e-learning course named Architecture of computers I, which is focusing on logic systems (winter semester of academic year 2013/2014, students of 1st year of the field Applied informatics). Students studying in the course were graduates of various secondary schools: secondary school of electrical engineering (15), grammar school (2), business academy (1), hotel academy (2).

In order to be able to match the suitable learning style to each student, ILS questionnaire was implemented into the module AdaptiveBook. At implementing the questionnaire we draw from experiences of (Nakic, Graf and Granic, 2013), who implemented a module of similar character into LMS Moodle.





**Figure 7:** Teacher’s and student’s interaction with AdaptiveBook module (Nakić, Graf and Granić, 2013)

By filling the ILS questionnaire out at the beginning of semester and applying association rules the student obtains personalization in the form of adaptive provision of the study material. By applying the module AdaptiveBook and the following continuous evaluation of study results during the semester we found out that in spite of the questionnaire filled-out and applying the association rules some students reached unsatisfactory study results. All these were the ones who did not graduate from secondary school of electrical engineering.

By monitoring the students’ activities using the standard configuration Report in Moodle it was not possible to determine their complete activity. Defining activity is an important step in personalization. Based on the information on the movement of the student in the course it is possible to apply association rules more consistently. On a regular basis, the module AdaptiveBook works on the basis of an allocated learning style to the particular student. But what if this style changes during the study due to unpredictable circumstances?

Based on access to the study materials we found out that students despite the provided learning style had problems with correct analyzing and understanding the provided study material. That is why they utilized very frequently a back transition to the previous parts of lessons, which was rather chaotic despite the module AdaptiveBook (Table 1).

**Table 1:** Interactive matrix of transitions between individual lessons

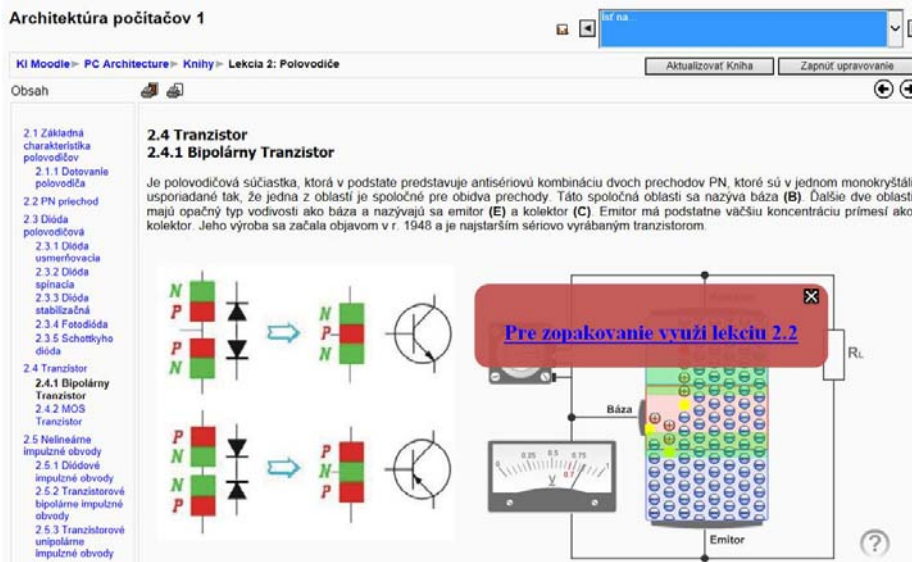
	Start study	L1	L2	L3	L4	L5	L6	L7	L8	L9	End study
Start study	0	2450	852	356	124	258	689	346	734	428	45
L1	892	0	1987	556	87	2190	324	222	318	110	23
L2	634	1554	0	2041	918	796	369	567	216	257	51
L3	176	652	347	0	1321	821	221	705	599	375	74
L4	841	869	490	1458	0	1878	478	756	311	338	36
L5	654	512	1591	428	998	0	2887	568	850	151	111
L6	317	974	627	898	1370	350	0	1655	152	185	34
L7	268	498	623	495	580	915	1331	0	1201	100	174
L8	954	825	829	461	613	558	471	434	0	1637	190
L9	438	604	268	947	864	466	420	623	350	0	255
End study	526	249	315	185	277	216	265	170	57	46	0

The value in the column (above 1000) expresses the fact that the students realized the given activity most frequently and after it they continued with another activity with the highest maximal value situated in the nearest column. In case that there is more than one maximal value in the column of interaction matrix, it means that the student returned to this activity during the course of his study.

On this account we interconnected the IES module with the one of AdaptiveBook in order to identify the students’ activity more easily. By interconnecting the modules we obtained a tool, which allowed us to mine the data directly at activities of the students with the study material and propose continuous changes in the learning styles to them. These changes resulted in providing study materials, or offering a choice of its parts through implemented interactive animations. E-learning course has been considerably simplified. The amount of text and pictures decreased. They were replaced just by this type of interactive media element.

Connection of IES modules and AdaptiveBook allowed the students for fully utilizing interactive possibilities of implemented animations and finding one’s way in the study material by means of hyperlinks, which continually appeared in them. Provision of hyperlinks was realized based on the results of data mining from IES module and applying association rules. The prerequisite for the provision of hyperlinks was for example repeated

utilization of one and the same function – a view of some of the animation parts, or a particular active work with animation, or its part.



**Figure 8:** Adaptive provision of hyperlinks by the module AdaptiveBook and module IES, from original course in Slovak language

After a repeated analysis of accesses at the end of the semester and setting up of interaction matrix of the transition of the students through e-learning course we found out that students passed the course fluently. It appears from this that a suitable learning style for each individual was chosen and the study material was adjusted to the possibilities and abilities of every student.

**Table 2:** Interaction matrix of transitions between individual lessons (after the modification by IES module and AdaptiveBook)

	Start study	L1	L2	L3	L4	L5	L6	L7	L8	L9	End study
Start study	0	1609	720	662	792	558	822	521	880	830	43
L1	955	0	1595	435	849	874	729	912	420	218	62
L2	949	674	0	1455	896	411	862	325	930	538	30
L3	958	449	174	0	1355	297	808	375	358	994	42
L4	221	706	667	721	0	1279	831	480	814	266	53
L5	551	656	742	505	378	0	1004	458	609	292	20
L6	156	795	302	804	928	429	0	1108	351	203	175
L7	663	694	251	846	956	892	676	0	1184	161	42
L8	982	356	826	703	629	710	615	123	0	1523	262
L9	519	546	334	590	495	554	863	294	1187	0	358
End study	259	177	142	236	112	190	127	90	134	217	0

## CONCLUSION

According to Felder and Silverman (1988), active learners are comfortable with problem-solving activities and group discussions, they prefer answering questions and doing exercises but less theory and examples. In contrary, reflective learners learn by reflecting on the matter and thinking things through.

To determine the learning strategy (learning style) is not a simple process. In the contribution we gave an example that despite filling out the structured questionnaire ILS the allotted learning style to the student need not necessarily suit him during the whole semester. At present, authors of professional publications dealing with the implementation of ICT in education (Bhuasiri et al., 2012) point to the fact that the development of ICT is higher than their actual use, and requires thinking about the elements that we need to improve to produce ICT effective integration in educational processes (Melia, Gonzales-Such and Garcia-Bellido, 2012). As Internet use has proliferated, e-learning systems have become increasingly popular. Many researchers have taken a great deal of effort to promote high quality e-learning environments, such as adaptive learning environments, personalized/adaptive guidance mechanisms, and so on. These researches need to collect large amounts of behavioral patterns for the verification and/or experimentation. However, collecting sufficient and correctly

behavioral patterns usually takes a great deal of time and effort (Chang, Huang and. Chu, 2009).

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## PHYSICAL EDUCATION TEACHERS' SUBJECTIVE THEORIES ABOUT INTEGRATING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) INTO PHYSICAL EDUCATION

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### ABSTRACT

As well as other school subjects, physical education (PE) is emerging in terms of integrating information and communication technology (ICT) into regular classes. Such innovative teaching practices that implement ICT in PE involve diverse parties that are affected by these teaching processes. Students, principals, districts, parents, administrators, policy makers, and last but not least the PE teachers themselves are involved. Hence, each participating party has its own personal perceptions and attitudes towards ICT and PE. This study examined the subjective theories of PE teachers about integrating ICT into PE. PE teachers' subjective theories that feature the following areas were covered: 1) student, 2) teaching, 3) teacher, 4) equipment, 5) computer literacy, 6) classroom management and organization, 7) social interaction, and 8) innovative and modern teaching. Within the framework of the research program "subjective theories" (RPST), PE teachers' subjective theories were modeled into a questionnaire after being extracted from an expert group discussion. A total of 57 in-service secondary school PE teachers were surveyed using the developed instrument. The data was analyzed using standard statistical procedures. The analysis focused on the subjective theories themselves and their relation to gender, computer literacy, household computer ownership, and professional experience (years in service).

**Keywords:** Educational Technology, Information Technology, Physical Education, Physical Education Teachers, Subjective Theories, Technology Uses in Education, Teachers Attitudes, Technology Integration

### INTRODUCTION

Information and communication technology (ICT) is widely seen as a motor of fostering 21st century skills in nearly all education-related fields, especially schools (Rutkowski, Rutkowski, & Sparks, 2011; Vockley, 2007). ICT has not only become ubiquitous in today's children's and adolescents' daily lives, it has even been adopted by nearly all school subjects in the meantime – at least within academic discussion and debate (Webb & Cox, 2004). School students are surely so-called "digital natives" (Prensky, 2001), being used to deal with ICT as part of their lifestyle and even expecting it to serve as a surrounding resource throughout their educational and professional career (Prensky, 2008).

Among the school subjects, physical education (PE) has picked up the discussion of technology integration in the modern classroom as well (Kretschmann, 2010). Various teaching hints and pedagogical scenarios have been suggested to give physical education teachers valuable options for integrating technology into PE (Castelli & Fiorentino, 2008; Kretschmann, 2010; Mohnsen, 2012; Whalen & Fiorentino, 2006). The scope of instructional technology in PE ranges from computers, laptops, and tablets (Juniu, 2011; Leight, 2012), physical activity measurement devices (McCaughy, Oliver, Dillon, & Martin, 2008) to online activities (Martin, Balderson, & Morris, 2012; McNeill, Mukherjee, & Singh, 2010) and active video gaming (Ennis, 2013). On the higher education level, physical education teacher education (PETE) programs have been in the discussion about ICT ever since (Leight & Nichols, 2012).

However, empirical research and evidence in the field of ICT, PE, and PETE is still rare and limited (Kretschmann, 2010). Although pre-service PE teachers and PE students have been in the focus of several studies (Adamakis & Zounhia, 2013; Goktas, 2012; D. L. Jones & Garrahy, 2001; Zorba, 2012), only a few studies emphasized the PE teachers' perspective (Gibbone, Rukavina, & Silverman, 2010; Gibbone & Silverman, 2010; Ince, Goodway, Ward, & Lee, 2006; Kretschmann, 2012), though mainly highlighting the PE teachers' ICT competence level (Liang, Walls, Hicks, Clayton, & Yang, 2006; Lockyer & Patterson, 2007; Thomas & Stratton, 2006; Woods, Goc Karp, Miao, & Perlman, 2008; C. Yaman, 2008; M. Yaman, 2007b).

Hence, the aim of this study was to determine what in-service and established PE teachers think about integrating ICTs into their respective PE classes. The main objective was to assess PE teachers' beliefs, opinions, views, perceptions, and attitudes towards technology integration in PE.

According to prior research findings, technology use in the educational settings is largely affected by the teachers' attitudes towards technology use (Albirini, 2006; Baylor & Ritchie, 2002). Teachers' attitudes appear



as a major predictor of the use of ICT in the educational fields (Albirini, 2006). Therefore, use of ICT in the classroom largely depends on the attitudes of teachers towards technology (Teo, 2008).

To integrate the diverse constructs involved in investigating the PE teachers' perspective, a "subjective theory" scientific framework was selected (Groeben & Scheele, 2000; Müller, Rebmann, & Liebsch, 2008), as the implicit thinking of PE teachers should be revealed. This approach tackles the personal and "subjective" PE teachers' point of view, which can also be called "epistemological beliefs" (Hofer, 2000).

"Epistemological beliefs are, therefore, always personal and consequently also subjective. This raises the question of the connection with subjective theories. Subjective theories can be considered as a person's set of assumptions, motives, suppositions, ideas and cognitions related to his view of himself and the world" (Müller et al., 2008, p. 91).

Blending the scientific framework with the initial study objective, the final study aim can be phrased: The main study objective is to determine the subjective theories of PE teachers about integrating ICT into PE. In a more colloquial formulation: "What do PE teachers think about integrating ICT in PE?"

## METHODS AND METHODOLOGY

In order to prepare properly for the field of PE teaching reality, a two-phase research design based on the subjective theory framework was chosen. In the first phase, a group discussion among diverse experts of PE was performed to extract and quantify subjective theories from PE teachers about ICT in PE. In the second phase, the revealed subjective theories from phase one were modeled in a questionnaire to reach a higher amount of PE teachers.

### Research Program "Subjective Theories"

The Research Program "Subjective Theories" (RPST) has had a rich impact on clinical and higher education research in Germany (Hermes, 1999; Wagner, 2003). In addition, RPST approaches have been applied to both PE and sports pedagogy research (Casella, 2012; König, 2013; Ommundsen, 2001).

RPST highlights the reflective abilities of the individual in explaining and conducting its own actions. From a metacognitive research perspective, the cognitive phenomenon of intuitive, "naïve", implicit theories about a respective topic or action serves as the starting point of scientific investigation. Explanation, prediction, and application of knowledge can be extracted out of the research subject's verbalized or written thinking, analogue to scientific theories. A subjective theory therefore is a complex cognitive aggregate of the research object by the research subject (Groeben & Scheele, 2000).

Although the majority of studies used qualitative-only approaches, only few studies combined both qualitative and quantitative methods (Richardson & Placier, 2001). As RPST is not restricted to the introspective, individual level, quantitative methodologies are as well appropriate as qualitative methodologies (Trautwein & Ludtke, 2007; Wagner, 2003). Within RPST, a two-phase model is very well included and described, which can therefore combine qualitative and quantitative research methods (Groeben & Scheele, 2000). Following this methodological discussion, this study embraces the two-way model, using a qualitative approach in its first phase and a quantitative approach in its second phase.

### Pre-Study

To explore the topic's aspects, an expert focus group was gathered that consisted of two pre-service teachers, two in-service teachers, and two PE researchers that were also lecturers in a PETE program on the higher educational level. The participants had diverse experience using ICT in PE. However, all participants read essential papers (Ince et al., 2006; Kretschmann, 2010; Pittman & Mohnsen, 2005) and skimmed relevant textbooks (Castelli & Fiorentino, 2008; Leight, 2012; Mohnsen, 2012) before the group discussion.

Within this expert focus group, a group discussion was performed (Cohen, Manion, & Morrison, 2011; Greenbaum, 1998). All participants were asked to present their thoughts and views about the integration of ICT in PE. The group discussion was semi-structured and moderated by one of the PE researchers. The following open questions served as a tentative interview guide (Foddy, 1993) to stimulate the discussion:

1. What ICTs do you know?
2. What ICTs can be used in PE?
3. What are the barriers to use ICTs in PE?
4. What is your general opinion about integrating ICT in PE?



The group discussion was recorded using an MP3 voice recorder and transcribed afterwards. The transcribed group discussion was analyzed by the two PE researches that took part in the expert focus group. The relevant discussion outcomes and participants’ statements were extracted and rephrased into brief statements that could be used as items in a Likert-scaled questionnaire.

**Instrument**

The modeled statements that came out of the group discussion were grouped into topics. The evaluated statements were included as items in a questionnaire using a 5-point Likert scale (5=strongly agree, 1=strongly disagree). Eventually, the items could be organized into eight categories:

1. Student-related subjective theories (10 items)
2. Teaching-related subjective theories (8 items)
3. Teacher-related subjective theories (7 items)
4. Equipment-related subjective theories (7 items)
5. Computer literacy-related subjective theories (9 items)
6. Classroom management and organization-related subjective theories (8 items)
7. Social interaction-related subjective theories (8 items)
8. Innovative and modern teaching-related subjective theories (7 items)

In complement to the subjective theories-related part, a socio-demographic part was added to the questionnaire. Age, gender, professional experience (years in service), and multiple items for computer literacy were therefore included. The respective single items of the subjective theories-related topics are shown in Tables 1 to 9.

**Data Collection**

Conducting a convenient sample, a total of 120 questionnaires were sent to secondary schools in the area code of Stuttgart, Germany. Altogether, 20 secondary schools were involved in the initial sampling strategy. Only 57 questionnaires had been completed and were returned. The return rate was 47.5%.

**Sample**

The sample consisted of a total of 57 secondary school PE teachers ( $M_{(age)}=48.84$  years;  $SD=1.39$ ). Among the PE teachers, 26 were male and 31 were female. The average of years of experience was 19.67 years ( $SD=1.41$ ). Therefore, the sample consisted of in-service PE teachers that have been working in their profession for such a long time that they can surely be treated as established and well experienced overall. All PE teachers had at least one PC or laptop in their respective household. There were no statistically significant differences in age or professional experience (years in service) according to gender (t-tests;  $p>0.05$ ). The descriptive characteristics of the sample are shown in Table 1.

**Table 1:** Descriptive characteristics of study sample

Variables	N	%	Mean (M)	Standard Deviation (SD)	
Age	Male	26	45.6	49.80	1.94
	Female	31	54.4	47.56	1.92
	Total	57	100	48.84	1.39
Professional Experience (Years in Service)	Male	26	45.6	16.56	1.96
	Female	31	54.4	18.70	2.10
	Total	57	100	19.67	1.41

**Data Analysis**

The survey data was analyzed using quantitative-research statistical-analysis methods (frequencies, t-test, reliability analysis, and (one-way) analysis of variance (ANOVA) including Tukey’s HSD post-hoc test. The software IBM SPSS Statistics (Version 21) for Mac OS was used to perform the statistical procedures.

**RESULTS**

The subjective theory-results are presented to the degree of detail that in addition to means and standard deviations, percentages and frequencies for all values are given (Tables 2-9). This modus of presentation allows an in-depth showing of distribution and tendencies for each item within the sample group. Following the comprehensive data-presentation of the assessed subjective theories, the relations of gender, computer literacy, household computer ownership, and professional experience (years in service) to the PE teachers’ subjective theories are presented.

### Student-Related Subjective Theories

Looking at the subjective theories of the PE teachers in regard to pedagogical benefit generated for the students, the majority of the PE teachers tended to be undecided (S3, S4, S5, S6, S7, S8). The PE teachers rather thought that the use of ICT in PE promotes teamwork, and social and communicative learning (S2, S9). However, the vast majority of the PE teachers agreed that unmotivated students in PE can't be engaged by any ICT setting (S1). Although nearly half of the PE teachers were uncertain whether boys get more into ICT than girls, the other half nearly split their opinion on agreeing and disagreeing for this subjective theory (S10). Nonetheless, there was a slight tendency towards disagreement within S10. The complete findings according to student-related subjective theories are shown in Table 2.

**Table 2: Student-Related Subjective Theories**

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
S1	Students' study motivation can be increased by integrating ICT.	18 (31.6)	17 (29.8)	17 (29.8)	5 (8.8)	0 (0.0)	3.84	0.13
S2	Working with a Laptop is a team activity.	1 (1.8)	3 (5.3)	24 (42.1)	24 (42.1)	5 (8.8)	2.49	0.18
S3	Students can gather new information on their own.	2 (3.5)	15 (26.3)	30 (52.6)	9 (15.8)	1 (1.8)	3.14	0.19
S4	ICT-supported education is as equal effective in regard to learning outcomes as traditional education.	1 (1.8)	13 (22.8)	21 (36.8)	19 (33.3)	3 (5.3)	2.82	0.14
S5	Instructional tips, hints, and images on the computer make students become more adventurous.	4 (7.0)	8 (14.0)	29 (50.9)	14 (24.6)	2 (3.5)	2.96	0.17
S6	Not actively participating students can be mentors and advisors at PCs.	2 (3.5)	22 (38.6)	16 (28.1)	15 (26.3)	2 (3.5)	3.12	0.14
S7	If students are not motivated, ICT will not motivate them anyways.	20 (35.1)	29 (50.9)	5 (8.8)	2 (3.5)	1 (1.8)	4.14	0.20
S8	ICT integration fosters independent learning.	0 (0.0)	11 (19.3)	32 (56.1)	10 (17.5)	4 (7.0)	2.88	0.19
S9	ICT integration fosters social and communicative learning.	0 (0.0)	3 (5.3)	25 (43.9)	23 (40.4)	6 (10.5)	2.44	0.18
S10	Boys get more into ICT in PE than girls.	2 (3.5)	10 (17.5)	26 (45.6)	15 (26.3)	4 (7.0)	2.84	0.24

### Teaching-Related Subjective Theories

Regarding the PE teachers' teacher-related subjective theories, the PE teachers seemed to be satisfied with their current teaching strategies (T1, T3, T6). They clearly favored traditional teaching resources such as images or a blackboard over ICT (T2). The overwhelming majority saw manifold movement, exploration, and free trial as the center of PE (T7). Nevertheless, the PE teachers deemed instructional technology such as animated images and video worthy of being useful in motor learning and feedback processes (T4, T6). A slight majority of the PE teachers would not use internet-searches as homework in PE. However, one third was uncertain about the benefit of internet-searches and close to 20% of the PE teachers would use them for homework in PE (T5). The complete findings according to teaching-related subjective theories are shown in Table 3.

**Table 3: Teaching-Related Subjective Theories**

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
T1	ICT integration does not lead to better content knowledge.	4 (7.0)	16 (28.1)	23 (40.4)	12 (21.1)	2 (3.5)	3.14	0.21
T2	Media as blackboard and (printed) images are more suitable in physical education.	7 (12.3)	22 (38.6)	16 (28.1)	7 (12.3)	5 (8.8)	3.33	0.19
T3	My teaching in physical education is successful without integrating any technology.	14 (24.6)	20 (35.1)	20 (35.1)	3 (5.3)	0 (0.0)	3.79	0.22
T4	Animated images (or short videos) can illustrate the diverse aspects of a movement or a technique well.	24 (42.1)	25 (43.9)	7 (12.3)	1 (1.8)	0 (0.0)	4.26	0.28
T5	Internet searches (e.g. ball games) are well suited as homework.	1 (1.8)	10 (17.5)	18 (31.6)	22 (38.6)	6 (10.5)	2.61	0.22
T6	Video recordings are better for individual feedback than personal feedback of the PE teacher.	9 (15.8)	13 (22.8)	24 (42.1)	8 (14.0)	3 (5.3)	3.30	0.19
T7	Despite ICT integrating, manifold movement, exploration, and free trial should remain the	45 (78.9)	9 (15.8)	3 (5.3)	0 (0.0)	0 (0.0)	4.74	0.45

	focus of the PE lesson.							
T8	Using educational software, PE content knowledge can be learned playfully.	0 (0.0)	13 (22.8)	26 (45.6)	14 (24.6)	4 (7.0)	2.84	0.25

### Teacher-Related Subjective Theories

With regard to their own teaching load, the PE teachers perceived ICT rather as a burden than as a relief (TE2). Using video in PE would mean a thorough time-consuming preparation and post-processing as well as careful and focused guiding within the PE lesson (TE1). The PE teachers thought that ICT is not useful in motivating students (TE4), but saw an advantage in faster processing digital assessment data (TE7). However, the PE teachers tended to understand ICT as an important motor for professional teaching development (TE3). The majority of the PE teachers were uncertain about a gain in reputation with their students when integrating ICT in PE (TE5). They were also undecided about switching to a moderator role while using ICT in PE (TE6). The complete findings according to teacher-related subjective theories are shown in Table 4.

**Table 4: Teacher-Related Subjective Theories**

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
TE1	Using video in PE means thorough preparation, guidance, and post-processing by the teacher.	24 (42.1)	28 (49.1)	5 (8.8)	0 (0.0)	0 (0.0)	4.33	0.32
TE2	The physical education teacher is relieved through self-reliant learning scenarios using laptops.	0 (0.0)	8 (14.0)	15 (26.3)	31 (54.4)	3 (5.3)	2.49	0.30
TE3	ICT is the building block of the development of new teaching and learning methods.	7 (12.3)	24 (42.1)	23 (40.4)	3 (5.3)	0 (0.0)	3.61	0.26
TE4	I do not need ICT for getting students motivated.	26 (45.6)	19 (33.3)	8 (14.0)	4 (7.0)	0 (0.0)	4.18	0.25
TE5	Using modern teaching methods increases my reputation with the students.	3 (5.3)	13 (22.8)	23 (40.4)	16 (28.1)	2 (3.5)	2.98	0.21
TE6	To give the students more freedom, I gladly switch to the role of a moderator.	8 (14.0)	13 (22.8)	18 (31.6)	17 (29.8)	1 (1.8)	3.18	0.16
TE7	Computer programs facilitate a fast sorting and analyzing of assessment data (e.g. competition results).	37 (64.9)	16 (28.1)	3 (5.3)	1 (1.8)	0 (0.0)	4.56	0.37

### Equipment-Related Subjective Theories

Most of the PE teachers perceived their available PE equipment not being outdated (E1), but stated that their school's instructional videos were outdated (E7). Almost half of them disregarded their respective school as a factor in ICT diversity, although the other half split its thoughts about their school to be an ICT diversity facilitator or hinderer (E4). In sum, the prospect of new, modern ICT equipment didn't seem to influence the PE teachers' teaching philosophies and habits (E2, E3, E5, E6). The complete findings according to equipment-related subjective theories are shown in Table 5.

**Table 5: Equipment-Related Subjective Theories**

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
E1	Most of our school's PE equipment is so outdated that it does not meet current standards.	4 (7.0)	7 (12.3)	18 (31.6)	22 (38.6)	6 (10.5)	2.67	0.20
E2	Our school can't afford to buy new PE equipment.	11 (19.3)	11 (19.3)	15 (26.3)	16 (28.1)	4 (7.0)	3.16	0.13
E3	Even if the equipment were there, I would not use ICT in PE.	7 (12.3)	10 (17.5)	15 (26.3)	17 (29.8)	8 (14.0)	2.84	0.13
E4	Our school supports ICT diversity.	4 (7.0)	15 (26.3)	26 (45.6)	9 (15.8)	3 (5.3)	3.14	0.23
E5	I would absolutely integrate ICT into my PE lessons, if it would be available.	9 (15.8)	9 (15.8)	22 (38.6)	15 (26.3)	2 (3.5)	3.14	0.18
E6	I think it would be more sensible to refurbish or expand our PE-related facilities than purchasing ICT.	21 (36.8)	17 (29.8)	13 (22.8)	5 (8.8)	1 (1.8)	3.91	0.19
E7	The instructional videos at our school are outdated.	21 (36.8)	19 (33.3)	12 (21.1)	2 (3.5)	3 (5.3)	3.93	0.21

### Computer Literacy-Related Subjective Theories

The PE teachers felt that they were not as ICT competent as their students (CL9), and that younger teacher colleagues are more self-confident and engaged in using ICT (CL5). Nonetheless, most of the PE teachers were interested in continuing education events that feature ICT and PE (CL6). Although the feeling of not having sufficient knowledge was rather equally distributed (CL1), the majority of the PE teachers thought they had too little knowledge about possible pedagogical scenarios using ICT in PE (CL2). Even if their computer literacy were better, the PE teachers tended to decline using ICT in PE more often (CL3). The vast majority of PE teachers stated that they don't use ICT in PE because they are afraid of making a fool out of themselves in front of their students (CL7). The fact that the PE teachers didn't use ICT in PE frequently to prove their skills accompanies the results in regard to CL7 (CL8). However, most PE teachers believed that there were a lot of useful webpages for PE lessons available (CL4). The complete findings according to computer literacy-related subjective theories are shown in Table 6.

**Table 6:** Computer Literacy-Related Subjective Theories

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
CL1	I do not have sufficient experience to integrate ICT in PE.	5 (8.8)	12 (21.1)	19 (33.3)	13 (22.8)	8 (14.0)	2.88	0.15
CL2	I have too few knowledge about possible pedagogical scenarios using ICT in PE.	15 (26.3)	20 (35.1)	11 (19.3)	7 (12.3)	4 (7.0)	3.61	0.16
CL3	If my computer literacy were better, I would use ICT in PE more often.	3 (5.3)	9 (15.8)	12 (21.1)	22 (38.6)	11 (19.3)	2.49	0.18
CL4	There are many webpages containing ideas for diversified PE lessons.	11 (19.3)	20 (35.1)	18 (31.6)	6 (10.5)	2 (3.5)	3.56	0.18
CL5	Younger PE teacher colleagues are more engaged into ICT integration.	5 (8.8)	26 (45.6)	15 (26.3)	11 (19.3)	0 (0.0)	3.44	0.23
CL6	I am not interested in continuing education events in the area of ICT and PE.	9 (15.8)	5 (8.8)	12 (21.1)	24 (42.1)	7 (12.3)	2.74	0.19
CL7	I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students.	1 (1.8)	7 (12.3)	3 (5.3)	23 (40.4)	23 (40.4)	1.95	0.22
CL8	I use ICT frequently to prove my ICT skills.	0 (0.0)	2 (3.5)	6 (10.5)	18 (31.6)	31 (54.4)	1.63	0.21
CL9	My students are better in using ICT than I am.	11 (19.3)	15 (26.3)	18 (31.6)	10 (17.5)	3 (5.3)	3.37	0.14

### Classroom Management and Organization-Related Subjective Theories

Perceived massive teaching and administration workload is probably one of the reasons that prevent PE teachers from using ICT in PE (C1, C2, C3). Moreover, most of the PE teachers believed that integrating ICT takes away movement time from the PE lesson (C4). On the other hand, the majority of the PE teachers thought that ICT is good for preparing PE lessons (C5). Although the results for the value of using ICT to plan complex PE settings were nearly equally distributed, there was a slight tendency that the PE teachers neglect this statement (C6). Most of the PE teachers stated that ICT in PE is placed best into the last two years of secondary school education (C7). As one third of the PE teachers were undecided whether there is a fair relation between learning outcomes efficiency and ICT preparation effort when using ICT in PE (C8), about 50% of the PE teachers wouldn't say that there was a fair relation (C8). The complete findings according to classroom management and organization-related subjective theories are shown in Table 7.

**Table 7:** Classroom Management and Organization-Related Subjective Theories

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
C1	I can't integrate ICT because I am under time pressure to include the content standards completely.	5 (8.8)	14 (24.6)	14 (24.6)	17 (29.8)	7 (12.3)	2.88	0.14
C2	If I had smaller class sizes, I could imagine using ICT in PE.	5 (8.8)	21 (36.8)	16 (28.1)	11 (19.3)	4 (7.0)	3.21	0.18
C3	PE class time is too short to use ICT.	15 (26.3)	19 (33.3)	10 (17.5)	12 (21.1)	1 (1.8)	3.61	0.16
C4	The use of ICT decreases PE movement time.	13 (22.8)	18 (31.6)	17 (29.8)	6 (10.5)	3 (5.3)	3.56	0.16
C5	ICT is good for preparing PE lessons.	15 (26.3)	23 (40.4)	12 (21.1)	7 (12.3)	0 (0.0)	3.81	0.20
C6	A complex PE equipment set-up	3 (5.3)	12 (21.1)	17 (29.8)	16 (28.1)	9 (15.8)	2.72	0.16

	can easily be planned using ICT.	(5.3)	(21.1)	(29.8)	(28.1)	(15.8)		
C7	ICT is most likely placed best in the last two years of secondary school PE.	10 (17.5)	30 (52.6)	13 (22.8)	3 (5.3)	1 (1.8)	3.79	0.27
C8	Preparation effort and learning outcome efficiency are in fair relation to each other when using ICT in PE.	1 (1.8)	8 (14.0)	19 (33.3)	26 (45.6)	3 (5.3)	2.61	0.26

### Social Interaction-Related Subjective Theories

While about 40% of the PE teachers were uncertain whether students learn to use ICT at home or not, close to 50% agreed that students learn to use ICT at home (SO1). About half of the PE teachers were uncertain whether demonstrating a movement or technique by a student is more efficient than using video (SO2). The other half of the PE teachers spread their opinions regarding SO2 almost equally on agreeing and disagreeing. About 50% of the PE teachers didn't think that working with a laptop in PE increases teamwork among students (SO3), whereas about 40% were uncertain about SO3. A similar distribution was assessed for the PE teachers' opinions about the positive effect of ICT on collaboration among other teacher colleagues (SO4).

Concerning the subjective theories that stated that the student-teacher relationship would suffer when using ICT in PE (SO5) and whether a webpage for their PE classes would be useful (SO6), the PE teachers' opinions were about equally distributed on agreement, disagreement, and uncertainty. Although there was a tendency towards disagreeing that internet forums would be helpful in communicating and comparing notes with PE teachers located at various schools (SO8), the overall distribution was similar to the subjective theories SO4 and SO5. Furthermore, the vast majority of PE teachers (more than 80%) held the opinion that playing sports and movement games increase PE enjoyment and facilitate communication better than ICT (SO7). The complete findings according to social interaction-related subjective theories are shown in Table 8.

**Table 8: Social Interaction-Related Subjective Theories**

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
SO1	Students learn to use ICT at home.	5 (8.8)	23 (40.4)	23 (40.4)	4 (7.0)	2 (3.5)	3.44	0.25
SO2	Demonstrating a movement or technique by a student is more efficient than using video.	4 (7.0)	14 (24.6)	30 (52.6)	7 (12.3)	2 (3.5)	3.19	0.27
SO3	Letting students work with a laptop in PE fosters their ability to work in a team (collaboration, communication in groups).	1 (1.8)	7 (12.3)	22 (38.6)	22 (38.6)	5 (8.8)	2.60	0.24
SO4	Using ICT in PE facilitates collaboration among teacher colleagues.	1 (1.8)	8 (14.0)	19 (33.3)	25 (43.9)	4 (7.0)	2.60	0.25
SO5	Using ICT in PE frequently makes the personal teacher-student relationship suffer.	5 (8.8)	10 (17.5)	16 (28.1)	20 (35.1)	6 (10.5)	2.79	0.17
SO6	A webpage for our PE classes would be useful.	6 (10.5)	11 (19.3)	16 (28.1)	15 (26.3)	9 (15.8)	2.82	0.13
SO7	Playing sports and movement games increase PE enjoyment and facilitate communication better than ICT.	27 (47.4)	20 (35.1)	9 (15.8)	1 (1.8)	0 (0.0)	4.28	0.27
SO8	Internet forums are helpful for PE teachers located at various schools to communicate and compare notes.	0 (0.0)	15 (26.3)	21 (36.8)	17 (29.8)	4 (7.0)	2.82	0.22

### Innovative and Modern Teaching-Related Subjective Theories

The PE teachers' opinions, whether ICT belongs into PE class due to its ubiquitousness in today's youth's lives, were equally distributed according to agreement, disagreement, and uncertainty (I1). Moreover, the PE teachers were relatively undecided whether modern (PE) teaching promotes ICT or not (I3). The PE teachers' opinions about the increased importance of ICT in PE in the future were also nearly equally distributed (I5). The majority of the PE teachers (75%) stated that they don't believe that ICT can replace traditional teaching, but can very well accompany it successfully (I6). Furthermore, the PE teachers haven't frequently heard from PE teachers from other schools that they used ICT in their respective PE classes (I7).

When it came to using ICT for school projects and after school programs, the majority of the PE teachers would use it for these occasions (I2). About 40% of the PE teachers thought that PETE programs should be infused with



more ICT, as 45% were uncertain about this statement (I4). The complete findings according to innovative and modern teaching-related subjective theories are shown in Table 9.

**Table 9: Innovative and Modern Teaching-Related Subjective Theories**

Index	Subjective Theory	Strongly Agree (N) (%)	Agree (N) (%)	Uncertain (N) (%)	Disagree (N) (%)	Strongly Disagree (N) (%)	Mean (M)	Standard Deviation (SD)
I1	Even though ICT is ubiquitous in the lives of children and adolescents, it does not belong into PE class.	3 (5.3)	16 (28.1)	17 (29.8)	19 (33.3)	2 (3.5)	2.98	0.20
I2	I could imagine ICT in PE-related school projects or after school programs.	16 (28.1)	24 (42.1)	15 (26.3)	2 (3.5)	0 (0.0)	3.95	0.23
I3	Modern (PE) teaching promotes ICT integration.	3 (5.3)	11 (19.3)	22 (38.6)	17 (29.8)	4 (7.0)	2.86	0.20
I4	ICT should play a bigger role in physical education teacher education programs.	4 (7.0)	21 (36.8)	26 (45.6)	5 (8.8)	1 (1.8)	3.39	0.26
I5	The importance of ICT in PE will increase in the future.	0 (0.0)	15 (26.3)	22 (38.6)	17 (29.8)	3 (5.3)	2.86	0.23
I6	ICT can't replace traditional teaching and learning methods, but complement and accompany it successfully.	14 (24.6)	29 (50.9)	10 (17.5)	3 (5.3)	1 (1.8)	3.91	0.26
I7	I frequently heard from other schools' PE teachers that they use ICT in their respective PE classes.	1 (1.8)	2 (3.5)	7 (12.3)	27 (47.4)	20 (35.1)	1.89	0.26

**Gender and Subjective Theories**

T-tests were performed to determine whether there was a relation between the subjective theories and gender. Among the 64 subjective theories, eight subjective theories showed statistically significant differences in regard to gender ( $p < 0.05$ ). No teaching-related, no equipment-related, and no classroom management and organization-related subjective theory showed statistically significant differences ( $p > 0.05$ ). To avoid excessive statistical reporting of statistically insignificant results and to remain brief, only the values of the statistically significant differences regarding gender are reported in Table 10.

**Table 10: Gender and Subjective Theories about ICT and PE**

Index	Subjective Theory	Gender	N	Mean (M)	Standard Deviation (SD)	t-Value	Significance
S6	Not actively participating students can be mentors and advisors at PCs.	Female	31	2.77	0.809	-2.735	0.008
		Male	26	3.42	1.203		
TE7	Despite ICT integrating, manifold movement, exploration, and free trial should remain the focus of the PE lesson.	Female	31	4.77	0.838	2.715	0.009
		Male	26	4.31	1.181		
M1	I do not have sufficient experience to integrate ICT in PE.	Female	31	3.16	1.272	2.066	0.044
		Male	26	2.54	1.279		
M3	If my computer literacy were better, I would use ICT in PE more often.	Female	31	2.77	0.784	2.117	0.039
		Male	26	2.15	1.321		
SO7	Playing sports and movement games increase PE enjoyment and facilitate communication better than ICT.	Female	31	4.48	0.744	2.019	0.048
		Male	26	4.08	0.832		
I4	ICT should play a bigger role in physical education teacher education programs.	Female	31	3.61	0.801	2.03	0.047
		Male	26	3.19	0.969		
I5	The importance of ICT in PE will increase in the future.	Female	31	2.65	0.864	-2.08	0.042
		Male	26	3.12	0.956		
I7	I frequently heard from other schools' PE teachers that they use ICT in their respective PE classes.	Female	31	1.68	0.881	-2.097	0.041
		Male	26	2.15	0.934		

For the subjective theory S6 (“Not actively participating students can be mentors and advisors at PCs.”), male PE teachers ( $M=3.42$ ) had a statistically significant higher mean score than female PE teachers ( $M=2.77$ ) ( $t=-2.735$ ,  $p=0.008$ ). For the subjective theory TE7 (“Despite ICT integrating, manifold movement, exploration, and free trial should remain the focus of the PE lesson.”), female PE teachers ( $M=4.77$ ) had a statistically significant higher mean score than male PE teachers ( $M=4.31$ ) ( $t=2.715$ ,  $p=0.009$ ).

For the subjective theory M1 (“I do not have sufficient experience to integrate ICT in PE.”), female PE teachers ( $M=3.16$ ) had a statistically significant higher mean score than male PE teachers ( $M=2.54$ ) ( $t=2.066$ ,  $p=0.044$ ). For the subjective theory M3 (“If my computer literacy were better, I would use ICT in PE more often.”), female



PE teachers ( $M=2.77$ ) had a statistically significant higher mean score than male PE teachers ( $M=2.15$ ) ( $t=2.117$ ,  $p=0.039$ ).

For the subjective theory SO7 (“Playing sports and movement games increase PE enjoyment and facilitate communication better than ICT.”), female PE teachers ( $M=2.77$ ) had a statistically significant higher mean score than male PE teachers ( $M=2.15$ ) ( $t=2.117$ ,  $p=0.039$ ).

For the subjective theory I4 (“ICT should play a bigger role in physical education teacher education programs.”), female PE teachers ( $M=3.61$ ) had a statistically significant higher mean score than male PE teachers ( $M=3.19$ ) ( $t=2.03$ ,  $p=0.047$ ). For the subjective theory I5 (“The importance of ICT in PE will increase in the future.”), male PE teachers ( $M=3.12$ ) had a statistically significant higher mean score than female PE teachers ( $M=2.65$ ) ( $t=-2.08$ ,  $p=0.042$ ). For the subjective theory I7 (“I frequently heard from other schools’ PE teachers that they use ICT in their respective PE classes.”), male PE teachers ( $M=2.15$ ) had a statistically significant higher mean score than female PE teachers ( $M=1.68$ ) ( $t=-2.097$ ,  $p=0.041$ ).

**Computer Literacy and Subjective Theories**

For assessing the PE teachers’ computer literacy, a 10-item subscale was used within the questionnaire. The items were 5-point Likert-scaled (5=very good, 1=very poor). The scale returned an excellent reliability score (Cronbach’s  $\alpha=0.90$ ). There were no statistically significant differences in gender ( $p>0.05$ ), except for the item “Installation of Hardware” ( $t=-3.006$ ,  $p=0.004$ ). The single item scores are shown in Table 11.

**Table 11: PE Teacher’s Computer Literacy**

Item	Mean (M)			Standard Deviation (SD)		
	Female	Male	Total	Female	Male	Total
Installation of Hardware	2.13	3.08	2.56	0.23	0.21	1.27
Installation of Software	2.90	3.42	3.14	0.20	0.21	1.13
Using Word Processing Software	3.94	3.77	3.86	0.17	0.18	0.92
Using Educational Software	3.10	2.92	3.02	0.19	0.21	1.08
Using the Internet	4.04	3.81	3.93	0.14	0.15	0.75
Designing a Webpage	1.77	1.81	1.79	0.18	0.24	1.11
Graphics Editing Software	2.81	3.19	2.98	0.22	0.23	1.17
Video Editing Software	1.65	2.23	1.91	0.18	0.25	1.14
Audio Editing Software	1.74	2.23	1.96	0.19	0.25	1.16
Knowledge to Include ICT in Education	2.81	2.96	2.88	0.19	0.20	1.02

To investigate the influence of computer literacy on the PE teachers’ subjective theories, the PE teachers were grouped into three groups in regard to their computer literacy mean scores (low computer literacy level, average computer literacy level, and high computer literacy level). After that, a one-way analysis of variance (ANOVA) accompanied with a Tukey’s HSD post-hoc test was conducted. Among the 64 subjective theories, 13 subjective theories showed statistically significant differences in regard to computer literacy levels ( $p<0.05$ ). No teaching-related, no teacher-related, and no innovative and modern teaching-related subjective theory showed statistically significant differences ( $p>0.05$ ).

For the subjective theory S3 (“Students can gather new information on their own.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=3.458$ ,  $p=0.039$ ). PE teachers with an average computer literacy level score showed a statistically significantly higher mean ( $M=3.41$ ) than PE teachers with a high computer literacy level score ( $M=2.86$ ) ( $p=0.036$ ).

For the subjective theory S4 (“ICT-supported education is as equal effective in regard to learning outcomes as traditional education.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=4.520$ ,  $p=0.015$ ). PE teachers with a low computer literacy level score showed a statistically significantly higher mean ( $M=3.60$ ) than PE teachers with a high computer literacy level score ( $M=2.57$ ) ( $p=0.012$ ).

For the subjective theory S5 (“Instructional tips, hints, and images on the computer make students become more adventurous.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=6.273$ ,  $p=0.004$ ). PE teachers with a low computer literacy level score showed a statistically significantly higher mean ( $M=3.80$ ) than PE teachers with an average computer literacy level score ( $M=2.85$ ) ( $p=0.009$ ) and PE teachers with a high computer literacy level ( $M=2.71$ ) ( $p=0.004$ ).

For the subjective theory S9 (“ICT integration fosters social and communicative learning.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=3.923$ ,  $p=0.026$ ). PE teachers with a low computer literacy level score showed a statistically significantly higher mean ( $M=2.90$ ) than PE teachers with a high computer literacy level score ( $M=2.14$ ) ( $p=0.022$ ).

For the subjective theory E5 (“I would absolutely integrate ICT into my PE lessons, if it would be available.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=3.923$ ,  $p=0.026$ ). A Tukey’s HSD post-hoc test didn’t show any statistically significant differences between the computer literacy level groups.

For the subjective theory CL1 (“I do not have sufficient experience to integrate ICT in PE.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=13.292$ ,  $p<0.001$ ). PE teachers with a low computer literacy level score showed a statistically significantly lower mean ( $M=1.60$ ) than PE teachers with an average computer literacy level score ( $M=2.85$ ) ( $p=0.003$ ) and PE teachers with a high computer literacy level score ( $M=3.52$ ) ( $p<0.001$ ).

For the subjective theory CL2 (“I have too few knowledge about possible pedagogical scenarios using ICT in PE.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=15.938$ ,  $p<0.001$ ). PE teachers with a low computer literacy level score showed a statistically significantly lower mean ( $M=2.10$ ) than PE teachers with an average computer literacy level score ( $M=3.73$ ) ( $p<0.001$ ) and PE teachers with a high computer literacy level score ( $M=4.19$ ) ( $p<0.001$ ).

For the subjective theory CL3 (“If my computer literacy were better, I would use ICT in PE more often.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=4.770$ ,  $p=0.012$ ). PE teachers with a low computer literacy level score showed a statistically significantly lower mean ( $M=1.70$ ) than PE teachers with a high computer literacy level score ( $M=2.95$ ) ( $p=0.010$ ).

For the subjective theory CL7 (“I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=4.890$ ,  $p=0.011$ ). PE teachers with a low computer literacy level score showed a statistically significantly lower mean ( $M=1.20$ ) than PE teachers with a high computer literacy level score ( $M=2.38$ ) ( $p=0.009$ ).

For the subjective theory CL8 (“I use ICT frequently to prove my ICT skills.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=5.118$ ,  $p=0.009$ ). PE teachers with a low computer literacy level score showed a statistically significantly higher mean ( $M=2.10$ ) than PE teachers with a high computer literacy level score ( $M=1.24$ ) ( $p=0.013$ ).

For the subjective theory CL9 (“My students are better in using ICT than I am.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=11.090$ ,  $p<0.001$ ). PE teachers with a high computer literacy level score showed a statistically significantly higher mean ( $M=4.14$ ) than PE teachers with a low computer literacy level score ( $M=2.60$ ) ( $p<0.001$ ) and PE teachers with an average computer literacy level score ( $M=3.04$ ) ( $p=0.001$ ).

For the subjective theory C1 (“I can’t integrate ICT because I am under time pressure to include the content standards completely.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=3.753$ ,  $p=0.030$ ). A Tukey’s HSD post-hoc test didn’t show any statistically significant differences between the computer literacy level groups.

For the subjective theory C8 (“Preparation effort and learning outcome efficiency are in fair relation to each other when using ICT in PE.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=3.460$ ,  $p=0.039$ ). PE teachers with an average computer literacy level score showed a statistically significantly higher mean ( $M=2.85$ ) than PE teachers with a high computer literacy level score ( $M=2.24$ ) ( $p=0.039$ ).

In reference to the same intention as for Table 10, to avoid excessive statistical reporting of statistically insignificant results and to remain brief, only the values of the statistically significant differences regarding the PE teachers’ computer literacy levels are reported in Table 12.

**Table 12: ANOVA for PE Teachers' Subjective Theories and Computer Literacy**

Index	Subjective Theory	Computer Literacy Level	N	Mean (M)	F-Value	p-Value	Difference (Tukey)	Difference p-Value
S3	Students can gather new information on their own.	Low	10	3.00	3.458	0.039	Low, Average	0.298
		Average	26	3.41			Low, High	0.876
		High	21	2.86			Average, High	0.036
S4	ICT-supported education is as equal effective in regard to learning outcomes as traditional education.	Low	10	3.60	4.520	0.015	Low, Average	0.055
		Average	26	2.81			Low, High	0.012
		High	21	2.57			Average, High	0.645
S5	Instructional tips, hints, and images on the computer make students become more adventurous.	Low	10	3.80	6.273	0.004	Low, Average	0.009
		Average	26	2.85			Low, High	0.004
		High	21	2.71			Average, High	0.851
S9	ICT integration fosters social and communicative learning.	Low	10	2.90	3.923	0.026	Low, Average	0.302
		Average	26	2.50			Low, High	0.022
		High	21	2.14			Average, High	0.218
E5	I would absolutely integrate ICT into my PE lessons, if it would be available.	Low	10	3.70	3.347	0.043	Low, Average	0.538
		Average	26	3.27			Low, High	0.954
		High	21	2.71			Average, High	0.202
CL1	I do not have sufficient experience to integrate ICT in PE.	Low	10	1.60	13.292	<0.001	Low, Average	0.003
		Average	26	2.85			Low, High	<0.001
		High	21	3.52			Average, High	0.054
CL2	I have too few knowledge about possible pedagogical scenarios using ICT in PE.	Low	10	2.10	15.938	<0.001	Low, Average	<0.001
		Average	26	3.73			Low, High	<0.001
		High	21	4.19			Average, High	0.251
CL3	If my computer literacy were better, I would use ICT in PE more often.	Low	10	1.70	4.770	0.012	Low, Average	0.172
		Average	26	2.42			Low, High	0.010
		High	21	2.95			Average, High	0.218
CL7	I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students.	Low	10	1.20	4.890	0.011	Low, Average	0.162
		Average	26	1.88			Low, High	0.009
		High	21	2.38			Average, High	0.213
CL8	I use ICT frequently to prove my ICT skills.	Low	10	2.10	5.118	0.009	Low, Average	0.478
		Average	26	1.77			Low, High	0.013
		High	21	1.24			Average, High	0.054
CL9	My students are better in using ICT than I am.	Low	10	2.60	11.090	<0.001	Low, Average	0.457
		Average	26	3.04			Low, High	<0.001
		High	21	4.14			Average, High	0.001
C1	I can't integrate ICT because I am under time pressure to include the content standards completely.	Low	10	2.30	3.753	0.030	Low, Average	0.067
		Average	26	3.27			Low, High	0.867
		High	21	2.52			Average, High	0.076
C8	Preparation effort and learning outcome efficiency are in fair relation to each other when using ICT in PE.	Low	10	2.80	3.460	0.039	Low, Average	0.988
		Average	26	2.85			Low, High	0.189
		High	21	2.24			Average, High	0.039

### Household Computer Ownership and Subjective Theories

To investigate the influence of household computer ownership on the PE teachers' subjective theories, the PE teachers were grouped into three groups in regard to the number of computers (including laptops) in their household (1, 2, and 3 or more). After that, a one-way ANOVA accompanied with a Tukey's HSD post-hoc test was conducted. Among the 64 subjective theories, only five subjective theories showed statistically significant differences regarding household computer ownership ( $p < 0.05$ ). No student-related, no teaching-related, no teacher-related, no social interaction-related, and no innovative and modern teaching-related subjective theory showed statistically significant differences ( $p > 0.05$ ).

For the subjective theory E7 ("The instructional videos at our school are outdated."), PE teachers' number of owned household computers differed statistically significantly ( $F = 4.047$ ,  $p = 0.023$ ). PE teachers with only one owned household computer showed a statistically significantly higher mean ( $M = 4.64$ ) than PE teachers with three or more owned household computers ( $M = 3.58$ ) ( $p = 0.018$ ).

For the subjective theory CL1 ("I do not have sufficient experience to integrate ICT in PE."), PE teachers' number of owned household computers differed statistically significantly ( $F = 3.277$ ,  $p = 0.045$ ). PE teachers with only one owned household computer showed a statistically significantly higher mean ( $M = 3.64$ ) than PE teachers with three or more owned household computers ( $M = 2.62$ ) ( $p = 0.037$ ).

For the subjective theory CL3 ("If my computer literacy were better, I would use ICT in PE more often."), PE teachers' number of owned household computers differed statistically significantly ( $F = 5.068$ ,  $p = 0.010$ ). PE

teachers with only one owned household computer showed a statistically significantly higher mean ( $M=3.27$ ) than PE teachers with three or more owned household computers ( $M=2.08$ ) ( $p=0.008$ ).

For the subjective theory CL5 (“If my computer literacy were better, I would use ICT in PE more often.”), PE teachers’ number of owned household computers differed statistically significantly ( $F=4.623$ ,  $p=0.014$ ). PE teachers with only one owned household computer showed a statistically significantly higher mean ( $M=3.91$ ) than PE teachers with three or more owned household computers ( $M=23.08$ ) ( $p=0.024$ ).

For the subjective theory C1 (“I can’t integrate ICT because I am under time pressure to include the content standards completely.”), PE teachers’ computer literacy levels differed statistically significantly ( $F=3.537$ ,  $p=0.036$ ). PE teachers with only one owned household computer showed a statistically significantly lower mean ( $M=2.00$ ) than PE teachers with two owned household computers ( $M=3.05$ ) ( $p=0.047$ ) and PE teachers with three or more owned household computers ( $M=3.00$ ) ( $p=0.048$ ).

Again, to avoid excessive statistical reporting of statistically insignificant results and to remain brief, only the values of the statistically significant differences regarding the PE teachers’ household computers ownership are reported in Table 13.

**Table 13:** ANOVA for PE Teachers’ Subjective Theories and Household Computer Ownership

Index	Subjective Theory	Household Computers	N	Mean (M)	F-Value	p-Value	Difference (Tukey)	Difference p-Value
E7	The instructional videos at our school are outdated.	1	11	4.64	4.047	0.023	1,2	0.245
		2	20	4.00			1, 3 or more	0.018
		3 or more	26	3.58			2, 3 or more	0.368
CL1	I do not have sufficient experience to integrate ICT in PE.	1	11	3.64	3.277	0.045	1,2	0.125
		2	20	3.80			1, 3 or more	0.037
		3 or more	26	2.62			2, 3 or more	0.845
CL3	If my computer literacy were better, I would use ICT in PE more often.	1	11	3.27	5.068	0.010	1,2	0.219
		2	20	2.60			1, 3 or more	0.008
		3 or more	26	2.08			2, 3 or more	0.231
CL5	Younger PE teacher colleagues are more engaged into ICT integration.	1	11	3.91	4.623	0.014	1,2	0.699
		2	20	3.65			1, 3 or more	0.024
		3 or more	26	3.08			2, 3 or more	0.071
C1	I can’t integrate ICT because I am under time pressure to include the content standards completely.	1	11	2.00	3.537	0.036	1,2	0.047
		2	20	3.05			1, 3 or more	0.048
		3 or more	26	3.00			2, 3 or more	0.988

**Professional Experience (Years in Service) and Subjective Theories**

To investigate the influence of the PE teachers’ professional experience (years in service) on their subjective theories, the PE teachers were grouped into three groups in regard to the years they were in service (1-10, 11-20, and 21 or more). After that, a one-way ANOVA accompanied with a Tukey’s HSD post-hoc test was conducted. Among the 64 subjective theories, only three subjective theories showed statistically significant differences regarding years in service ( $p<0.05$ ). No student-related, no teaching-related, no teacher-related, no social interaction-related, no classroom management and organization-related, and no innovative and modern teaching-related subjective theory showed statistically significant differences ( $p>0.05$ ). The statistically significant ANOVA and Tukey’s HSD post-hoc test results regarding PE teachers’ professional experience (years in service) and their subjective theories about ICT and PE are shown in Table 14.

**Table 14:** ANOVA for PE Teachers’ Professional Experience (Years in Service) and Subjective Theories

Index	Subjective Theory	Years in Service (Years)	N	Mean (M)	F-Value	p-Value	Difference (Tukey)	Difference p-Value
E5	I would absolutely integrate ICT into my PE lessons, if it would be available.	1-10	20	3.80	7.989	0.001	1-10, 11-20	0.092
		11-20	14	3.07			1-10, 21 or more	0.001
		21 or more	23	2.61			11-20, 21 or more	0.350
CL7	I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students.	1-10	20	1.60	4.616	0.014	1-10, 11-20	0.992
		11-20	14	1.64			1-10, 21 or more	0.022
		21 or more	23	2.43			11-20, 21 or more	0.058
CL9	My students are better in using ICT than I am.	1-10	20	2.90	4.516	0.015	1-10, 11-20	0.682
		11-20	14	3.21			1-10, 21 or more	0.013
		21 or more	23	3.87			11-20, 21 or more	0.182

For the subjective theory E1 (“I would absolutely integrate ICT into my PE lessons, if it would be available.”), PE teachers’ years in service differed statistically significantly ( $F=7.989$ ,  $p=0.001$ ). PE teachers who were 1 to

10 years in service showed a statistically significantly higher mean ( $M=3.80$ ) than PE teachers who were 21 or more years in service ( $M=2.61$ ) ( $p=0.001$ ).

For the subjective theory CL1 (“I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students.”), PE teachers’ years in service differed statistically significantly ( $F=4.616$ ,  $p=0.014$ ). PE teachers who were 1 to 10 years in service showed a statistically significantly lower mean ( $M=1.60$ ) than PE teachers who were 21 or more years in service ( $M=2.43$ ) ( $p=0.022$ ).

For the subjective theory CL9 (“My students are better in using ICT than I am.”), PE teachers’ years in service differed statistically significantly ( $F=4.516$ ,  $p=0.015$ ). PE teachers who were 1 to 10 years in service showed a statistically significantly lower mean ( $M=2.90$ ) than PE teachers who were 21 or more years in service ( $M=3.87$ ) ( $p=0.013$ ).

## DISCUSSION AND CONCLUSIONS

This study’s aim was to investigate the subjective theories of in-service PE teachers about integrating ICT into PE. Using a RPST scientific framework, a quantitative research instrument was developed and diverse data on the study’s subject field was collected and analyzed. In the following, the study’s results will be discussed in regard to theoretical aspects and implications, and other findings in the field.

### Student-Related Subjective Theories

The PE teachers’ overall agreement with the subjective theory that stated that the students study motivation can’t be increased by ICT (S1) isn’t easy to discuss, as there is not much objective evidence to compare for PE. In general, innovative instructional methods easily raise the motivational level of school students (Brophy, 2010). However, putting a PC into a classroom doesn’t make a low quality teaching and motivational climate high quality. For the use of technology (pedometers, heart rate monitors, video analysis, and picture boards) in physical education and physical activity behavior outside school (Cox, Williams, & Smith, 2007), and especially for exergaming in PE (Chen, 2013), there is empirical evidence that student’s motivation benefits from ICT involvement. On the other hand, simply putting an isolated teaching tool into an educational context doesn’t raise the motivational climate if not in tune with a careful conducted instructional design (Morgan & Kingston, 2005). Speculating about the difference between S1 and the literature, here may be a bias in the PE teachers, either regarding technology as an instructional method and/or the belief that unmotivated students can’t be motivated anyways. Although the subjective theory S7 (“If students are not motivated, ICT will not motivate them anyways.”) isn’t distributed clearly towards one direction, S7 didn’t focus on the latter general belief, but on ICT. S7 therefore doesn’t help much determining the underlying attitude in question.

The fact that the PE teachers split their subjective theories reports on whether girls or boys get more into ICT (S10) mirrors the common uncertainty and prejudices about gender-related tech-savviness (McGrath, 2004). Although there may be differences in terms of attitude and use with the boys in the clear advantage regarding tech-savviness, especially in regard to computer and video game cultures (Kay, 2007), this study’s PE teachers show mixed views. On the one hand, this may state a positive trend towards an equal gender treatment in PE, but may lead to less individual-centered teaching on the other hand. Furthermore, as motivation toward PE differs significantly between boys and girls, with girls showing a large decrease aging (Parish & Treasure, 2003), an interrelation between motivation, and ICT literacy and attitudes might be assumed (Vekiri, 2010). This study’s PE teachers showed similar distribution of beliefs about girls’ and boy’s ICT savviness as in other studies that examined non-PE teachers (Sang, Valcke, van Braak, Tondeur, & Zhu, 2011; Vekiri, 2013; Wikan & Molster, 2011).

The PE teachers’ central tendency for the subjective theories S3, S4, S5, S6, S7, and S8 may be caused by a feeling of uncertainty (Meldrum, 2011; Semiz & Ince, 2012) due to their lack in practical experience with the particular ICT topic. Moreover, a lack of content knowledge may prevent most of the PE teachers from a clear decision, as ICT has most likely not been part of their pre-service education (Hetland & Strand, 2010). Unclear facts about individual and team learning in PE in general, and integrated ICT activities (Ranguelov, Horvath, Dalferth, & Noorani, 2011) may add to the PE teachers’ central tendency.

### Teaching-Related Subjective Theories

The results for the subjective theories T1, T3, T4, and T6 confirm the general findings that (PE) teachers tend to stick to their teaching methods that they have used over the course of their careers (Mosston & Ashworth, 2008; Semiz & Ince, 2012; Strand & Bender, 2011). The results for the subjective theories T4 and T6 may support this explanation, as it can certainly be assumed that video feedback is a common method as well in PETE and PE (Fiorentino, 2004; J. Lim, Henschel Pellett, & Pellett, 2009).



Especially the results for the subjective theory T3 (“My teaching in physical education is successful without integrating any technology”) reveal that this study’s sample may indeed include a negative bias towards ICT in PE in the PE teachers (Kretschmann, 2012). As the vast majority of the PE teachers is clearly in favor of the subjective theory T7 (“Despite ICT integrating, manifold movement, exploration, and free trial should remain the focus of the PE lesson.”), it may be inferred that the study’s PE teachers don’t think of PE and ICT being connected at first sight. For T3 and T7, the ICT-skeptical bias may as well blend in with the PE teachers’ tendency to stick to their established teaching methods and resist to change (Zimmerman, 2006).

The mixed results with a tendency for disagreeing for the subjective theory T5 (“Internet searches (e.g. ball games) are well suited as homework.”) are in line with the common approach to only include little or no homework in PE (Zavatto et al., 2005). The PE teachers may not use the Internet for homework, although there are plenty of PE-related webpages available (Elliott, Stanec, McCollum, & Stanley, 2007; Mohnsen & Roblyer, 2013).

### **Teacher-Related Subjective Theories**

The results for the subjective theories T1 and T2 suggest that the PE teachers see ICT in PE as an add that needs special attention, affecting their PE lesson planning, and causing stress and time-management issues. According to other findings, these attitudes are rather common among (PE) teachers (Afshari, Abu Bakar, Luan, Abu Samah, & Say Fooi, 2009; Papastergiou, 2010). However, not only ICT is regarded as an external pressure for change. General curricular, policy, and organizational changes may rather be deemed as a burden as well (Petrie & Hunter, 2011).

The rather negative results for the subjective theory TE4 (“I do not need ICT for getting students motivated.”) are expected as S1 and S7 revealed a disbelief in the PE teachers that ICT can have a positive motivational effect in PE. The switch to the introspective personal perspective of the teacher didn’t change these aspect-specific results’ tendency.

The PE teachers admitted that there are major benefits of digital assessment data (TE7) despite being rather skeptical towards ICT in PE. But digital assessment data may be a special case among technology use in PE. As national and state physical fitness tests implementations have increased (Wilson, 2011), more time and effort has to be spent on assessing and administrating test data. Using ICT for administrating students’ test data may be more time- and cost-efficient than traditional paper-pencil methods (Mosier, 2012). As testing is mandatory in most cases and doesn’t directly refer to PE class teaching methods, PE teachers may not classify it belonging to their personal PE teaching philosophy and teaching methods context, causing a rather positive attitude towards ICT use in this case.

The PE teachers clearly see the potential of PE development and their personal development (T3) according to ICT. Despite their skeptical attitude, the PE teachers don’t neglect the fact of technology development and its increasing infusion into PE programs (Kretschmann, 2010; Mears, 2009a; Papastergiou, 2010). The PE teachers seem to see the direct connection to 21st century skills and policy development (Sanders & Witherspoon, 2012), but seem also to not transfer the ICT motor to their own teaching.

As the PE teachers tend to be undecided whether an increased ICT use in PE would also increase their reputation with the students (T5), teacher credibility issues in regard to ICT in PE (Bouck, Flanagan, Heutsche, Okolo, & Englert, 2011; Hergüner, 2011) may not be clear to PE teachers. Whether a PE teacher gains reputation with the student by using ICT in PE may depend on the teacher, the students, the school culture, or in sum, the case.

Similar to the teaching-related subjective theories T1, T3, T4, and T6, the teacher-related subjective theory TE6 (“To give the students more freedom, I gladly switch to the role of a moderator.”), the PE teachers may stick to their known teaching strategies they feel comfortable with. A change in the perceived and intended role when integrating ICT can’t be done instantly by most teachers (Schibeci et al., 2008). The PE teachers therefore may be not familiar with a moderator role in PE, being used to a command teaching style (Mosston & Ashworth, 2008) and additionally be not familiar to different roles in ICT implementation (Uibu & Kikas, 2008).

### **Equipment-Related Subjective Theories**

Although lack of equipment is prominent within the PE discussion (Jenkinson & Benson, 2010; Kinnunen & Lewis, 2013), this study’s PE teachers perceive their available equipment as not being outdated (E1). However, they regard instructional support-related videos available at their school outdated (E7), which is in line with the findings of Thomas and Stratton (2006) who reported less up-to-date technological equipment in school PE. As the commercial instructional video releases (Mohnsen & Thompson, 1997) have declined, it’s less likely that



schools have purchased the latest published ones. The availability of free PE-related instructional videos on the Internet doesn't make expensive commercial videos attractive any more (Quennerstedt, 2013). Limited evidence is available, stating that limited budget influences technology use in PE (Woods et al., 2008). However, the items E1 and E7 didn't differentiate between electronic devices and media, and non-electronic analogue material. Therefore, there is a lack of clarity regarding this distinction within the PE teachers' perceptions.

The PE teachers have a mixed perception of their respective school being a factor in ICT implementation (E4). Nevertheless, literature findings on ICT implementation clearly report the school itself as an influencing factor (Afshari et al., 2009). It may be speculated that at most of the schools, the principal doesn't recognize PE as an ICT-related subject and therefore may not support or hinder PE in technology integration. However, the principals' influence on budget and school-wide curricular integration in terms of PE may not be underestimated (Brockmeier, Sermon, & Hope, 2005; Staples, Pugach, & Himes, 2005).

Equipment-related subjective theories in general (E2, E3, E5, and E6) seem to be independent from the PE teachers' teaching philosophy and habits. For instance, even if technology were available for PE the teachers wouldn't include them (E5). This may be explained by the negative technology use bias of the sample and/or by the lack of the PE teachers' instructional knowledge regarding technology in PE (Johns, 2003; Semiz & Ince, 2012).

### **Computer Literacy-Related Subjective Theories**

The results for the subjective theory CL5 ("Younger PE teacher colleagues are more engaged into ICT integration.") are in line with the findings of Yaman (C. Yaman, 2008), confirming that age is a factor. General findings on teacher's computer and technology competence also state that teachers' age influence teachers' technology adoption (Buabeng-Andoh, 2012).

The fact that PE teachers perceive themselves not being as competent in ICT compared to their students (CL9) may or may not change over the following PE teacher generations. One line of argumentation may proclaim a everlasting gap between teachers' ICT competence level and students' ICT competence level caused by the "natural" age difference (Guo, Dobson, & Petrina, 2008). An alternative line of argumentation may lead to teachers and students being on an equal or at least similar ICT competence level, as future generations of (PE) teachers will be digital natives themselves (Prensky, 2010). However, students' and teachers' perceptions according to computer and ICT literacy, and actual abilities may differ (Grant, Malloy, & Murphy, 2009; Sarfo & Ansong-Gyimah, 2010). This means that the confidence level in the PE teachers on integrating ICT in PE may therefore ground on mere perceptions rather than facts about students' computer and ICT literacy.

The PE teachers' feelings about not having sufficient knowledge and experience according to the pedagogical use of ICT in general and in PE (CL1 and CL2) are most likely influenced by the lack of technology method content within their professional education (Semiz & Ince, 2012; Woods et al., 2008). However, the negative results for the subjective theory CL3 ("If my computer literacy were better, I would use ICT in PE more often.") may confirm the sample's negative technology bias again. It is likely that insufficient knowledge and experience with ICT and PE influences the likelihood of ICT adaption and encouragement of ICT use in PE (C. Yaman, 2008; M. Yaman, 2007b).

The results for the subjective theories CL7 ("I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students.") and CL8 ("I use ICT frequently to prove my ICT skills.") suggest that the PE teachers tend to choose teaching methods they feel safe to use without disruptions, especially in regard to ICT in the classroom (Ertmer, 2005). Non-PE teachers have also reported feeling anxious about using ICT when they think that their students know more about ICT than they do (Balanskat, Blamire, & Kefala, 2006).

The PE teachers seem to be aware of webpages for PE and their usefulness for their profession (CL4). This is not surprising, as the PE teachers' computer literacy level was sufficient to determine the relevant webpages. Nonetheless, there seems to be a gap between the knowledge of available teaching and learning resources and its implementation (Ertmer & Ottenbreit-Leftwich, 2010).

### **Classroom Management and Organization-Related Subjective Theories**

The PE teachers' perceptions about lack of time, curriculum content pressure, and organizational structures like class size in PE that increase teaching stress (C1, C2, and C3) are accompanied by the literature (Afshari et al., 2009; Thomas & Stratton, 2006). The results for the subjective theory C8 ("Preparation effort and learning outcome efficiency are in fair relation to each other when using ICT in PE.") accompany the PE teachers' perceptions about these barriers. The perceived effort in adapting new teaching methods or content is always

judged not being time- and cost-efficient by (PE) teachers (Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Thomas & Stratton, 2006).

The PE teachers' belief that technology use in PE decreases "precious" movement and physical activity time (C4) within PE lessons may be closely connected to an understanding of PE that doesn't promote ICT integration (Kretschmann, 2010). However, the PE teachers are aware about the benefit of using ICT for PE lesson planning and preparation (C5), but were unsure about complex settings in PE (C6). This suggests that PE teachers may tackle ICT integration from a reflective perspective (Tsangaridou & O'Sullivan, 1994), considering ICT for diverse purposes (Tearle & Golder, 2008). Again, (PE) teachers' tendency to stick to known and established teaching methods may as well be related to the PE teachers' uncertainty about complex PE settings, as these settings are perceived as challenging for both expert and beginner teachers (Rich & Hannafin, 2009; Shovala, Erlicha, & Fejgina, 2010). Adding an extra factor such ICT may be perceived as making a complex situation even more complex.

The results for the subjective theory C7 ("ICT is most likely placed best in the last two years of secondary school PE.") suggest that PE teachers' teaching strategies and philosophies are bound to grade level. As it is obvious that primary school PE and secondary school PE need different appropriate teaching approaches (Hastie & Martin, 2005; Himberg, Hutchinson, & Roussell, 2002), teachers are assumed to choose grade level-specific teaching methods. The fact that the PE teachers judged ICT more appropriately placed into the last two years of secondary school may be explained by the belief that students at this stage of their educational attainment have gathered more computer and ICT literacy over their past school career, making them probably more likely to adapt ICT in subjects that are not primary ICT-related. Moreover, students nearing the end of their school education may be in their cognitive and metacognitive prime (Pallrand & Moretti, 1980), potentially allowing a wider range of teaching and learning methods. It may be inferred that the PE teachers think that ICT integration is better suited for more advanced students due to their perception that integrating ICT in PE is more complex than traditional teaching methods. The position statement of the National Association for Sport and Physical Education (NASPE) also proclaims an age-appropriate ICT use (National Association for Sport and Physical Education (NASPE), 2009).

#### **Social Interaction-Related Subjective Theories**

The varying results in the subjective theory SO1 ("Students learn to use ICT at home.") may be caused by the PE teachers varying perceptions of their students' computer and media socialization (Daunic, 2011). Although it is widely clear that students are socialized ubiquitously in their home environment (Morimoto & Friedland, 2011), PE teachers perceive regional differences (Ince et al., 2006) and/or may subsume ICT education under school education purposes in general or for their respective school (Vanderlinde, Dexter, & van Braak, 2012; Wastiau et al., 2013).

The varying results for the subjective theory SO2 ("Demonstrating a movement or technique by a student is more efficient than using video.") may be explained by mixed perceptions, knowledge, and skill levels regarding the use of video in PE. The studies conducted by M. Yaman (2007b) and C. Yaman (2008) also featured video and PE, whereas scores for PE teachers' competencies showed similar results. Despite having multiple sources of pedagogical scenarios for video in PE available (Cassidy, Stanley, & Bartlett, 2006; Leight, 2012; J. Lim et al., 2009), the PE teachers may be influenced by a certain understanding of demonstrations in PE. The PE teachers may believe that movements and techniques have to be demonstrated by themselves. Physical demonstration by the teacher may be the preferred method of instruction by PE teachers. Although demonstrations are an essential skill that PE teachers should master (Bailey, 2001), too much emphasis on this skill may lead to an implicit disregard against any other modes of demonstration, including ICT use. Nevertheless, there is clear evidence in the literature that video can be of assistance in motor skill learning in PE (O'Loughlin, Ní Chróinín, & O'Grady, 2013).

The results for the subjective theory SO3 ("Letting students work with a laptop in PE fosters their ability to work in a team (collaboration, communication in groups.") varies as well. The PE teachers may have the prejudiced image of the isolated media-addicted youth sitting alone in front of a computer (Holmes, 2012). Therefore, the PE teachers may interpret laptop work not as a collaborative, social activity but as an isolated individual task. The study by Trimmel and Bachmann (2004) showed that laptop classes didn't enhance social intelligence, whereas a study review by Fried (2008) highlighted the positive effects of laptop use on student learning. However, there are multiple pedagogical arrangements provided in the literature to design collaborative laptop uses in classrooms (Koschmann, Kelson, Feltovich, & Barrows, 1996). Using laptops providing a collaborative feedback scenario in PE is also described by Kretschmann (2010). The integration of laptops in stationary group work is also recommended in another scenario.

The analysis of the subjective theory SO4 (“Using ICT in PE facilitates collaboration among teacher colleagues.”) lead to mixed results. On the one hand, teachers mostly regard themselves as isolated entities that usually don’t collaborate with colleagues if not forced by external authorities (DuFour, 2011). However, there is evidence of a beneficiary informal collaboration among teachers regarding technology (Stevenson, 2005). For PE teachers, the same tradition of isolation can be stated, though there is a strong development of establishing communities of practice from a professional development perspective (Tozer & Horsley, 2006). PE-focused collaborations between schools and regional communities (France, Moosbrugger, & Brockmeyer, 2011) as well between PETE programs and schools (Parker, Templin, & Setiawan, 2012) are documented in the literature. This study only covered “physical” collaborations at the PE teachers’ local school. Nevertheless, long-term collegial interaction was identified as a factor influencing technology use in schools (Mumtaz, 2006). However, there is a huge potential for collaboration and sharing experience using “virtual” online channels such as mailing lists (Pennington & Graham, 2002; Pennington, Wilkinson, & Vance, 2004) or social networks (Sezen Balcikanli, 2012). For such online opportunities, the results for the subjective theories SO6 (“A webpage for our PE classes would be useful.”), and SO8 (“Internet forums are helpful for PE teachers located at various schools to communicate and compare notes.”) vary as well. Although there are plenty of resources hinting at offerings on the Internet (Elliott et al., 2007; Mohnsen & Roblyer, 2013), the PE teachers were undecided whether to use them or not.

The subjective theory SO5 (“Using ICT in PE frequently makes the personal teacher-student relationship suffer.”) mirrors a common teachers’ belief that using ICT in the classroom would decrease teacher-student interaction. On the contrary, a study by Tanui, Kiboss, Walaba, and Nassiuma (2008) reported that there was no significant change in teacher behavior according to teacher-student interaction and student-student interaction. Furthermore, pedagogical models for ICT integration in the classroom emphasize a supportive teacher-student relationship (Webb, 2013), and definitely don’t intend to change teacher-student interaction in a bad way.

#### **Innovative and Modern Teaching-Related Subjective Theories**

The subjective theories I1, I3, and I5 came up with mixed results. These subjective theories were all asking about an understanding of teaching in PE that naturally and mandatory includes technology. The PE teachers show diversity in regard to this innovative teaching philosophy. PE teachers may struggle in how to relate ICT to their teaching philosophy, as this struggle is also documented in other subject teachers (King, 2012). Humphries, Hebert, Daigle, and Martin (2012) developed a technology-related subscale for assessing PE teaching efficacy. In relation to this study, the technology-related aspect of PE teachers’ teaching efficacy may also stand for the technology-related part within the PE teachers’ teaching philosophy. Thus, it may be inferred that an increase of the PE teachers’ technology-related teaching efficacy may as well lead to an enhanced technology-related PE teaching philosophy. Mears (Mears, 2009a) appealed for more tech-savviness in PE teachers.

The mixed results for the subjective theory I5 (“The importance of ICT in PE will increase in the future.”) may be caused by the interrelation between the uncertainty of possible PE futures, the PE teachers’ personal teaching philosophy and subject understanding, and the upcoming instructional technology developments (Finkenberg, 2008; Sanders & Witherspoon, 2012). The subjective theory I6 (“ICT can’t replace traditional teaching and learning methods, but complement and accompany it successfully.”) may be affected by the same interrelation, though may be also referring to a general (positive or negative) ICT in PE-bias.

The subjective theory I7 (“I frequently heard from other schools’ PE teachers that they use ICT in their respective PE classes.”) is related to the subjective theory SO4. The negative trend in the results for I7 may be explained by either non-existent occasions sharing information among PE teachers from different schools and/or by mere non-existent implementation of ICT in PE among PE teachers from different schools.

Despite the varying results for the subjective theory I4 (“ICT should play a bigger role in physical education teacher education programs.”), a decent amount of the PE teachers (40%) were in favor of infusing PETE programs with ICT. This positive trend is also mirrored by PETE literature (Ayers & Housner, 2008; Bechtel, 2010; Hetland & Strand, 2010; E. M. Jones, Bulger, Illg, & Wyant, 2012; Kretschmann, 2010; Leight & Nichols, 2012).

#### **Gender and Subjective Theories**

Statistically significant gender differences in the PE teachers’ subjective theories only showed in personal- or interpersonal-related subjective theories, whereas the teaching-related, equipment-related, and classroom management and organization-related subjective theories didn’t show statistically significant differences. As the

empirical evidence for PE teachers in regard to this aspect is very limited, also studies with PETE student group focus are considered for the discussion in this case.

Studies that featured gender differences in PE teachers or PETE students, and ICT reported varying results. Bebetos and Antoniou (2009) found no gender-related differences in PETE students according to attitudes towards ICT and computer use. For other subject teachers, Dogan (2010) also found no significant gender differences in the teachers' perceptions about the use of educational technologies. Moreover, Bakr (2011) didn't find statistically significant gender differences in regard to attitudes towards computers in education among Egyptian teachers.

On the contrary, C. Yaman (2008) found that female PE teachers use technologies, and technology-related learning and teaching methods such as educational games ( $p=0.043$ ), practice ( $p=0.003$ ), and a behavioral approach ( $p=0.004$ ) meaningfully more than male ones. As practice and behavioral approaches may refer to a personal teaching philosophy and/or a either positive or negative ICT in PE-bias, C. Yaman's results also confirm the gender differences in this study for the subjective theories TE7, SO7, I4, and I5. The results for the subjective theory M1 ("I do not have sufficient experience to integrate ICT in PE.") contradict C. Yaman's report for educational games, as in this study, female PE teachers believe to be less ICT competent, whereas in C. Yaman's study, it is the other way round.

In the study by Goktas (2012), most of the assessed attitudes in PETE showed statistically significant differences. The PE teachers attitudes towards technology may be interpreted as directly connected to the PE teachers' personal teaching and subject philosophy in regard to technology. Therefore, the reported gender differences in Goktas' study are in line with the results of this study regarding statistically significant gender differences for the subjective theories TE7, M1, M4, SO7, I4, and I5. However, the attitudes in Goktas' study only tackled computer-related attitudes explicitly, leaving other ICTs out of the discussion.

As gender differences in attitudes and beliefs of non-PE school subject teachers are common in various studies (Gansmo, 2009; Jamieson-Proctor & Finger, 2006; Kibirige, 2011; Prestridge, 2012), it comes to no surprise that PE teachers share similar differences in their subjective theories about ICT in PE.

### **Computer Literacy and Subjective Theories**

The comprehensive computer literacy level results are similar to the findings in other PE teachers-related studies (Gibbone et al., 2010; Woods et al., 2008; C. Yaman, 2008; M. Yaman, 2007b) and other subject teachers-related studies (Konan, 2010; Ocak & Akdemir, 2008; Oluwatayo, 2012). Therefore, this study's sample of PE teachers is neither a low nor a high computer literacy level loaded sample and doesn't contain a computer literacy bias.

Although other studies stated that PE teachers' computer literacy influences their attitudes towards technology in PE (Gibbone et al., 2010; Ince et al., 2006; Woods et al., 2008), this study's results only showed a small number (13 out of 64) of PE teachers' subjective theories about ICT in PE that are statistically significantly influenced by the PE teachers' computer literacy. However, the aforementioned other studies didn't apply inferential statistical procedures and therefore based their judgment rather on rational argumentation.

It comes to no surprise that most of the statistically significant differences according to the PE teachers' computer literacy level popped up in computer literacy-related subjective theories (CL1, CL2, CL3, CL7, CL8, and CL9). This study's results therefore confirm the postulated relationship between PE teachers' computer literacy levels, and certain attitudes and beliefs of PE teachers' regarding ICT in PE in previous studies (Gibbone et al., 2010; Ince et al., 2006; Woods et al., 2008). This study's results are also in line with the findings in non-PE teachers that also report a statistically significant relationship between teachers' computer literacy, and their attitudes towards educational technology and its integration into classrooms (Albirini, 2006; Cavas, Cavas, Karaoglan, & Kisla, 2009; Ocak & Akdemir, 2008; Ogunkola, 2008; Sadik, 2006).

### **Household Computer Ownership and Subjective Theories**

The small number (5 out of 64) of statistically significant differences regarding PE teachers' computer ownership in relation to their subjective theories about ICT in PE may be unexpected, as computer ownership has been consistently correlated with teachers' beliefs and attitudes towards ICT (Cavas et al., 2009; Ogunkola, 2008; Roussos, 2007). Additionally, in a rather PE-related context, Goktas (2012) found that computer ownership is a significant factor that affects attitudes in PETE students. Hence, it is not surprising that PE teachers' household computer ownership mostly affected the PE teachers' computer literacy-related subjective theories (CL1, CL3, and CL5) on a statistically significant level.



As every PE teacher in this study possessed at least one computer or laptop, and multiple computer ownership didn't appear as a major factor that influences the PE teachers' subjective theories, previous studies that only focused on a dichotomous computer ownership (0=don't possess a computer; 1=possess a computer) (Cavas et al., 2009; Monk, Swain, Ghrist, & Riddle, 2003; Ogunkola, 2008) may not be taken into account. Whether there is a computer in the household or not, or personal computer ownership is fulfilled or not appear to be outdated questions and codes, as today's (PE) teachers may all possess computers in the meantime. PE teachers may not be as tech-savvy as their students, but at least possess the computer equipment to potentially be.

Nonetheless, some recent research findings in pre-service teachers show a different picture in regard to computer ownership. PETE students (Goktas, 2012) and non-PE pre-service teachers (Zhou, Zhang, & Li, 2011) still don't all own computers themselves. This fact may be explained according to budget issues in the pre-service teacher population. However, (PE) teacher education students do have regular access to computers and ICTs via their university's and study program's ICT infrastructure (Adamakis & Zounhia, 2013; Sharp, 1996; Zhao & Jiang, 2010), compensating for the lack of possessing an own computer. In addition, pre-service (PE) teachers who don't possess a computer will be able to afford an own computer once they become in-service teachers, leaving budget issues behind.

### **Professional Experience (Years in Service) and Subjective Theories**

Only a small number (3 out of 64) of statistically significant differences regarding PE teachers' years in service in relation to their subjective theories about ICT in PE can be reported. This result aligns with the findings by Dogan (2010) that include no difference in teaching experience among non-PE teachers in regard to technology attitudes. Additionally, Gorder (2008) also found no statistically significant gender differences in perceptions based on years of experience in a non-PE teacher population. Furthermore, the temporal stability (Kolbe & Boos, 2009) of the PE teachers' subjective theories is confirmed by the fact that years in service show very small to no impact on the PE teachers' subjective theories.

On the contrary, other studies reported statistically significant relationships and influences between teachers' years in service and attitudes towards technology (Anderson & Williams, 2012; Bakr, 2011; Kahveci, Sahin, & Genc, 2011; Kibirige, 2011). Therefore, it may be inferred that for the population of PE teachers, years in service have a way smaller to no effect on PE teachers' attitudes, beliefs, and subjective theories in regard to ICT in PE.

PE teachers with lesser years in service tended to be more open to the use of ICT in PE depending on ICT availability, as they stated their intention to include ICT in PE if it were available in the subjective theory E5 ("I would absolutely integrate ICT into my PE lessons, if it would be available.").

Years in service showed a reversed effect in the subjective theory CL7 ("I do not use ICT in PE because I am afraid to make a fool out of myself in front of the students."), as PE teachers with a higher amount of years in service were more concerned about their own ICT performance in regard to their reputation with their students. A similar result appeared for the subjective theory CL9 ("My students are better in using ICT than I am."), as PE teachers with a higher amount of years in service have a stronger believe that their students have a higher ICT competence level than they have themselves. PE teachers' years in service, as they stand for age and teaching experience as well, mainly influenced the PE teachers' computer literacy-related subjective theories. This result is expected, as older teachers usually show less computer literacy compared to younger teachers (Asan, 2003; Cavas et al., 2009).

This study's results in the PE teachers' professional experience (years in service) and subjective theories indicate that this study's sample may have a technology-related bias indeed. Taking the interpretations on the above reported results on various aspects of the PE teachers' subjective theories in this study in consideration, a possible negative bias regarding technology use in PE becomes more likely and can therefore be assumed at this point of analysis and interpretation.

### **LIMITATIONS**

This study's sample size (n=57) can't be regarded as a representative sample size, as it is too low compared to the basic population of PE teachers. In addition, PE teachers appeared to be a group that is hard to research, as the participation (questionnaire return rate=47.5%), interest, and turn around time slowed down the data collection process. Another population-based hinderer for larger sample sizes appears in the fact that very numerous schools would have to be involved in data collection, as only a few PE teachers are employed at a single school. However, the other studies that examined PE teachers in this field didn't have large sample sizes either. Ince et al.'s (2006) study included a total of 47 PE teachers, whereas only 19 PE teachers were assigned to the experimental group. Gibbone et al.'s (2010) study included a total of 92 PE teachers, Kretschmann (2012)



and Woods et al. (2008) both investigated a total of 114 PE teachers, M. Yaman (2007b) included a total of 186 PE teachers, and C. Yaman's (2008) study sample contained a total of 191 PE teachers. Comparing this study's sample size to these other studies' sample sizes, this study's sample size is a rather smaller one, but seems to be appropriate to produce significant and valid results. As PETE students are an easier to access population than PE teachers are, sample sizes in ICT-related studies in that population are significantly higher. For instance, Goktas' (2012) sample counted a total of 154 PETE students, the study by M. Yaman (2007a) contained a total of 159 PETE students, and the study by Adamakis and Zounhia (2013) even featured a total of 313 PETE students.

The study's data collection took place in a single area code (area code of Stuttgart, Germany). Therefore, a regional bias may exist. Referring to Dogan (2010), it can be concluded that regional confounders have to be taken into consideration when interpreting findings regarding teachers and PE. Howley, Wood, and Hough (2011) reported that teachers in rural areas showed greater positive attitudes towards technology. Additionally, as schools themselves are a factor of teacher's technology use in classrooms (Afshari et al., 2009), their location and regional idiosyncrasies might as well influence (PE) teacher's beliefs, attitudes, and subjective theories about ICT. Institutional influences on teachers' perceptions are also highlighted in a recent study by Perrotta (2013).

As this study's focus group consisted of secondary school PE teachers only, this study's results may also be limited to this certain grade level and/or school type. Moreover, there is evidence for school levels being a confounder in ICT attitudes of teachers. In a survey of 500 teachers that included different school types (elementary, intermediate, and secondary school), intermediate and secondary school teachers showed significant differences in their attitudes towards e-learning (Aldhafeeri, Almulla, & Alraqas, 2006).

The "if-then" argumentation is regarded as essential as well for "objective" scientific theories and subjective theories, providing an explanation of reality and actions within the real world (Casella, 2012; Groeben & Scheele, 2000). However, not all featured subjective theories in this study were modeled into an if-then phrased questionnaire item. This strategy was chosen in order to widen the potential implications in the study's field of PE teachers and PE. A narrow focus, only using if-then phrases, would have limited the study's scope and wouldn't have mirrored the group discussion's results appropriately. Furthermore, subjective theories have been successfully modeled into non-if-then items in quantitative research before (Müller et al., 2008).

As mentioned before multiple times, the sample may be biased regarding technology use in PE and/or in general. On the one hand, prior studies in PE teachers (Gibbone et al., 2010; Thomas & Stratton, 2006) and PETE students (Goktas, 2012) reported rather positive attitudes towards ICT in general. In addition, most teacher-focused studies showed general positive attitudes towards ICT in educational settings (Charalambous & Ioannou, 2008). On the other hand, M. Yaman (2007a) and Kretschmann (2012) mentioned a negative tendency of PE teachers in terms of routing against ICT in PE. Nevertheless, research has shown that there is evidence of a significant resistance of teachers to using ICT in educational settings (Jamieson-Proctor, Burnett, Finger, & Watson, 2006). For instance, a fifth of a European teachers sample expressed significant skepticism regarding ICT in schools, as they didn't see "significant learning benefits for pupils" (Korte & Hu sing, 2007). There is also evidence of levels of either "technological affinity" or "technological aversion" in teachers (Kahveci et al., 2011), making an argumentation for a sample-specific bias even more plausible. According to Kretschmann (2012), there may also be a country-specific bias distinguishing German PE teachers from other countries PE teachers. Verifying this thought, there is a huge gap between the number of ICT-related publications in PE-related research and practice journals from Germany compared to the ones from the United States (US), leaving the US publication output roughly ten times higher ahead.

## IMPLICATIONS

Previous research on the PE teachers' perspective, including this study, hasn't distinguished between the multiple ICTs available. As the technological development is vividly rapid in its nature, the latest devices and software are also heading into educational uses in the PE setting (Papastergiou, 2010). There is not much to no empirical evidence available on the differences or similarities of PE teachers' views on diverse hardware, software, and their application in PE, although there are plenty of suggestions for PE uses available. For instance, physical measurement devices such as heart rate monitors (Nichols, Davis, McCord, Schmidt, & Slezak, 2009) or pedometers (Cagle, 2004; Pangrazi, 2004), geocaching (Elwood Schlatter & Hurd, 2005), wikis (Hastie, Casey, & Tarter, 2012; Mears, 2009b), social media platforms (Kaluf, 2012), podcasts (Mears, 2009b; Mikat, Martinez, & Jorstad, 2007; Shumack & Reilly, 2011), apps (Cummiskey, 2011), and exergaming (Ennis, 2013; Hicks & Higgins, 2010) are prominent features in recent PE practice literature. The PE teachers' opinions on the use and value in PE for each of these ICT assets may differ as well as its diverse applications.

Previous studies indicated that teachers' beliefs about ICT in the classroom differ from their actual use in the classroom (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). The same mechanism may be assumed as well for PE teachers. Positive attitudes and proficiency in ICTs don't grant wide and rich ICT integration (Bauer & Kenton, 2005). Thus, the relation of PE teachers' view on using ICT in PE and their actual ICT use in PE is still in need to be shed light on. Furthermore, there is no evidence available about the potential change of PE teachers' teaching methods and styles when integrating ICT compared to traditional non-ICT-integrating PE. However, non-PE teachers were likely to sustain and didn't change their existing patterns of teaching practice when integrating technology in their classes (Cuban, Kirkpatrick, & Peck, 2001).

Tsitouridou and Vryzas (2004) reported that teachers perceive technology adoption as an important strategy for improving educational practices. Although there is evidence for a positive relation between teachers' general pedagogical beliefs and their technology use in classes (C. P. Lim & Chai, 2008; Sang, Valcke, van Braak, & Tondeur, 2010), this relationship may or may not be a direct one (Chai & Lim, 2011). However, teachers showing positive views on potential ICT benefits in educational settings may not perceive themselves having sufficient computer literacy (Gulbahar & Guven, 2008), and may show a difference between ICT literacy and pedagogical ICT competence (Banaji, Cranmer, & Perrotta, 2010). Considering these results, there may also be significant differences between general pedagogical beliefs and subjective theories regarding ICT in education, and regarding ICT in PE in the PE teacher population.

Kretschmann (2010, 2012) postulated PE teacher continuing education and PETE being amongst several developmental areas in the field of technology and PE research. Although there are some suggestions for infusing PETE programs with technology available in recent publications (Ayers & Housner, 2008; Baert, 2012; Bechtel, 2010; E. M. Jones et al., 2012; Leight & Nichols, 2012; Mitchell & McKethan, 2003), evaluations using scientific research methodology haven't been performed and/or made public yet. Additionally, trainings on ICT use in PE for in-service PE teachers haven't been in the focus of PE teachers-related publications so far, although there is plenty of research available for teachers of other subjects (Batane, 2004; Guzman & Nussbaum, 2009; Jung, 2005), as teacher trainings focusing on ICT are regarded as a major factor of ICT implementation in schools (Afshari et al., 2009).

PE teachers may be regarded as a special population among school teachers. PE is the only school subject that explicitly has physical activity as teaching and learning content and method (National Association for Sport and Physical Education (NASPE), 2004). Therefore, teaching philosophies and ideologies of PE teachers may be different from other subject teachers, especially in regard to ICT integration (Kretschmann, 2010). Comparing PE teacher populations with non-PE teacher populations might reveal interesting insights according to the teacher's perspective on ICT use in PE and in the classroom. For instance, constructivist approaches have been prominent in PE research (Wallian & Chang, 2007; Wright, Grenier, & Seaman, 2010; Zhu, Ennis, & Chen, 2011), though not in relation to ICT use in PE. General studies in teaching methods showed that teacher beliefs grounded on constructivist approaches had an impact on using ICT for creative thinking and learner-centered activities in the classroom (Prestridge, 2012). This relationship hasn't been investigated for PE so far. As suggested by Kretschmann (2012), there may be two dichotomous poles, separating PE teacher's approaches to ICT in PE. Roughly speculated, there may be PE teachers who naturally adopt and integrate ICT and PE, opposing PE teachers that decline any use of ICT in PE.

Tondeur, Devos, Van Houtte, Van Braak, and Valcke (2009) found that schools having better structural and cultural characteristics had a higher frequency of ICT use. ICT use is therefore also majorly affected by the supportive organizational culture and a collegial work environment (Deaney & Hennessy, 2007). It is likely that not only the actual school' ICT culture and ICT availability, but also the (PE) teachers perceptions of them, influence ICT use in classes. Despite diverse discussion and debate about PE and school culture (Ennis, 2006; Medcalf, Marshall, Hardman, & Visser, 2011; Tripp, Rizzo, & Webbert, 2007), ICT hasn't played a role within this discussion yet.

Whereas this study tackled the PE teachers' perspective, the students' view on ICT and PE is just as important, as they are the recipients of any educational effort. Overall, students' view on ICT is to be regarded as quite positive, both in relevance in the leisure and professional domains (Sharpe, 2004a, 2004b). Various findings from multiple disciplines and subjects show positive opinions and appreciation of ICI adoption in ICT-enhanced classes for various ICT assets such as multimedia and whiteboards (Hall & Higgins, 2005), or technology in general (Becker & Maunsaiyat, 2002; Kubiato, Halakova, Nagyova, & Nagy, 2011; Yu, Lin, Han, & Hsu, 2012). The students' perspective of PE has been researched in-depth (Bernstein, Phillips, & Silverman, 2011; Dyson, 2006; Rikard & Banville, 2006), though not with any emphasis on ICT in PE yet. Hence, a future research question may sound like this: "What do PE students think about integrating technology into PE?"

This study has shed some more light on the PE teacher's perspective on ICT in PE. But the lack of empirical research findings in the area of technology and PE that was stated by Kretschmann (2010; 2012) can still be confirmed. Therefore, more empirical research efforts should be made in this area. In conclusion, a statement by Goktas (2012) can be repeated: "Further studies are needed in the same area using different samples so that more valid and reliable conclusions may be drawn."

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## TECHNOLOGY FACILITATED PBL PEDAGOGY AND ITS IMPACT ON NURSING STUDENT'S ACADEMIC ACHIEVEMENT AND CRITICAL THINKING DISPOSITIONS

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### ABSTRACT

The impact of particular learning environments and self-regulation could be a beneficial area for research focus. More specifically, there has not been sufficient attention given to the role played by disposition or “will” in facilitating self-regulation to be successful. A student can possess the skills or ability to think critically but lack the will or motivation to use those skills. This quasi-experimental study investigated traditional lecture instruction, PBL, and blended problem-based learning (B-PBL) on students’ academic achievement and critical thinking dispositions. The results were compared. The findings revealed that the use of a blended problem based learning strategies had a positive impact on student achievement. However, no significance was found among the groups in critical thinking dispositions for categorical variables at both the pretest and posttest, indicating the need for long-term exposure to B-PBL environments before results could reveal significant changes in attitude towards the usage of critical thinking skills. Recommendations included conducting a longitudinal study and a qualitative study, and further studies be conducted within different disciplines and with different class levels regarding different combinations of using ICT and PBL.

**Keywords:** Technology facilitated learning, PBL Pedagogy, Academic achievement, Critical thinking dispositions

### INTRODUCTION

Educators will influence every single individual who goes out into society and pushes her/his way through the trenches of workforce systems. It is imperative for students to graduate from college having the skills to think critically; in addition, they must have high levels of motivation and high levels of willpower in order to practice critical thinking skills. The workforce environment will require those who can critically think through problems, find solutions, and teamwork with diverse people. This requires high self-regulatory processing in order to cope under these inevitable workforce conditions, not just the skills to do so.

PBL works well as a training vehicle for future environmental problem solvers and supports and sustains critical thinking and analysis, effective communication skills, and can promote the development of lifelong learning skills (Duch et al., 2001). It is, in particular, a powerful way to link the content of higher-education courses to the world outside the academic environment (Amador, Miles, & Peters, 2006).

The cognitive revolution of recent decades has induced the majority of researchers to think in cognitive rather than motivational terms. Few studies have been dedicated to investigating dispositions’ role in self-regulation within a PBL environment. For this study, the researchers chose a blended-learning environment as one of the three areas of study, specifically because of e-campus’s environmental capabilities to offer students more options during the PBL process. E-campus is an online course-management system that allows professors to post grades, information, and assignments. Instructors and students can also hold synchronous discussions via chat rooms. It is an interactive, Web-based educational tool used to supplement or replace traditional classroom learning, transforming courses into blended-learning environments. In addition, e-campus is a Virtual Learning Environment (VLE). It is an electronic tool that can be accessed by computers both on and off campus, and e-campus is used for teaching and also learning support and development. Current research reports the flexible nature of blended-learning environments (Garnham & Kaleta, 2002; Vaughan, 2007). Thus, for this study, students’ academic achievement and self-regulatory processes were analyzed within three different types of learning environments.

There is a need for this study to address the perpetual concern of an ill-prepared workforce, and one can address this issue in numerous ways. The researcher chose to investigate higher education's role in the matter. The instructor's choice of pedagogy invariably affects the dynamic of the classroom in terms of teacher-student interaction. Higher-education students possess the ability to self-regulate; however, how a student self-regulates and to what level depends upon many factors. In addition, clearly, individual students possess the ability to achieve academically, but to what level that student achieves, again, depends upon many factors. One of the factors that can impact a student's academic achievement and self-regulation in diverse ways can be the instructional methodology chosen by the instructor to teach the content of the course. According to Larson and Sung (2009), there is a need to focus research on course design and motivation regarding delivery modes of instruction. This study was designed to investigate the impact of different teaching methodologies and perhaps discover beneficial teaching methods that could potentially play a role in the solution to the perpetual problem of an ill-prepared workforce.

According to Russell et al. (2003), traditional teacher preparation programs need to be altered because of perceived insufficiency. Many faculties of education are undergoing reform, attempting to better prepare teachers for teaching through a standards agenda, including the area of communication and technology (Evertson & Weinstein, 2006). Therefore, during that attempt for change, it is imperative to understand issues of curriculum and instruction. For example, in a PBL design, an important finding to note is the notion that there is a need for more flexibility when conducting PBL courses. Goodnough (2005) concluded that "[i]t may be preferable for each PBL group to have an experienced, full-time tutor; however, in most undergraduate education programs, this is not possible" (p. 299). Reports from students enrolled in a PBL traditional face-to-face classroom explained that when searching for information, the research step of PBL required large amounts of time resulting in slowing down the groups' efforts, causing frustration (Cruickshank & Orlander, 2002). Interestingly, concurrent reports overwhelming revealed time flexibility as being the most well-liked feature from students enrolled in a hybrid course (Garnham & Kaleta, 2002).

Three key points emerged from the abovementioned findings in the research in relation to areas of improvement within higher education's learning environments. These included the need for improvement in higher-education course-curriculum design for learning; the need reported by students for more time when learning, specifically via PBL; and the need for more research in the area of students' motivation/critically thinking levels. This study incorporated investigating a blended problem based teaching methodology and the impact on students' self-regulatory processes.

## REVIEW OF LITERATURE

Individuals have the capability to adjust their behaviors based upon social demands. Regulation means changing a behavior to meet a goal. There are four ingredients to self-regulation, including standards, monitoring, will-power, and motivation. Motivation refers to a drive, urge, or impulse to do something. A student can fail to self-regulate if he does not care about reaching the goal. Heatherton & Vohs (1998) concluded that when selfish motivations emerge, self-regulation can be used to restrain impulses to serve the goal of being accepted by others.

### Problem-Based Learning

Advantages of using a PBL method of instruction include fostering student problem-solving skills, critical thinking skills, and research skills (Camp, 1996). PBL promotes collaborative learning, which allows for small group discussions and reflections (Daiute & Dalton, 1993). It promotes a deep level of processing and learning (Dominiowski, 1998). PBL works well to help develop better problem-solving skills for future workforce employees (Amador et al., 2006).

The most applicable and relative meta-analysis to date, in relation to the field of education, has derived from Walker & Leary (2009). Teacher-education studies results were included within the analysis process of 82 studies, along with allied health, business, engineering, medical education, science, social science, and kinesiology. Forty-seven of the studies fell outside of the medical and allied health field. The researchers were concerned with the type of implementation of PBL and its effects on learning outcomes. The purpose of their analysis was to investigate a variety of disciplines and assessment levels in PBL outcomes. The vote count analysis revealed that 68 studies showed positive outcomes in favor of PBL. Of utmost interest were the teacher-education PBL studies, which revealed positive outcomes. In contrast to those findings were parallel outcomes revealed when comparing PBL and lecture-based outcomes within the discipline of engineering. In addition, the results were not promising in the area of medical education. Walker and Leary explained that teacher-education program developers should be encouraged by these findings, but there is a clear need for additional quantitative,

controlled studies in teacher education. They concluded that concept-level outcomes were mostly parallel between PBL and lecture while findings were positive for PBL at the principle and application level.

Not only is the majority of the research on PBL centered on medical students and gifted education, the minimal amount of studies that exists outside of these two disciplines focuses mainly on areas of flexible knowledge, effective problem solving, critical thinking skills, and self-directed learning skills. PBL has gained much interest of educators because of its potential for motivating students and transference of learning (Hmelo-Silver, 2004). However, studies on the goals of PBL assisting in developing critical-thinking dispositions and motivation are underappreciated in the field of education.

The few studies outside the discipline of medicine included a study conducted by Hmelo in 1995 on students in an engineering PBL course whose factual knowledge and problem-solving skills, when measured, showed increases for both components. Also, in 1998, Schwartz and Bransford conducted a study on students in a PBL psychology course whereas the researchers concluded that students solving problems before the lecture performed better on problem-solving tasks than those students who only read the chapter with lecture or who just solved the problems. This suggests that a particular combination of lecture and PBL could be beneficial for student achievement. In addition, Derry et al. (2002) revealed that students in a pre-service teacher-education course, utilizing video problems and a Web-based information resource, applied more appropriate concepts and produced more refined explanations when measuring learning outcomes of the problem-based assessment.

### **Critical Thinking Dispositions**

In order for successful critical thinking to take place, one must have attained the “will” (disposition) and the “ability” (skills) to evaluate a situation critically. Critical thinking may be distinguished, but not separated, from emotions, desires, and traits of mind. Ideally, one develops critical-thinking skills and at the same time the disposition to use those skills to solve problems and form good judgments; however, unfortunately, simultaneous development of the two cognitive processes does not always transpire. For example, one may be said to have poor thinking skills because he does not have all the relevant information, resulting in common errors in judgment (Facione & Facione, 1997).

Unfortunately, weak-sense critical thinking results when individuals possess intellectual thinking skills in isolation, without the intellectual traits of the mind. Without all the proper information, one may make unjustified inferences, use inappropriate concepts, fail to notice important implications, or make quick assumptions. One’s thinking may be unclear, inaccurate, imprecise, irrelevant, narrow, shallow, illogical, or trivial due to ignorance or misapplication of the appropriate skills of thinking. Conversely, one’s thinking might be said to be poor from the result of a sub-optimal disposition. The dispositional dimension of critical thinking is characterological. The focus for its development would be on the habitual intention to be truth-seeking, open-minded, systematic, analytical, inquisitive, confident in reasoning, and sensible in making judgments. For those who are ambivalent on one or more of these aspects of the disposition toward critical thinking, or who have an opposite disposition (intellectually arrogant, bias, intolerant, disorganized, lazy, heedless of consequences, indifferent toward new information, mistrustful of reasoning, or imprudent) are more likely to encounter problems in using their critical thinking skills, or are even less likely to even engage problems using their critical thinking skills. Failure to recognize the relationship between thinking, feeling, wanting, and traits of mind can easily lead to various forms of closed-mindedness. It is imperative to recognize poor critical thinking dispositions, because without intervention, it can lead to various forms of self-deception, both individually and cooperatively (Facione & Facione, 1997). Strong-sense critical thinking requires intellectual humility, empathy, integrity, perseverance, courage, autonomy, and confidence in reason. Thus, critical thinking without essential intellectual traits often results in clever but manipulative and often unethical or subjective thought. The relationship between critical-thinking skills and critical-thinking dispositions is a concept to investigate. People can have both elements in profusion, while some individuals may have neither the will nor the skills to complete a particular task. Interestingly, some may have skills but not the disposition to use them while some individuals are willing to behave in certain ways but lack strong skills. The key is that the teacher who fosters critical thinking should foster reflection in students by asking questions that stimulate thinking essential to the construction of knowledge, which is what PBL promotes (Facione & Facione, 1997).

### **Blended Learning**

Blended course design is combining aspects of a distance online course with the aspects of a traditional face-to-face classroom course. “Blended learning should be an integration of constructivist teaching methods with face-to-face learning in a classroom within an e-learning environment.” (Donnelly, 2006, p.112).

Numerous researchers are reporting positive results utilizing PBL across disciplines (Schwartz & Bransford,

1998; Derry et al., 2002; Hmelo & Silver, 2004; Downing et al., 2009), additional researchers are reporting positive benefits within blended-learning environments (Aycock, Garnham, & Kaleta, 2002; Fanter, 2002; Dziuban et al., 2004; Garrison & Kanuka, 2004; Williams, 2009; U.S. Department of Education Report, 2009). Higher education must reflect upon technology's role in providing more successful learning environments. It has been suggested that technology may be beneficial in adapting PBL for specific disciplines (Hmelo-Silver, 2004). Larson and Sung (2009) sum it up best with the conclusion that research needs to shift towards how we use the technological medium along with combined factors of course design and student motivation rather than delivery mode. It is critical then, to focus studies on the types of environments provided for learning. It seems logical to investigate constructivist environments, such as implementing the PBL process to present course material, given the reports of positive results, but taking it a step further and investigating the combination of PBL within a blended-learning environment might reveal an even more successful learning environment. In addition, it seems applicable to study the above mentioned within the field of education with findings such as Walker and Leary's (2009) regarding the notion that teacher-education studies utilizing PBL are doing very well when compared to other disciplines. However, in order to create successfully combined learning environments, the issues that have emerged in the past regarding PBL and technology must be addressed.

Goodnough indicated that one major area of weakness regarding PBL course design came from limited time when students were presented course information through PBL. Students reported that time spent locating resources seemed to be an issue of concern whereas 50% of the students reported needing more time to work on their problems, yet others reported needing less time. Fortuitously, a noteworthy point in the area of strength for blended-learning environments was the theme of flexibility that has recently emerged from the research. Researchers explain that students overwhelmingly reported time flexibility as the most well-liked feature of hybrid and blended courses (Fanter 2002; Aycock Garnham, & Kaleta, 2002). Also, Dziuban et al. (2004) concluded, after evaluating several studies related to blended courses that the blended students retain information equal to those enrolled in a traditional face-to-face course. This implies that blended-learning must be strategically combined with successful researched-based teaching methods in order to see positive results utilizing its features when compared to traditional-learning classrooms. It may be extremely advantageous to integrate E-campus into the step-by-step process of PBL and utilize this technology as a tool for forging more successful learning environments.

## THE STUDY

For this study, the research design chosen was a quasi-experimental non-randomized pretest/posttest group design. The purpose of this study was to investigate the impact of students' the "disposition" and the "ability" to evaluate a situation critically and academic achievement after learning within three different environments, which included instructing one group of students in a traditional lecture format, a second group of students within a PBL environment, and a third group of students within a blending PBL environment, allowing the students to use the information communication features of e-campus during the PBL process. The following research questions guided this study regarding the impact of various teaching methods on students' academic achievement and self-regulatory processes.

1. Are there significant differences in academic achievement among students learning via three different teaching methodologies: problem-based learning (PBL), blended problem-based learning (B-PBL), and traditional face-to-face lecture classroom instruction?
2. Are there significant differences in critical thinking dispositions among students learning via three different teaching methodologies: problem based learning (PBL), blended problem-based learning (B-PBL), and traditional face-to-face lecture classroom instruction?

## METHODOLOGY

### Population & Participants

The accessible student population for the study was 150 undergraduate nursing major students enrolled in a regional campus of a science and technology institute in 2014. These students were mostly in their freshman and sophomore year, aging between 18 and 23. They were expected to vary in their educational experience prior to entering the university. English for Nursing Purposes (ENP) is a required course which is offered year-round. Most students take this course during their first or second year of study. An average class size is close to 50 students. The researcher instructed all three classes, however, utilized different instructional methodologies within each of the three sections. Students who took the class were encouraged to participate in the study. Voluntary participation was ensured both through explicit verbal and written explanations. The participants could withdraw from the study at any time and that their participation would in no way influence their academic standing in the class where the questionnaires were distributed. Participants were informed verbally and in

writing that they could decline to answer any items on the questionnaire. The subjects gave their consent by completing and returning the questionnaire. A total of 150 questionnaires were administered and 120 were returned, resulting in a response rate of 80%.

**Instrumentation**

*Comprehensive Exam*

Students were administered one comprehensive course-content pretest and one comprehensive course-content posttest. The pretest/posttest contained 45 questions pertaining to content of the course for the semester. The questions were extracted from the course textbook.

Reliability

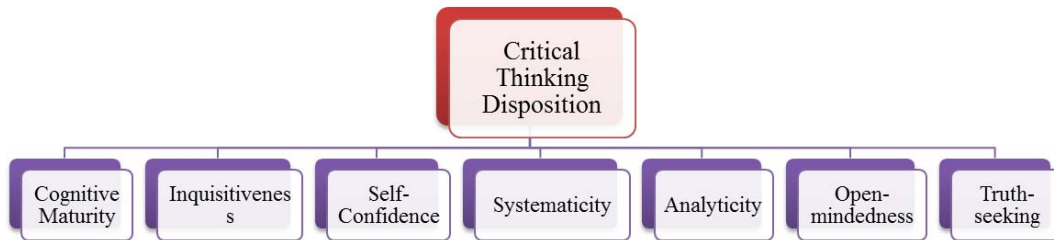
A split-halves method was used to test the reliability the comprehensive exam. The researchers asked 30 students who agreed to participate. The Spearman-Brown coefficient revealed .76, indicating a strong reliability and is suitable for evaluating individuals if averaged with several other scores of similar reliability. In addition, a Cronbach’s alpha reliability test, an internal consistency reliability test, revealed a good reliability coefficient of .85.

Validity

Chapter questions extracted from the concepts within the course textbook that have been created by experts in the field of English for Specific Purposes (ESP), and several long-term full-time professors and lecturers of the Department of Nursing. To establish the content validity of the items in the pretest/posttest comprehensive exam, experts in the fields of Applied English and Nursing were asked to help identify content necessary for assessment of academic achievement. They were also asked to validate the content of the instrument and review for things such as unclear instructions, confusing, ambiguous or repetitive items, and/or overly complex or difficult sentence structure. The researchers then revised the instrument based on the constructive feedback received from the reviewers.

*The California Critical Thinking Disposition Inventory*

According to the Mental Measurements Yearbook, the California Critical Thinking Dispositions Inventory (CCTDI) was designed to assess the affective, attitudinal dimension of critical thinking. The recommended use of the inventory is for student assessment and program evaluation. It was stated that the CCTDI is not a measure of critical-thinking ability or skills; however, it is a self-report instrument designed to assess measures of personal attitudes and attitudes characteristic of the ideal critical thinker. For example, a person may value being objective, but not be able to achieve objectivity, or a person may be disposed toward approaching problems analytically or in an evaluative manner but lack the ability to adequately use the critical-thinking skills required to do so (Merker, 2007). Figure 1 below illustrates the conceptual framework of CCTDI.



**Figure 1.** Conceptual framework of CCTDI

Reliability

According to Facione et al. (2000), the internal consistency reliability for the seven individual scales in their initial CCTDI pilot sample ranged from .71 to .80, with the alpha reliabilities for the total score on the CCTDI. Cronbach alpha’s are reported as falling between .90 and .91 across college students.

Validity

The content validity of the test was based on claims of the items derived from the consensus of 46 theoreticians regarding the dispositional dimension of critical thinking. An original set of 150 statements was reduced to 75 based on the psychometric performance of the items on a pilot version of the instrument. The team of developers for this instrument examined the relationship between the CCTDI and other cognitive constructs. For construct validity, significant relationships were observed between the disposition toward critical thinking and the construct’s openness to experience and ego resiliency. Correlations with these constructs and the CCTDI scales



ranged from .25 to .47 ( $p < .001$ ), indicating low to moderate association between the variables under investigation.

*Teaching/ Learning Context*

Traditional Face-to-Face Procedures

Pretests of comprehensive exam and the California Critical Thinking Disposition Inventory (CCTDI) were administered during week two of this 18-week course. The traditional face-to-face format of instruction consisted of the instructor lecturing while covering chapters one through eight of the course textbook. The instructor lectured, utilizing PowerPoint presentations in addition to distributing PowerPoint handouts to the students during each session. Regarding assessment, during each chapter section, there were some small group (non-PBL) work activities related to the chapters along with outside homework assignments of reading the text chapters and journal-entry review assignments. Each review assignment required the students to read additional information beyond the text, yet related to the chapters. Throughout the semester, students completed a total of four (4) quizzes, each covering two lessons in the textbook. During week seventeenth, students were administered the CCTDI questionnaire posttest. During the week of the finals, a comprehensive exam administered covering chapters one through eight of the text, which was the posttest for this study. Students were asked not to study for this final exam, as the result would not count towards their final grade.

PBL Procedures

The PBL format of instruction consisted of the same instructor taking on the role of the facilitator. A comprehensive course-content pretest and a CCTDI pretest were also administered during week two. Students were divided into groups of five. Each group was assigned the same problem over which they researched and collaboratively discussed. The students worked on problem-based assignments for two to three class periods, depending upon the length of the chapter.

Students completed part of the problem-based process in the computer lab. In addition, there was one class period dedicated to teacher-led PowerPoint whole-group discussion relative to each chapter, following total completion of the problem-based assignment corresponding to the chapter. According to Schwartz and Bransford (1998), students solving problems before the lecture performed better on problem-solving tasks than those students who just solved the problems.

A modified “Seven Jump” for PBL was used for this study. Students received problems each week relative to the chapter of the course textbook. The modified “Seven Jump” process required the students to complete a six step PBL process. First of all, the students defined the problem. Secondly, they brainstormed ideas and solutions to problems in order to activate prior knowledge. Third, they developed learning issues or questions about which they would like to gain new knowledge. Fourth, they researched individually to primarily find a solution to the problem. During the research stage, students were provided with handouts of links to look up on the World Wide Web. The fifth step involved the group reconvening, in order for discussion of findings. All five steps were completed during a two-hour class period. The following class period was scheduled for whole group discussion. Between the PBL assignment and whole group discussion, the students completed the sixth step. This step required the participants to individually write a one-page journal entry, explaining how their group decided to solve the assigned problem, during their in-class collaboration step of the PBL process. Students submitted a one-page reflection at the beginning of the following class discussion period. These procedures were consistently followed for each of the eight problems, relative to textbook chapters, presented over the 18-week semester. Table 1 below illustrates a sample English for Specific Purposes (ESP) class format of a conventional PBL. In week seventeenth, students were administered the CCTDI questionnaire posttest. During the final’s week, students were again administered a comprehensive course-content posttest covering chapters one through eight of the text.

**Table 1.** Sample Class Using A Conventional PBL Format on *Oncology* unit

PBL Step	Class Period/ Place/ Duration	Procedures
	Before Class	1. Students will read a medical column/admission note relative to the chapter/unit. 2. Problems provided to students before class, i.e. <ul style="list-style-type: none"> <li>● What is the Oncology Unit?</li> <li>● What are different types of cancer?</li> <li>● What are the stages of tumor development?</li> <li>● How is cancer treated?</li> <li>● What are some possible side effects of Chemotherapy? Etc.</li> </ul>

1 (Define)	Class 1/ Classroom & Lab./ 2 hrs	1. Watch Video Clips of (Hawthorne and/or ER) 2. Students define the problems received prior to class
2 (Brainstorm)		Students brainstorm ideas and solutions to activate their knowledge.
3 (Develop)		Students develop learning issues/questions about which they'd like to gain knowledge, i.e. <ul style="list-style-type: none"> <li>● Conduct an admission interview</li> <li>● Communicate with the patients during hospitalization</li> <li>● Talking about side effects after treatment</li> <li>● Discharge teaching</li> <li>● Language useful for explaining medication</li> </ul>
4 (Research)		Students research individually to find solutions to the problem(s).
5 (Reconvene)		Group members reconvene to discussion their findings
6 (Discuss)	Class 2/ Classroom/ 2 hrs	Whole group discussion, including completion of a collaborative one-page reflection.

**Blended-Problem-Based Learning (B-PBL) Procedures**

Pretests of comprehensive course-content and CCTDI were administered in week two. The B-PBL environment required the students to follow the same PBL steps; however, the approach was diverse. The main difference for the B-PBL process was the flexible nature of technology, allowing for more time and a break between steps. The theme of PBL flexibility issues reported from the research (Cruikshank & Orlander, 2002; Goodnough, 2005) was taken into account with the notion that students indicated needing more time for thorough completion of the PBL process. The students did not complete all five steps of the PBL process in one class period as described above in PBL group. Rather, the B-PBL students were allowed the opportunity to complete steps 1-4 only at their own pace during the entire two-hour class session, depending upon the length of time each group needed to work. Step 5 of PBL process was separated from the other steps and completed outside of class within E-campus's chat room. This type of blended teaching methodology offered the groups an opportunity for more time to complete the PBL process based upon how their group operated and completed tasks, lowering frustration levels.

In addition to using the chat room feature of E-campus, students used supplemental information communication features of E-campus. They used the discussion forum to post questions and times for students to meet regarding their PBL assignments, allowing for alternative communication outside the classroom. Also, during the B-PBL process, students used the technological convenience of E-campus's information-communication features to download PowerPoint presentations, PBL assignment sheets, and research links. During the research stage, students were provided with links through E-campus's posting features, which served a purpose to save time during the in-class step 4. After completing the chat session step 5 from the students' computers at home, the students were asked to write a collaborative group reflection as step 6 as their homework assignment. Students were given a CCTDI posttest and a final comprehensive test in their designated time.

***Data Analysis***

The statistical data analysis used for the comprehensive exam data scores were parametric statistical techniques. The CCTDI is a self-report instrument designed to assess students' affective, attitudinal dimension of critical thinking.

**MANOVA / ANOVA /ANCOVA**

The dependent variables for this study were academic achievement and critical-thinking dispositions. The independent variables were three different instructional modalities, including traditional face-to-face lecture, PBL, and B- PBL. In order to test for statistical differences, an ANOVA was used on the pretest/posttest comprehensive exam for the three groups of students being taught via different teaching methodologies. A Multivariate analysis (MANOVA) was used on the pretest/posttest subcategory scores relative to self-regulation. MANOVA was initially run to test for significant differences at the pretest for the CCTDI. When significant differences were noted among the groups at the pretest, the researcher must consider the Analysis of Covariance (ANCOVA), given that the sample population was not randomly selected. Statistical analysis was performed using the most current version of Statistical Package for Social Sciences (SPSS) for Windows.

**FINDINGS**

Research question one asked: "Are there significant differences in academic achievement among students

learning via three different teaching methodologies: problem-based learning (PBL), blended problem-based learning (B-PBL), and traditional face-to-face lecture classroom instruction?”

Table 2 shows the descriptive statistics for students’ academic achievement scores on the comprehensive exam. The B-PBL group had the highest mean average of 79.13, while the traditional group had the lowest mean average score of 65.34 on the posttest.

**Table 2.** Descriptive Statistics Comprehensive Exam Pretest/Posttest Scores for Academic Achievement

	Group	Mean	SD	n
Pretest Academic Achievement	PBL	21.17	8.30	40
	B-PBL	25.48	8.68	39
	Traditional	24.10	8.51	41
Posttest Academic Achievement	PBL	70.37	10.71	40
	B-PBL	79.13	12.50	39
	Traditional	65.34	11.62	41

No statistically significant differences were found by the ANOVA test on students’ pretest scores. However at the end of the study, based upon posttest scores, as illustrated in table 3, the groups were significantly different,  $F = 10.83, p < .05$ .

**Table 3.** ANOVA for Comprehensive Exam Pretest/Posttest Scores for Academic Achievement

		Sum of Squares	f	Mean Square	F	Sig.
Pretest	Between Groups	295.002	2	147.501	2.042	.14
	Within Groups	6284.598	117	72.237		
Posttest	Between Group	2935.098	2	1467.549	10.825	.00*
	Within Groups	11795.002	117	135.575		

A post hoc Tukey HSD multiple comparison test was necessary to determine group differences after significant differences in scores were revealed. Table 4 illustrates the data for the Post Hoc Tukey HSD individual between group comparisons at the posttest for academic achievement. There was a significant difference between the B-PBL group and the PBL group at the posttest with  $p < .05$ . The B-PBL teaching methodology was shown to have a significant impact on the students’ academic achievement posttest scores. In addition, the B-PBL group had significantly higher posttest scores than that of the PBL and the traditional groups.

**Table 4.** Tukey HSD Post Hoc - Individual Comparisons between Groups at Posttest for Different Teaching Methodologies Impact on Academic Achievement (n=120)

Time	Group(I)	Group(II)	Mean Difference	Sig.
Posttest	B-PBL	PBL	8.76	.01*
	PBL	Traditional	5.02	.23
	B-PBL	Traditional	13.78	.00*

Research question two asked: “Are there significant differences in critical thinking dispositions among students learning via three different teaching methodologies: problem based learning (PBL), blended problem-based learning (B-PBL), and traditional face-to-face lecture classroom instruction?” The purpose of question two was to determine what kind of impact problem based learning, blended problem based learning, and traditional methods of instruction had on students self-regulation skills, and more specifically to determine the impact of these three different teaching methods on students’ attitudes and attributes of how “willing” and able they are to think critically.

CCTDI overall scores below 240 were considered very low scores for undergraduate university populations. Scores ranging between 240 and 350 indicated that the student was transmitting inconsistent attitudes towards or vague assessment of higher order thinking. These mid-level scores were characteristic of students whose cognitive development was still evolving. At the pretest, the PBL group’s overall mean scores ( $M = 278.93$ ), the B-PBL group’s overall mean scores ( $M = 285.84$ ), and the traditional group’s overall mean scores ( $M = 282.90$ ) were all indicative of mid-level scores and students expressing ambiguous valuation of higher order thinking. At the posttest, the PBL group’s overall mean scores ( $M = 280.13$ ), the B-PBL group’s overall mean scores ( $M = 286.00$ ), and the traditional group’s overall mean scores ( $M = 283.34$ ) were all, once again, indicative of mid-

level scores and students expressing ambiguous valuation of higher order thinking. Table 5 shows results of the MANOVA used to determine if students' pretest and posttest scores on the CCTDI were significantly different among the PBL, B-PBL and Traditional groups. The results indicated no significant differences among the groups in critical thinking dispositions for truth-seeking, open-mindedness, analyticity, systematicity, confidence, inquisitiveness, and maturity at both the pretest and posttest.

**Table 5.** Multivariate Tests - MANOVA Pretest / Posttest Scores for the CCTDI

Effect	Value	F	Hypothesis df	Error df	Sig.
Pretest Pillai's Trace	.17	1.10	14.00	168.00	.36
Posttest Pillai's Trace	.16	1.00	14.00	164.00	.45

## CONCLUSIONS

This quasi-experimental study was designed to investigate the impact of different teaching methodologies on academic achievement and critical thinking dispositions of the undergraduate nursing major students. The findings for academic achievement of course content revealed higher scores for all groups from pretest to posttest. The B-PBL showed statistically significant higher test scores over the PBL and traditional group at the posttest. However, no significance was found among the groups in critical thinking dispositions for categorical variables at both the pretest and posttest. Blended problem based learning strategies did not have a positive impact on critical thinking dispositions.

Consistent negative reports, acknowledging the deficiencies of new entrants and an ill-prepared workforce should be a major concern of higher education. It is critical for higher education to be more strategic and focused on efforts to scrutinize potential solutions to these deficiencies. Higher education instructors have the choice as to what methods of instruction they would like to expose their students to that could potentially help with the reported deficiencies. An instructor's choice of teaching method is an important factor for determining successful learning environments. For example, the PBL choice of teaching method has been known to foster successful learning environments for critical thinking skills for medical students. However, numerous researchers report both positive and negative results utilizing PBL across disciplines (Schwartz & Bransford, 1998; Derry et al., 2002; Hmelo & Silver, 2004; Goodnough, 2005; Downing et al., 2009). Much of the negative feedback from students regarding PBL revolve around time limitations. Because negative feedback exists in the research from students regarding time limitations within PBL environments, it is critical to address this issue.

In regards to blended learning environments, where technology is used in combination with face to face learning, researchers are reporting positive benefits within blended-learning environments (Aycock, Garnham, & Kaleta, 2002; Fanter, 2002; Dziuban et al., 2004; Garrison & Kanuka, 2004; Williams, 2009; U.S. Department of Education Report, 2009). Higher education must reflect upon technology's role in providing more successful learning environments in conjunction with other teaching methods, for example, PBL. It has been suggested that technology may be beneficial in adapting PBL for specific disciplines (Hmelo-Silver, 2004). Larson and Sung (2009) sum it up best with the conclusion that research needs to shift towards how we use the technological medium along with combined factors of course design and student motivation rather than delivery mode. The focus for this study was the impact of three different types of teaching methodologies on students' academic achievement and self -regulation. One of the three teaching methodologies chosen for this study was designed specifically in order to investigate the impact of utilizing PBL in conjunction with information communication technology. Technology was used in conjunction with problem based learning as a strategy to allow for flexibility in this particular study. In this case, the delivery mode of technology was not studied, but rather how the technological medium combined with problem based learning impacted student's academic achievement and critical thinking dispositions.

Dispositions are affinities or tendencies to use obtainable existing skills. Students who develop critical thinking dispositions are prone to use critical, reflective thinking during problem solving and analysis across various domains (Facione , Facione, & Giancarlo 2000). It is worth mentioning that a student's ability is not sufficient to predict how he or she will act. Critical thinking dispositions are part of an attitude memory that can take considerable experience and time for the development of that attitude strength. PBL can facilitate the development of attitudes towards using critical thinking skills given that PBL allows students to have a stake in their own learning and share multiple perspectives on problem solving with others. The results of the study revealed no significant differences in critical thinking dispositions scores between groups at the pretest or posttest. Tiwari et al, 2006, found significant differences in critical thinking dispositions between a PBL group

and traditional lecture group during a two- year period with contact exposure of 3 to 6 hours per week, while each group was facilitated by a PBL tutor. After a total of 2 years of PBL treatment, results indicated that students in the PBL group scored significantly higher than the traditional group on two of the seven subscales, which were truthseeking and analyticity. The findings from the current study did not support that of Tiwari et. al's. A possible explanation for this finding could indicate the need for long-term exposure to B-PBL environments before results could reveal significant changes in attitude towards the usage of critical thinking skills. In addition, students may need to receive more one-on-one guidance from an individual tutor during the PBL process. For the current study, the instructor was the only professional support provided for the students during the PBL process. Individual tutors were not provided during the online chat or during the in-class discussions.

### RECOMMENDATIONS FOR FUTURE STUDY

The findings of the present study indicated that the use of blended problem based learning enhanced academic achievement. One recommendation would be to obtain and analyze data from a larger population accomplished through a longitudinal study. For example, expose two different groups of students, one to the B-PBL group described in this study, and one to a different combination of PBL and blended learning techniques. Exposure to the two environments should be for an extended period of time, such as, over a 2-year period and then test students' critical thinking dispositions in a course.

This study was restricted by an education curriculum and three groups of college nursing students. Further studies could be conducted within different disciplines and with different class levels regarding different combinations of using ICT and PBL. Another recommendation would be to conduct a qualitative study on student's views regarding the usage of E-campus as part of the PBL process. For example, subjects could be asked about their feelings regarding group work pros and cons during E-campus chats. In addition, how students felt about the B-PBL methodologies of instruction could give educators some insight into why certain critical thinking elements were or were not significantly enhanced in the B-PBL group.

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## THE EFFECTS OF “LIVE VIRTUAL CLASSROOM” ON STUDENTS’ ACHIEVEMENT AND STUDENTS’ OPINIONS ABOUT “LIVE VIRTUAL CLASSROOM” AT DISTANCE EDUCATION

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### ABSTRACT

This study was performed to investigate the effects of live virtual classroom on students’ achievement and to determine students’ opinions about the live virtual physics classroom at distance learning. 63 second-year Distance Computer Education & Instructional Technology students enrolled in this study. At the live virtual physics classroom, the instructor presented physics lessons. Midterm, final and make-up scores were examined after the LOC instruction. Students who are LOCFE (n=32), joined over 50 % percent and they had significantly higher scores than students who are LOCFR (n=31), joined below 50 % percent to the lessons. According to t-test result, LOCFE group more successfully than LOCFR group ( $p=.006^*$ ). In addition, the interviews carried out with students to determine students’ opinions about the live virtual physics classroom and the results were evaluated, classified and discussed several essential considerations about virtual classrooms.

**Keywords:** Distance education, virtual classroom, live virtual physics classroom

### INTRODUCTION

Distance education is a field of education that focuses on, technology and incorporated in delivering education to students who are not physically “on site” to receive their education (Potashnik & Capper, 1998). Distance education is going to become more popular and accepted approach for education in the modern age. Several considerations have led to wide acceptance and sustained growth of distance education in all over the world. First, it is recognized that education is a key factor in economic development and social change (Rashid & Elahi, 2012). Distance education activities are designed to fit the specific context for learning, the nature of the subject matter; need and goals of the learner, the learner’s environment and instructional technologies methods.

Use of the web based instruction for educational purposes is widespread and rapidly growing. Thousands of university courses have been developed for delivery entirely via the web. This approach accelerates more colleges and universities urge faculty to create online versions of their courses (Dutton et al., 2002). Online course is one of the most dynamic and enriching forms of distance learning that exist today. Online course is a subcategory of distance education, which has been defined as the formal delivery of instruction in which time and geographic location separate students and instructors (Holmberg, 1989; McIsaac & Gunawardena, 1996; Verduin & Clark, 1991).

A virtual classroom is an online learning environment (Wang & Newlin 2012). Characteristics of online courses are a type of distance education. The delivery format goes by a number of names: e-learning, Internet learning, distributed learning, networked learning, tele-learning, virtual learning, or web-based learning (WCET, 2004). Online synchronous learning is, in many ways, similar to a physical classroom. For example, both physical and virtual classrooms allow for immediate feedback, interactions with instructor and peers, and guided exercises to motivate and increase student learning. Collis (1996) outlined four equally compelling advantages of synchronous systems in an instructional context.

- Motivation synchronous systems provide motivation for distance learners to keep up with their peers.
- Telepresence real time interaction fosters development of group cohesion and a sense of community.
- Good feedback synchronous systems provide quick feedback and support consensus and decision-making in group activities.
- Pacing synchronous events encourage discipline in learning and help students prioritize their studies.

With synchronous systems, an instructor can assess students’ levels of knowledge and tailor the course material appropriately. In addition, the inclusion of a scheduled time adds the perception (or reality) that the instructor and classmates are providing external motivation and are encouraging students’ participation, which can result in higher retention and completion rates (Schullo et al., 2007).

From the student perspective, synchronous systems allow for immediate feedback in the form of “just-in-time clarification and information”. This feedback is particularly helpful when dealing with abstract concepts. The

ability to talk with other class participants and instructors in real time can enhance the interaction that other forms of communication cannot (Pan & Sullivan, 2005).

The online virtual classroom has another advantage as interactions which are learner-content, learner-instructor, and learner-learner in the online environment (Hillman et al., 1994; Miltiadou & Savenye, 2003; Moore, 1989; Riel & Harasim, 1994). Synchronous technologies can add value to teaching and learning models, either as a supplement or replacement for face-to-face or asynchronous learning (Schullo et al., 2007). Many researchers have indicated that interaction in the distance course and considered it as an important factor that can influence the success or failure of a course (Kearsley, 1995; Keegan, 1988; Moore, 1989; Miltiadou & Savenye, 2003; Ross, 1996; Tsui, 1996; Vrasidas & McIsaac, 1999). Kearsley (1995) find out that a high level of interaction has positive effects at distance learning courses. Moore (1989) examined distance course's interaction types. Tsui and Ki (1996) indicated that students interacted more frequently over the course of the semester, as they became more comfortable using technology and more successfully.

In the light of these findings this study was aimed to investigate the effects of live virtual classroom on students' achievement at distance learning and to determine students' opinions about the live virtual physics classroom at distance education in Istanbul University.

## **METHODS**

### **Purpose of the research**

The purpose of this study is to investigate the effects of live virtual classroom on students' achievement at distance education. In the context of this study, "Is live virtual classroom effective in terms of student achievement at distance education?" research question was investigated and examined.

### **Participant and procedure**

The participant of this study was 63 second-year Distance Department of Computer Education & Instructional Technology students. At the live virtual physics classroom, the instructor presented one-dimensional motion, Newton mechanic, force concept, two-dimensional motion, energy conservation and momentum subjects in each week. Students were able to ask questions to instructor at the misunderstanding points and the instructor had solved physics problems in detailed online with students. In addition, students could follow the recorded lessons whenever they want.

In this study, to investigate the effects of live virtual classroom on students' achievement at distance learning; midterm, final and make-up exam scores of students were examined after the live virtual physics classroom (LVPC) implementation.

In addition, the interviews carried out with students to determine students' opinions about the live virtual physics classroom at Istanbul University. The interviews were recorded and reported by 3 experts. Students' responses were evaluated and similar responses were classified within the scope of the study. Some examples of these responses were presented in the study.

### **Findings**

In order to investigate the effects of live virtual classroom on students' achievement at distance learning, students' midterm exam, final exam and make-up scores were examined in detailed and the results were presented for *Live Virtual Physics Classroom Followers Rarely (LVPCFR)* and *Live Virtual Physics Classroom Followers Frequently (LVPCFF)* groups under the 3.1. and 3.2. sub-headings as follows.

#### **Live Virtual Physics Classroom Followers Rarely (LVPCFR) Findings**

In the analysis of the live virtual physics classroom data, *Live Virtual Physics Classroom Followers Rarely (LVPCFR)* group's content following numbers, live virtual physics classroom following numbers, scores and grade frequencies according to months during the semester were determined and graphs were presented.

**Table 1.** LVPCFR group’s numbers of content following, numbers of live virtual physics classroom following, scores and grade frequencies

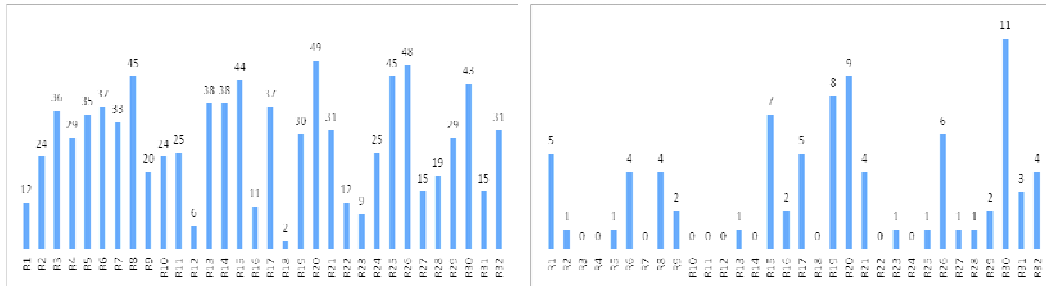
Line	Student Score and Grade						Number of Content Following					Number of Live Virtual Physics Classroom Following								
	Student Group (LVPCFR)	Midterm Score	Final Score	Make-Up Score	Average Score**	Letter Grade (Final)	Letter Grade (Make-Up)	Result	September	October	November	December	January	Total	September	October	November	December	January	Total
1	R1	65	25	40	48	FF	FF	FF	0	0	2	0	10	12	0	0	1	0	4	5
2	R2	70	40	50	56	FF	BB	BB	9	8	7	0	0	24	0	1	0	0	0	1
3	R3	50	45	70	64	FF	BA	BA	3	13	8	0	12	36	0	0	0	0	0	0
4	R4	60	45	NE*	50	FF	-	FF	0	1	18	1	9	29	0	0	0	0	0	0
5	R5	50	47	67	64	FF	BA	BA	0	8	15	2	10	35	0	0	0	0	1	1
6	R6	45	30	35	38	FF	FF	FF	5	19	7	2	4	37	0	2	0	0	2	4
7	R7	75	60	NE*	65	BA	-	BA	1	5	19	2	6	33	0	0	0	0	0	0
8	R8	55	50	NE*	52	CB	-	CB	0	8	25	0	12	45	0	0	4	0	0	4
9	R9	45	30	NE*	35	FF	-	FF	0	8	11	0	1	20	0	1	1	0	0	2
10	R10	20	25	40	34	FF	FF	FF	0	18	6	0	0	24	0	0	0	0	0	0
11	R11	80	45	60	66	FF	BA	BA	4	1	3	15	2	25	0	0	0	0	0	0
12	R12	35	40	45	42	FF	FF	FF	3	0	3	0	0	6	0	0	0	0	0	0
13	R13	50	75	NE*	68	BA	-	BA	0	3	16	0	19	38	0	1	0	0	0	1
14	R14	70	40	45	53	FF	FF	FF	0	10	25	0	3	38	0	0	0	0	0	0
15	R15	50	67	NE*	69	BA	-	BA	2	17	4	18	3	44	0	7	0	0	0	7
16	R16	45	45	45	45	FF	FF	FF	0	2	9	0	0	11	0	2	0	0	0	2
17	R17	90	20	55	67	FF	BA	BA	2	6	18	6	5	37	0	0	4	1	0	5
18	R18	50	55	NE*	54	CB	-	CB	0	0	2	0	0	2	0	0	0	0	0	0
19	R19	45	35	40	42	FF	FF	FF	4	14	7	2	3	30	0	3	1	2	2	8
20	R20	70	65	NE*	67	BA	-	BA	0	0	39	1	9	49	0	0	9	0	0	9
21	R21	83	20	57	65	FF	BA	BA	4	12	13	0	2	31	0	2	2	0	0	4
22	R22	35	40	50	46	FF	CC	CC	0	0	11	1	0	12	0	0	0	0	0	0
23	R23	40	45	50	47	FF	CC	CC	0	0	9	0	0	9	0	0	1	0	0	1
24	R24	95	52	NE*	64	BA	-	BA	2	14	5	4	0	25	0	0	0	0	0	0
25	R25	82	58	NE*	66	BA	-	BA	0	11	24	3	7	45	0	0	0	1	0	1
26	R26	85	55	NE*	64	BA	-	BA	4	23	15	5	1	48	0	2	2	2	0	6
27	R27	65	30	25	41	FF	FF	FF	2	9	4	0	0	15	0	1	0	0	0	1
28	R28	75	25	45	54	FF	FF	FF	3	4	6	1	5	19	0	1	0	0	0	1
29	R29	75	35	45	54	FF	FF	FF	2	12	3	11	1	29	0	1	1	0	0	2
30	R30	65	20	35	44	FF	FF	FF	0	18	16	3	6	43	0	5	3	2	1	11
31	R31	85	20	57	69	FF	BA	BA	3	5	6	1	0	15	0	1	2	0	0	3
32	R32	60	40	40	46	FF	FF	FF	0	10	9	3	9	31	0	0	0	0	4	4

NE\*: Not Entered

Average Score\*\*: 30% Midterm + 70% Final / Make-Up Score

LVPCFR: Live Virtual Physics Classroom Followers Rarely

As seen in Table 1.; when examined LVPCFR group’s the lowest and the highest scores were determined. Student who was numbered as 14 followed content and Live Virtual Physics Classroom, 38 and 0 respectively. Student numbered as 30 followed content and Live Virtual Physics Classroom, 43 and 11 respectively. The both of students failed at the distance physics course.



**Figure 1.** LVPCFR group’s numbers of content following, numbers of live virtual physics classroom following, scores and grade frequencies

It was shown in Figure 1, general frequency distributions of LVPCFR Group’s Content Following (Total) and Live Virtual Physics Classroom Following (Total) during the semester.

**Live Virtual Physics Classroom Followers Frequently (LVPCFF) Findings**

In the analysis of the live virtual physics classroom data, *Live Virtual Physics Classroom Followers Frequently (LVPCFF)* group’s content following numbers, live virtual physics classroom following numbers, scores and grade frequencies according to months during the semester were determined and graphs were presented.

**Table 2.** LVPCFF group’s numbers of content following, numbers of live virtual physics classroom following, scores and grade frequencies.

Line	Student Score and Grade							Number of Content Following					Number of Live Virtual Physics Classroom Following							
	Student Group (LVPCFF)	Midterm Score	Final Score	Make-Up Score	Average Score**	Letter Grade (Final)	Letter Grade (Make-Up)	Result	September	October	November	December	January	Total	September	October	November	December	January	Total
1	F1	65	50	NE*	55	CB	-	CB	0	17	12	18	3	50	0	4	4	20	0	28
2	F2	45	25	35	38	FF	FF	FF	0	1	27	0	24	52	0	0	0	0	1	1
3	F3	60	60	NE*	60	BB	-	BB	11	26	45	16	4	102	0	0	1	3	0	4
4	F4	55	30	50	52	FF	CB	CB	2	19	28	4	21	74	0	7	7	1	0	15
5	F5	80	75	NE*	77	AA	-	AA	2	19	19	15	9	64	0	11	5	2	0	18
6	F6	90	40	75	80	FF	AA	AA	3	19	22	23	15	82	0	3	7	5	3	18
7	F7	70	45	55	60	FF	BB	BB	1	2	47	10	34	94	0	1	5	11	4	21
8	F8	70	55	NE*	60	BB	-	BB	7	28	35	13	15	98	0	3	10	3	0	16
9	F9	91	42	74	83	FF	AA	AA	13	30	16	26	0	85	0	4	0	13	0	17
10	F10	70	40	30	49	FF	FF	FF	12	20	26	14	1	73	0	4	0	10	0	14
11	F11	60	60	NE*	60	BB	-	BB	9	28	9	9	7	62	0	0	0	2	1	3
12	F12	75	65	NE*	68	AA	-	AA	12	27	36	15	4	94	0	16	9	13	0	38
13	F13	90	30	35	52	FF	FF	FF	17	20	34	3	4	78	0	5	0	0	1	6
14	F14	89	42	73	84	FF	AA	AA	8	8	25	29	12	82	0	2	4	2	4	12
15	F15	90	40	73	79	FF	AA	AA	10	31	4	4	3	52	0	10	0	3	0	13
16	F16	90	38	75	80	AA	AA	AA	0	2	15	47	1	65	0	0	5	1	0	6



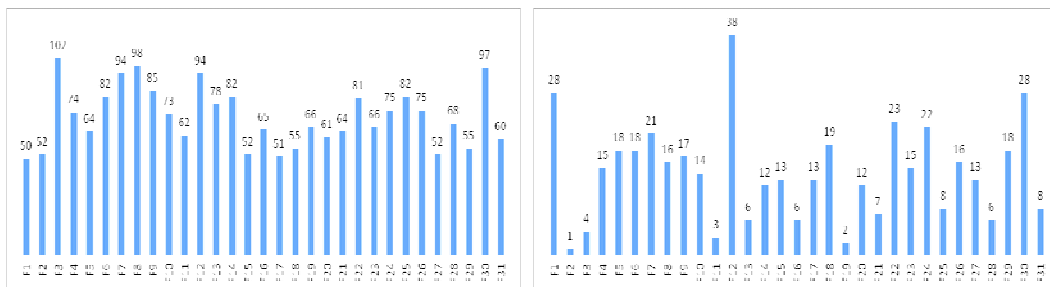
17	F17	50	40	40	43	FF	FF	FF	3	21	18	9	0	51	0	4	3	6	0	13
18	F18	45	25	30	35	FF	FF	FF	6	7	17	7	18	55	0	1	5	0	13	19
19	F19	60	25	30	39	FF	FF	FF	15	19	28	0	4	66	0	0	0	0	2	2
20	F20	60	50	NE*	53	CB	-	CB	16	8	27	2	8	61	0	0	0	5	7	12
21	F21	60	40	50	53	FF	CB	CB	0	2	24	11	27	64	0	0	2	4	1	7
22	F22	65	50	NE*	55	CB	-	CB	0	55	9	0	17	81	0	21	0	0	2	23
23	F23	60	45	NE*	50	FF	-	FF	0	33	13	12	8	66	0	6	3	6	0	15
24	F24	65	40	50	55	FF	CB	CB	19	16	28	6	6	75	0	8	12	0	2	22
25	F25	60	55	NE*	57	BB	-	BB	0	14	32	13	23	82	0	1	5	1	1	8
26	F26	50	25	50	50	FF	CB	CB	8	18	21	8	20	75	0	1	7	3	5	16
27	F27	78	80	NE*	81	AA	-	AA	6	21	19	4	2	52	0	4	8	1	0	13
28	F28	82	74	NE*	77	AA	-	AA	9	15	18	15	11	68	0	0	1	5	0	6
29	F29	30	25	30	30	FF	FF	FF	2	16	20	12	5	55	0	0	9	5	4	18
30	F30	90	72	NE*	79	AA	-	AA	14	26	24	17	16	97	0	9	4	9	6	28
31	F31	60	55	NE*	57	BB	-	BB	5	10	13	15	17	60	0	1	0	1	6	8

NE\*: Not Entered

Average Score\*\*: 30% Midterm + 70% Final / Make-Up Score

LVPCFF: Live Virtual Physics Classroom Followers Frequently

As seen in Table 2; when examined LVPCFF group’s the lowest and the highest scores were determined. The student who was numbered as 2 followed content and Live Virtual Physics Classroom, 52 and 1 respectively. The student numbered as 12 followed content and Live Virtual Physics Classroom, 94 and 38 respectively. While student 2 failed at distance physics course, student 12 finished physics course with the highest score.



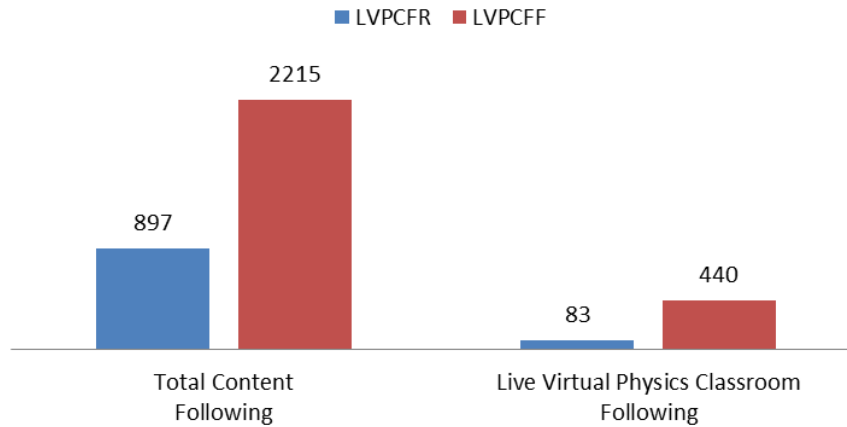
**Figure 2.** LVPCFF Group’s content following (total) and live virtual physics classroom following (total) frequencies during the semester as scale.

It was shown in Figure 2, general frequency distributions of LVPCFF Group’s Content Following (Total) and Live Virtual Physics Classroom Following (Total) during the semester.

**Table 3.** Comparison of LVPCFR and LVPCFF groups’ scores of students’ according to independent group t-test results.

Groups	Mean	N	Std. Deviation	Std. Error Mean	Independent group t test		
					t	SD	p
LVPCFR	49,12	31	17,006	3,006	-2,859	61	,006*
LVPCFF	65,74	32	27,980	5,025			

As shown in Table 3.; LVPCFF group had significantly higher mean score (65,74) than LVPCFR group’s mean score (49,12) during Live Virtual Physics Course and independent group t-test results showed that there was statistically significant difference between LVPCFF and LVPCFR groups’ scores (p= ,006\*).



**Figure 3.** The comparison between the LVPCFR and LVPCFF groups were presented according to general frequency distributions of content following (total) and live virtual physics classroom following (total) during the semester.

In addition, the comparison between the LVPCFR and LVPCFF groups were presented according to general frequency distributions of Content Following (Total) and Live Virtual Physics Classroom Following (Total) during the semester in Figure 3.

### Interview Findings

There are three open-ended questions in the interview form, which are as follows: (1) “What do you think about the live virtual physics classroom?”, (2) “Which factors effected your success in the live virtual physics classroom? and (3) “Which points of the live virtual physics classroom did you like the most?”. Some examples of data obtained in the analysis of the responses are briefly listed below:

*“Although the physics lessons are boring and difficult, I enjoyed the lessons and it encouraged me to do my homeworks”*

*“It effected my understanding the subject to be part of solving problems during the live virtual physics classroom”*

*“It was the most important factor of the live virtual physics classroom on my success that I could follow lessons over and over again”*

*“The instructor solved problems about the subjects and I could asked my questions to him whenever I need at the live virtual physics classroom”*

When the similar responses obtained in the interviews are classified, two main opinions become prominent, as follows: (1) Live virtual classroom is highly desirable and (2) To be able to access the recorded live virtual physics classroom at any time by students were the most important factors of students’ success. These results indicate that the students were generally positively affected by the live virtual physics classroom at distance education.

### CONCLUSION

The purpose of this study is to investigate the effects of live virtual classroom on students’ achievement at distance learning. In order to investigate the effects of live virtual classroom on students’ achievement at distance education, students’ midterm exam, final exam and make-up scores were examined in detailed. According to data analysis, it was found that LVPCFF group had significantly higher mean score (65,74) than LVPCFR group’s mean score (49,12) during The Live Virtual Physics Classroom and independent group t-test results showed that there was statistically significant difference between LVPCFF and LVPCFR groups’ scores ( $p = ,006^*$ ). According to the findings, it was seen that LVPCFF group more successful than LVPCFR group.

According to the interviews results, it was seen that students had two main opinions as follows: (1) live virtual classroom is highly desirable and (2) To be able to access the recorded live virtual physics classroom at any time by students were the most important factors of students’ achievement. These results indicate that the students

were generally positively affected by the live virtual physics classroom at distance education. As mentioned before, live virtual classroom has the advantage of being able to show an image of the speaker, three dimensional objects, motion, and preproduced video footage. The unique advantage of live virtual classroom is that they provide for two-way interaction between the instructor and the students (McIsaac & Gunawardena, 1996). According to data analysis and student's interview results support to importance of live virtual classroom on distance education.

As indicated at previous researches, an important advantage in using recorded live virtual classroom is that students can exercise “control” over the programming by using the stop, rewind, replay, and fast forward features to proceed at their own pace. Recorded live virtual classroom is also a very flexible medium allowing students to use the recorded live virtual classroom at a time that is suitable to them. Students can repeat the material until they gain mastery of it by reflecting on and analyzing it (McIsaac & Gunawardena, 1996). According to Jason (2001), students view the use of the virtual classroom as an ease of accessibility. It is much easier with the information posted on the Web because it is available 24 hours a day. Distance learning courses can be done anywhere and at any time. Students can view this information without having to contact the instructor (Posey et al., 2010). In this context, data analysis and student's interview results show that providing the recorded live virtual classroom in distance education has positively effected on students' success. As shown in this study, our findings support previous works of researchers (Miltiadou & Savenye, 2003; Potashnik & Capper, 1998; Riel & Harasim, 1994; Verduin & Clark, 1991; Vrasidas & McIsaac, 1999) about importance of live virtual classroom and it is clear that the live virtual physics classroom has played a critical role in students' achievement at distance education.

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## THE EFFECTS OF MULTIMEDIA AND LEARNING STYLE ON STUDENT ACHIEVEMENT IN ONLINE ELECTRONICS COURSE

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### ABSTRACT

This experimental study investigated the effects of multimedia preferences and learning styles on undergraduate student achievement in an adaptive e-learning system for electronics course at the Yogyakarta State University Indonesia. The findings showed that students in which their multimedia preferences and learning style matched with the way the material presented in online electronics course have higher scores significantly compared to those in which their learning mode were mismatched. The difference happened both in adaptive and non-adaptive online courses.

**Keywords:** multimedia, learning style, adaptive, electronics course, e-learning

### INTRODUCTION

Empirical studies have shown that individual one-on-one tutoring is the most effective mode of teaching. Individual tutoring allows learning to be highly individualized and consistently yields better outcomes than other methods of teaching (Hock, 2001). Because individual tutoring logistically and financially is impossible for all students in a traditional classroom situation, numerous kinds of computer programs have been developed for teaching in the form of Computer Assisted Instruction (CAI) and Computer Based Training (CBT). Students can learn individually with these computer systems. Although both CAI and CBT may be somewhat effective in teaching students, they do not provide the same kind of individualized attention that a student would receive from a human tutor. In these systems the instruction is not individualized to the student needs. They do not take into account the student's knowledge, learning style, preferences and other characteristics. The same teaching material is presented to every student in the same way regardless of his or her prior knowledge and experience.

This limitation has prompted a new generation of educational systems known as Intelligent Tutoring Systems (ITS). An important feature of ITS is their ability to adapt the presentation of material to a student's needs. They can adapt instruction dynamically to the different levels of student's knowledge. These systems obtain their intelligence and adaptivity by adopting pedagogical rules about how to teach as well as using information about the students. ITS design is founded on fundamental assumptions on learning that individualized instruction is far superior to classroom style learning because the instruction can be adapted for each student (Jerinic, 2000).

ITS have not been so popular in schools, because of problems such as high development cost, hardware dependency, installation and delivery problems. Integration of the traditional ITS and web technology has supposedly resolved these problems. Along with the advances of computer technology, more ITS researchers found it practical to develop an ITS and a learning material in electronic form. This is known as adaptive hypermedia and it has become a new field of research.

Adaptive educational hypermedia, which is a particular application of AHS in education, is a recently established area of research integrating technologies of CAI, ITS and hypermedia systems. There are at least two reasons driving the advances of educational adaptive hypermedia. First, educational hypermedia applications are typically used by much more heterogeneous users than any standalone computer-based learning application. Any web-based learning system that is designed for a specific group of users may not suit other users. Second, generally the user of web based educational hypermedia is working without any assistance from teachers, as would be the case in a traditional classroom situation.

An adaptive e-learning system (AES) has been developed for electronics course for undergraduate students in Yogyakarta State University (Surjono, 2007a), (Surjono, 2007b). The adaptivity mechanism that is used in the system to decide whether a student will get a certain learning mode is very simple. As it was described in the system design, students have to fill out the questionnaires when the first time accessing the adaptive course. The questionnaire contains questions that ask the tendency of learning styles and multimedia preferences.

It is known that a mismatch between student learning styles and the way the material is presented (as reflected by teacher teaching styles) can lead to poor student performance. A mismatch between the teacher's and learner's styles may hinder the learning process.



A number of researchers have investigated the improved performance of students whose learning styles matched the presentation mode. Ford and Chen (2001) have found significant differences in performance on conceptual knowledge for students learning in matched and mismatched conditions. Performance in matched conditions was significantly higher than that in mismatched conditions. Bajraktarevic et al. (2003) has suggested that significantly higher results were obtained for the matched session compared with the mismatched session.

This study investigated whether students in which their actual multimedia preferences and learning style (learning mode) matched with the way the material presented in online electronics course have higher achievement scores compared to those in which their learning mode were mismatched. The comparison was also made both in adaptive and non-adaptive online courses.

### **MULTIMEDIA PREFERENCES**

There are many definitions of multimedia available. Typical examples define multimedia as “the use of multiple forms of media in a presentation” (Schwartz and Beichner, 2003), “a combination of text, graphics, animation, pictures, video, and sound to present information in a coherent manner” (Singh, 2003), and “the integration of media such as text, sound, graphics, animation, video, imaging into a computer system” (Jonasses, 2003). Vaughan (2011) defined multimedia as a class of computer-driven interactive communication systems which create, store, transmit, and receive textual, graphic and auditory networks of information. All of these definitions agree that multimedia is the integration of more than one medium in a computer system to present information.

A research study was conducted to investigate the effectiveness of multimedia instruction (Najjar, 1996). Students in the control group studied the learning materials in a classroom or lecture, combined with hands-on experiment. Students in the experimental group studied the material via multimedia-based instruction. The result indicated that student achievement was higher in the experimental group. Motion effect in animation creates illusion of movement which helps to explain abstract concepts. Computer graphics are effective for gaining attention and can encourage students to create mental images that in turn make it easier for them to learn certain types of information (Rieber, 1996).

Research conducted by Asoodeh (1993) showed that subjects who used animated visuals scored significantly higher on mental rotation tests than those who used static visuals. The use of graphics, charts and diagrams describes the relationship between pictures and words in a learning environment. Presenting learning materials in graphical form can encourage students to use mental skills in a more effective way. Arnheim (1994) suggested that visual learning can increase students understanding of abstract concepts because a student’s perception of ideas can be enriched by visual example. Therefore, visuals can promote development of perceptual thinking.

The use of multimedia in a computer based learning system is expected to increase student understanding with particular materials. However, an excessive use of multimedia may or may not improve the learning effectiveness. In order for multimedia to be effective, it should only be used in certain situations. Applying multimedia in every situation uses a lot of resources but does not necessarily provide a desirable result. Singh (2003) suggests that multimedia should be used only:

- when students have low prior knowledge;
- when students have low motivation;
- when multimedia is effectively designed.

### **LEARNING STYLE**

There are various definitions of learning style from the literature. According to James and Blank (1993) learning style can be defined as the complex manner in which learners most efficiently and most effectively perceive, process, store and recall what they are trying to learn. McLoughlin (1999) summarizes the term of learning style as referring to adopting a habitual and distinct mode of acquiring knowledge. In addition, Honey and Mumford (1992) have defined learning style as the attitudes and behaviours which determine an individual’s preferred way of learning.

Riding and Cheema (1991) surveyed a number of learning style constructs and classified them into two broad categories: wholist-analytical and verbaliser-imager. The wholist-analytical category describes how individuals process information. Wholists prefer to learn material globally, while analysts are likely to process information in details. The verbaliser-imager describes how individuals represent information. Verbalisers prefer to present information in words, while imagers tend to present information in pictorial form. According to Felder et al. (1991), wholist and serialist are known as global and sequential; while verbalise and imager are known as verbal and visual.

There are a wide variety of instruments available for the measurement of learning styles. These include:

- Honey and Mumford’s Learning Styles Questionnaire
- Grasha-Riechmann Student Learning Style Scales
- Felder’s Index of Learning Styles

Honey and Mumford’s Learning Styles Questionnaire is a widely used inventory learning style developed by Honey and Mumford (1992). The inventory suggests that there are four types of learner falling into two categories:

- Activists and reflectors
- Theorists and pragmatists

The Grasha-Riechmann Student Learning Style Scales (GRSLSS) were developed in the early 70’s to identify and categorize the following styles of learners (2002):

- Competitive and collaborative
- Avoidant and participant
- Dependent and independent

The Felder’s Index of Learning Styles focuses on aspects of learning styles significant in engineering education and has four dimensions (1991):

- Visual-verbal
- Sequential-global
- Active-reflective
- Sensing-intuitive

**LEARNING MODE**

Learning mode is a combination of learning style and multimedia preference that is used in the adaptive e-learning system (AE) in this study [3]. Students have their own learning styles (ls) and multimedia (mm) preferences that can be obtained through online questionnaires. Depending upon the questionnaire scores, the AES will present the learning materials with one of four possible learning modes, i.e.: *Global-Multimedia*, *Global-nonMultimedia*, *Sequential-Multimedia* and *Sequential-nonMultimedia*.

Any possible questionnaire result related to the ls dimension is shown in Table 1 (Surjono, 2006).

Table 1. Possible questionnaire results for LS dimension

Answer “a” (sequential)	Answer “b” (global)	Result (b – a)	Preference interpretation
0	11	11	Very strong preference toward global mode
1	10	9	
2	9	7	
3	8	5	Moderate preference toward global mode
4	7	3	Little preference toward global mode
5	6	1	
6	5	-1	
7	4	-3	Little preference toward sequential mode
8	3	-5	
9	2	-7	
10	1	-9	Moderate preference toward sequential mode
11	0	-11	
			Very strong preference toward sequential mode

There are six possibilities of the ls preference interpretation ranging from “very strong preference for global mode” to “very strong preference for sequential mode”. A student who has a positive result (1 to 11) indicating that his or her learning style tendency is global will be given a presentation in global mode. On the other hand, a student who has a negative result (-1 to -11), indicating that his or her learning style tendency is sequential, will be given a presentation in sequential mode.

Any possible questionnaire result related to the mm dimension is shown in Table 2 (Surjono, 2006).

Table 1. Possible questionnaire results for MM dimension

Answer “a” (multimedia)	Answer “b” (non-multimedia)	Result (b – a)	Preference interpretation
0	11	11	Very strong preference toward non-multimedia mode
1	10	9	
2	9	7	
3	8	5	Moderate preference toward non-multimedia mode
4	7	3	Little preference toward non-multimedia mode
5	6	1	
6	5	-1	
7	4	-3	Little preference toward multimedia mode
8	3	-5	Moderate preference toward multimedia mode
9	2	-7	
10	1	-9	
11	0	-11	Very strong preference toward multimedia mode

There are six possibilities of the mm preference interpretation ranging from “very strong preference for non-multimedia mode” to “very strong preference for multimedia mode”. A student who gets a positive result (1 to 11) indicating that s/he has verbal learning tendency will be given a presentation of the learning material without any additional multimedia resources. On the other hand, a student who gets a negative result (-1 to -11), indicating that s/he has a tendency towards visual learning, will be presented learning material with additional multimedia resources.

Presentation style used in the AES is a two-state variable that is defined as the way that the material is presented: this can be either sequential (where material is presented in a set unchangeable sequence) or global (where the various sections of the material are available for direct access, so that the user can pick and choose). Multimedia mode is also a two-state variable that allows material to be presented with optional multimedia artefacts in the form of film clips or animated schematics. Learning style will be referred to as ls and multimedia mode will be referred to as mm.

The additional multimedia resources are presented to the student who has a tendency of visual learning regardless of his or her ls values. The student can access navigation buttons of the multimedia features located at the bottom of the learning material page. The multimedia resources offered to the intended student include music, video clip and flash animation.

**RESEARCH METHOD**

The research was carried out using a randomized pretest-posttest control group experimental design. This design consisted of an experimental group and a control group. Employing this design minimized possible threats to internal validity such as history, maturation, instrumentation, regression, and selection. A total of 67 students agreed to participate voluntarily in the experimentation. The random assignment technique resulted in 34 students being in the experimental group and 33 students in the control group.

The experimental treatment used in this study was accessibility to the AES for students in the experimental group. As a comparison, students in the control group were provided accessibility to the NON-AES. The AES and NON-AES contained the same learning material, exercises and tests that are covered in an electronic course called Analogue Electronics for first-year second-semester undergraduate students at the Department of Electronics at Yogyakarta State University. The syllabus of Analogue Electronics implemented in the systems includes 7 chapters and had to be learned by the students for seven weeks with 2 hours access each week. An advanced multilevel statistical analysis was used to investigate the effects of the learning mode on student achievement.

**RESULTS**

In the NON-AES, students cannot change the learning mode by configuring different options of learning style and multimedia availability. The system provides a fixed default setting for the learning mode, which is a sequential and non-multimedia presentation. In order to do an analysis within the NON-AES group, additional data is required concerning actual student’s preference towards the learning style and multimedia. Since the NON-AES was not designed to have questionnaires that can be accessed online, the data was collected manually

through a printed version of questionnaires. The questionnaires are used to obtain the actual learning mode (ls and mm) preferences of students.

The printed questionnaires results consisting of ls and mm values were compared to the NON-AES ls and mm default values which are ls = 0 and mm = 0. Two variables were created to accommodate this comparison: suited\_ls and suited\_mm. The categories are as follow:

- suited\_ls = 1, if their actual ls preference is equal to 0.
- suited\_ls = 0, if their actual ls preference is equal to 1.
- suited\_mm = 1, if their actual mm preference is equal to 0.
- suited\_mm = 0, if their actual mm preference is equal to 1.

The analysis is to examine the effect of suited\_ls and suited\_mm variables (learning style and multimedia mode suitability) on the test scores over repeated measures within the NON-AES group only. This analysis will answer the following research question: “Do students who study using the NON-AES in which their actual learning mode preferences are suited to the system perform better than those who are not suited?”

A research hypothesis that will be tested following the analysis result can be defined as follow: “Students who study the learning material in the NON-AES in which their actual learning mode preferences are suited (suited\_ls = 1 and suited\_mm = 1) will achieve higher test scores than those who study the same material in the same system in which their preferences are not suited (suited\_ls = 0 and suited\_mm = 0).”

Using the multilevel statistical analysis, an optimum model can be plotted to illustrate the relations of each score mean corresponding to respective learning mode over the repeated measures. Figure 1 shows score mean of students among learning mode over repeated measures.

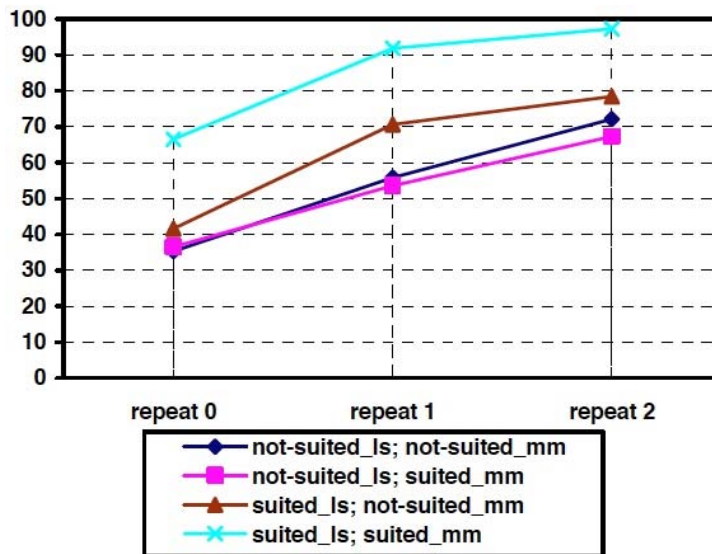


Figure 1. Comparison of score means for suited/unsuited learning mode in NON-AES

From the hypothesis testing, there is enough empirical data to reject the null hypothesis at the significance level of  $p = 0.05$ . It can be concluded that students who learn using the NON-AES in which their learning mode is suited have higher test score at repeat 0 and repeat 1 than students using the same system in which their learning mode is not suited.

Even though the AES allows students to change their learning mode, some students may not realize that either they need to do this or that the system can do this, because the students have only a limited on-line time during the experimentation. Consequently, the way the system presents the learning material may not match with their actual learning mode preferences. In order to reveal their actual learning mode preferences, they were asked to answer a printed version of questionnaires where the completion time was not limited.

The printed questionnaires results consisting of ls and mm values were compared to their learning mode from profile when they use the AES. Two variables were created to accommodate this comparison: suited\_ls and suited\_mm. The categories are as follows:

- suited\_ls = 1, if their actual ls preference is equal to their ls stored in the profile.
- suited\_ls = 0, if their actual ls preference is not equal to their ls stored in the profile.
- suited\_mm = 1, if their actual mm preference is equal to their mm stored in the profile.
- suited\_mm = 0, if their actual mm preference is not equal to their mm stored in the profile.

The analysis is to examine the effect of suited\_ls and suited\_mm variables (learning style and multimedia mode suitability) on the test scores over repeated measures within the AES group only. This analysis will answer the following research question: “Do students who study using the AES in which their actual learning mode preferences are suited to their profiles perform better than those who are not suited?”

A research hypothesis that will be tested following the analysis result can be defined as follow: “Students who study the learning material in the AES in which their actual learning mode preferences are suited (suited\_ls = 1 and suited\_mm = 1) will achieve higher test scores than those who study the same material in the same system in which their preferences are not suited (suited\_ls = 0 and suited\_mm = 0).”

Using the multilevel statistical analysis, an optimum model can be plotted to illustrate the relations of each score mean corresponding to respective learning mode over the repeated measures. Figure 2 shows score means of students with learning mode over repeated measures.

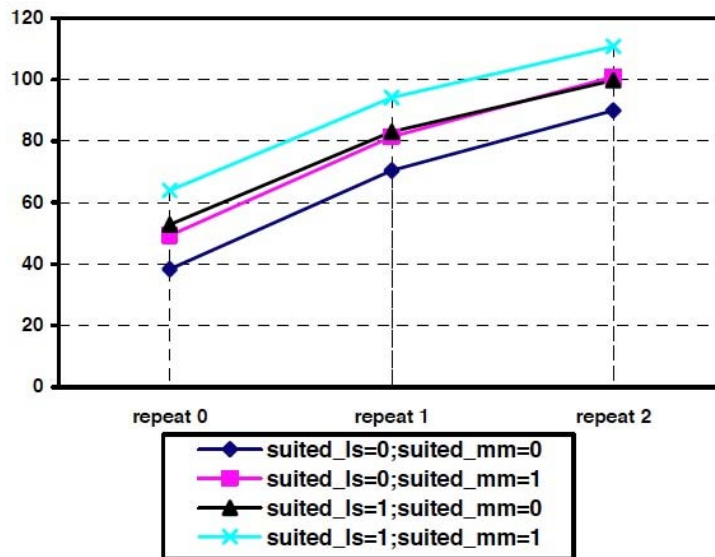


Figure 2. Comparison of score means for suited/unsuited learning mode in AES

From the hypothesis testing, there is enough empirical data to reject the null hypothesis at the significance level of  $p = 0.05$ . It can be concluded that students who study using the AES system in which their learning mode is suited have higher test score at repeat 0, repeat 1 and repeat 2 than students who study using the same system in which their learning mode is not suited.

## CONCLUSIONS

In an non-adaptive e-learning system, students in which their actual multimedia preferences and learning style matched with the way the material presented in online electronics course have higher achievement scores compared to those in which their learning mode were mismatched.

In an adaptive e-learning system, students in which their actual multimedia preferences and learning style matched with the way the material presented in online electronics course have higher achievement scores compared to those in which their learning mode were mismatched.



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## THE EFFECTS OF ONLINE PEER ASSESSMENT AND FAMILY ENTREPRENEURIAL EXPERIENCE ON STUDENTS' BUSINESS PLANNING PERFORMANCE

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### ABSTRACT

*Problem Statement:* In recent years, many educators and researchers in the field of education have made efforts to leverage the advantages provided by online peer assessment, leading to its extensive application in a range of domains, particularly higher education. However, studies on the roles of the reviewer and author in online peer assessment are often limited to student perceptions and feelings, rather than empirical data and it remains unclear how these influence learning. It is essential to determine which role benefits students more, or whether both roles together contribute to learning. In addition, the business experience of the parents to have a significant influence on the entrepreneurial spirit of the children. Therefore, entrepreneurial experience of the family and learning modes should be considered together when exploring students' business planning writing performance.

*Purpose of Study:* This study explores whether the performance of students in business planning classes is influenced by the roles they play in the review process (reviewer, author or both) as well as by the entrepreneurial experience of their families

*Methods:* This study recruited 128 students from two fourth year elective classes in entrepreneur management at a university in northern Taiwan. The non-equivalent group quasi-experimental design was utilized to compare the quality of business plans written under three assessment modes. a 3x2 ANCOVA was used to investigate the interaction between the assessment mode and entrepreneurial experience of the family. The dependent variables indicated the quality of the business plans measured according to the seven business plan assessment criteria.

*Findings and Results:* Results showed the learning effectiveness of those in the reviewer group is far more successful than for those in the author group. Our results also showed that if the student's family had entrepreneurial experience, the learning gains of the peer group would be better than those of the other two groups.

*Recommendations:* Researchers who are interested in this issue might continue to explore the topic through the following: (1) investigate whether results differ in different educational settings or with different cultural backgrounds; (2) perform similar studies in different disciplines and compare their results with those of this study. (3) To overcome the practical difficulties in observing the continued entrepreneurial actions of students, researchers could encourage students to participate in entrepreneurial competitions within or outside of campus, to better observe entrepreneurial performance after the business planning course.

**Keywords:** online peer assessment, entrepreneurship, business plan, higher education, peer observation and feedback.

### INTRODUCTION

Peer assessment often enhances the quality of the learning process, trains critical thinking ability, and increases learner autonomy (Falchikov and Goldfinch, 2000; Pope, 2001). In recent years, many educators and researchers in the field of education have made efforts to leverage the advantages provided by online peer assessment, leading to its extensive application in a range of domains, particularly higher education (Van den Berg, Admiraal and Pilot, 2006; Wen and Tsai, 2008).

Peer assessment involves students' evaluating the work of their peers and providing feedback, including quantitative ratings or qualitative suggestions on how to improve performance (Orsmond, Merry and Callaghan, 2004). In the process of peer assessment, students play the roles of reviewer (assessor) and author (assessee). They learn to judge the quality of performance through observation and analysis and comparison of one work with others. The process of giving and receiving peer feedback may even compel students to revise and re-evaluate their own work.

In such an environment, additional feedback is provided, because the process of reviewing is not limited to the teacher. Furthermore, feedback from one's peers differs fundamentally from that of instructors, providing students with greater flexibility in evaluating the meaning and value of peer feedback and deciding whether to revise their work accordingly. Students have the opportunity to communicate with the reviewers, which enhances their awareness of the assessors' viewpoint and evaluation (Katstra, Tollefson and Gilbert, 1987). All of this combines to enhance the intention of writing and to motivate students to excel.

However, implementing peer assessment into the traditional teaching environment can be a complex and time consuming process, due to the difficulties involved in the collection and delivery of data (Davis, 2000). Furthermore, preserving anonymity to relieve social pressure is essential to maintain the reliability of the peer assessment process. Zhao (1998) found that maintaining anonymity between the reviewer and author encourages students to provide more suggestions and increases the usefulness and authenticity of their feedback.

Internet technology provides the opportunity for online peer assessment, which assists in overcoming many of the obstacles involved in traditional peer assessment, particularly those associated with anonymity. Sung et al. (2003), based on the observation of 34 undergraduate students, reported that online peer assessment has a positive influence on learning. Li and Steckelberg (2005) examined the impact of anonymous online peer assessment on the quality of WebQuest projects prepared by students in a teacher training program. The results revealed that students with experience in peer assessment outperformed those without.

Although the benefits of online peer assessment have been confirmed by studies such as those by Sung et al. (2003), there is a variety of factors that impact the effectiveness of online peer assessment. For example, Grasse and Person (1994) showed that learning achievement is positively related to the quality of the questions asked during online peer assessment. Controlling the quality of questioning to reflect on students' learning could further enhance the effectiveness of the peer review process (Davis, 2000). Identifying other possible factors that influence the learning outcomes of online peer assessment is a topic worthy of further investigation.

In this study, observational learning and self-regulated learning are adopted as a theoretical basis for the online peer assessment activities (Bandura, 1997; Lai & Law, 2006; Schunk, 2001). Peer observation and feedback are crucial to the online peer assessment process (Liu & Lee, 2013). Students assume the roles of both author and reviewer simultaneously. As a reviewer, they have to provide suggestions based on evaluation criteria, inspect and learn from others via observational learning, and then make adjustments to their own work. As an author, they receive peer feedback and then revise their work based on the feedback. Peer feedback can be seen as the scaffolding to support students to be able to complete their assignments. Since this feedback is formative in nature, it has the clear potential to foster the subsequent learning process. Through this process, students gradually develop into self-regulated learners. From a self-regulated learning perspective, it is critical to develop self-observation skills that can be used to compare the information gathered from observation to attain a performance goal. Sub-processes related to self-judgment are important. They are regarded as the steps in a learning monitoring process that helps learners to bring their behavior in line with their performance and goals (Schunk, 2001).

Studies on the roles of the reviewer and author in online peer assessment are often limited to student perceptions and feelings, rather than empirical data and it remains unclear how these influence learning. It is essential to determine which role benefits students more, or whether both roles together contribute to learning. Li, Liu and Steckelberg (2010) provided empirical data on how the roles of reviewer and author impact learning. The results indicate that when controlling for the quality of the initial projects, there is a significant relationship between the quality of the peer feedback students provided and the quality of their own projects. However, whether students played the roles of both reviewer and author in this instructional experiment and the interaction of these roles was not taken into account; therefore, estimates of effectiveness are biased. To overcome this shortcoming, we divided students into three groups: reviewers, authors, and peers. Finally, research into online peer assessment has tended to focus upon educational courses; therefore, in this study the focus is on the writing of business plans, which has seldom been explored in previous studies.

There are many cases of successful business ventures begun by university students, which have encouraged other students to engage in entrepreneurial activities. Klinger and Schündeln (2011) demonstrated that the development of a business plan is a key factor in entrepreneurial training. Since the 1970's, the development of business plans has been regarded as a core component of business training and entrepreneurial education (Hills, 1988; Finkle, Kuratko, & Goldsby, 2006). Honig (2004) described how many reputable American universities encourage students to participate in business plan contests and take pride in those who win. Russell, Atchison and Brooks (2008) noted that developing entrepreneurial skills is the top priority of governments seeking to

encourage business innovation. Business plan contests also enhance the confidence of participants and initiate the formation of networks for future business ventures.

It has also been shown that family experience starting a business has a strong influence on the entrepreneurial motivation of the offspring of such families. For example, Ooi, Selvarajah, and Meyer (2011) found that the occupation of the mother had a significant influence on the entrepreneurial attitudes of university students in Malaysia. Wang and Wong (2004) found that if the family of university students in Singapore had a background in management, the students would have greater aspiration to start a new business. Kirkwood (2007) conducted semi-structured interviews with 50 entrepreneurs. They found the business experience of the parents to have a significant influence on the entrepreneurial spirit of the children. It has been noted in other studies that the occupation of parents has a significant effect on the entrepreneurial intentions of the students (Ali, Topping and Tariq, 2011; Gurol and Atson, 2006; Zampetakis and Moustakis, 2006). This study explores whether the performance of students in business planning classes is influenced by the roles they play in the review process (reviewer, author or both) as well as by the entrepreneurial experience of their families, focusing on the following questions:

1. Is there a correlation between the assessment scores submitted by instructors and those submitted by students? How does this assessment process enhance the student's progress? Is there a difference in impact on learning performance for the various roles? Which role has the best learning effect?
2. Does the entrepreneurial experience of the family influence how students develop the writing of business plans?

## METHODOLOGY

### *Participants*

This study recruited 128 (72 males and 56 females) students from two fourth year elective classes in entrepreneur management at a university in northern Taiwan. Sixty-five percent of the participants were business management majors, with the remainder majoring in a variety of other disciplines (e.g., Information Technology, Design, and Applied English). The students were divided into three groups: 64 were placed in the peer group and 64 were placed in the reviewer and author groups. Although the sample size was relatively small, the students covered a wide demographic including a variety of academic backgrounds. All of the students wrote business plans. The descriptive statistics for the sample were as follows: the average age was 22.1 years, 61% of the participants were female, and 39% of the participants worked at least part-time during the semester.

### *Online Peer Assessment Activities in the Course*

This study was conducted from mid-term to the end of the semester (approximately two months). A modified two-round procedure was adopted in which the students were divided into three groups: reviewer group, author group, and peer group. Of the 128 students, 64 were placed in the peer group and 64 were placed in the reviewer and author groups. When students in the latter group logged into the Moodle system (the e-learning platform), they were randomly assigned to the reviewer and author groups. Business plans from the author group were randomly assigned to students in the reviewer group. Business plans in the peer group were assigned to other peers. The identity of authors and reviewers remained anonymous during the review process. Teachers managed students' accounts and tracked the peer assessment process.

Students were required to finish the first version of the business plan and upload it to Moodle within seven days of the beginning of the course. The business plans underwent three rounds of review and two rounds of modification. Each business plan had to be refined two times and submitted three times. In this period, students in the reviewer and peer groups had to review the plans and provide feedback based on the criteria of business planning. Students in the author and peer groups revised their business plans according to the peer feedback. Students in the reviewer group on the other hand, revised their business plans based on feedback from instructors (only quantitative scores). The first revised business plans (second version) were then uploaded to the Moodle platform. The second revision (third version) was completed in a similar manner. The reviewer group and peer group performed their final assessment and offered feedback during the last week.

Given the different roles of the three groups, their tasks and modes of assessment were different (see Table 1). The modes of assessment associated with the three groups are described below.

- Reviewer group: this group played the role of "provider". After reading the business plans from the author group, they gave a total score to each business plan based on seven assessment criteria and provided comments. Students in this group revised their business plans based on the scores given by the teacher.
- Author group: this group played the role of "recipient". They did not need to review or assess the business plans of others; they only revised their own work according to the comments from the reviewer group

- and returned the revised versions for further consideration.
- Peer group: this group played both roles: “provider” and “recipient”. Students were paired up in this group, giving scores and comments on each other’s business plans according to the seven assessment criteria.

Table 1: *Three modes of student assessments*

	Reviewer	Author	Peer
Role of assessment	Provider	Recipient	Dual roles
Revision basis	Feedback from the teacher (only scores)	Feedback from the reviewer group	Feedback from peers

Assessment scores and feedback were given three times in this three-round review procedure. The data were analyzed and an attempt made to sum up which mode of assessment was more effective for learning. The three-round scores of instructors were adopted for the analysis of data. To prevent differences in the prior knowledge of students from affecting the experimental results and leading to inaccurate conclusions, the scores from the first round were utilized as prior knowledge (covariance) to eliminate the impact of this effect.

**Criteria for Assessing Business Plans**

To assess the pros and cons of the written business plans please refer to Vesper (1996) and Mason and Stark (2004), who used the concept of investors as the basis for assessment, as shown in Table 2.

In each round of assessment, every business plan was quantitatively rated in terms of seven dimensions: ability of operation, completeness, market orientation, realism, consistency, competitive advantage, and definitude. The scores ranged from 60 to 100 (with 60 and below = lowest score with proposal statement very incomplete; 100 = highest score with proposal statement very complete). Every business plan from the author and the peer groups was rated by peer reviewers in terms of these seven dimensions in each of the three rounds of the review procedure.

Similarly, the instructor evaluated the business plan of every group. This served as a standard score for each round of assessment. In addition to the quantitative evaluations of the seven dimensions, peers were asked to provide qualitative detailed comments or feedback for each business plan assigned for review. This enabled members of the author and peer groups to modify their plans by referring to the peer feedback.

As described above, the goal was to provide participants with clear evaluation criteria for the peer assessment process; therefore, before the actual implementation of peer assessment, the instructor explained the dimensions of the assessment in considerable detail. In addition, sample business plans and peer comments were used as examples and as an aid to clarify the criteria.

The instructor also devoted some class time to discussing and resolving problems related to the online peer assessment process. Providing well-defined criteria and support from the instructor promoted positive attitudes among participants toward the peer review.

Table 2: *Business plan assessment index*

Criteria	Definition of Indicator
Ability of operation	To show that the management team has the abilities and adequate experience required to operate a business, has a future operating strategy, and is fully prepared for the industry, markets, products and technologies,.
Completeness	Encompasses business management functions and provides the information and supporting references required to satisfy investors.
Market orientation	To understand that profit comes from the demands of the market. Without definitive analysis of market demand, business plans are overly vague.
Realism	All figures should be as objective and practical as possible, managers should not estimate according to subjective wishes.
Consistency	The basic assumptions or estimates on which the entire business plan is based should be logical and reasonable.
Competitive advantage and investment niche	Business plans should fully display the relevant data, most importantly, to show the specific competitive advantages of the plan, and clearly point out the niche for investors.
Definitude	To clearly point out the market opportunities and competitive threats for the company, with



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concrete information as proof. At the same time, the plan should provide possible resolutions, rather than vague explanations.

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### ***Research Design and Data Analysis***

The non-equivalent group quasi-experimental design was utilized to compare the quality of business plans written under three assessment modes. Dependent sample T-tests were used to investigate changes from the first round to the second round and from the second round to the third round. A one-way ANOVA was used to test differences in the learning effects of three different assessment modes. Finally, a 3x2 (assessment mode: reviewer group, author group, and peer group; entrepreneurial experience of the family: business experience vs. no business experience) ANCOVA was used to investigate the interaction between the assessment mode and entrepreneurial experience of the family. The dependent variables indicated the quality of the business plans measured according to the seven business plan assessment criteria.

## **RESULTS AND DISCUSSION**

### ***Analysis of Student Learning Performance Using the Three Assessment Modes***

Students participating in this study were assigned to a reviewer group, author group, or peer group. To verify the relationship between the scores of teachers and students, we conducted correlation analysis of the three-round review scores provided by the teacher and students. The significant correlation coefficients of three-round review were 0.528, 0.715, and 0.939 respectively, showing a strong correlation between the scores marked by peers and the expert scores. Furthermore, the peer scores became increasingly consistent with the teacher's evaluation after additional peer review rounds, indicating a high degree of validity.

We also utilized ANOVA to analyze the learning effects of different assessment modes, the results of which indicated no significant difference ( $F=2.3870$ ;  $p>0.05$ ) in the overall change of learning performance from the first review scores to the second review scores, among the reviewer, author, and peer groups (see Table 3). One possible explanation was that the students were unfamiliar with the three assessment modes at the beginning, resulting in less effective feedback from their peers. However, there was a significant ( $F=4.1376$ ;  $p<0.05$ ) change in learning performance from the second review scores to third review scores (see Table 4).

Furthermore, according to Scheffe's post hoc analysis, students in the reviewer group improved more between the second review and the third review than those in the author group. This implies that peer observation prompted students to reflect more on their own work than with peer feedback. Therefore, the teacher could improve the process by guiding the reviewers, such as defining clear and detailed evaluation standards. This is consistent with a study by Keat, Selvarajah and Meyer (2011), who found that the reviewer group experienced greater gains in learning than the author group, when the quality of questioning was controlled for.

A business plan can be viewed as a blueprint for business development. The purpose of writing a business plan is to obtain financing and to communicate with professional investors and financial institutions. When investors consider a business plan acceptable, they begin to evaluate it as an investment. Reviewers can learn to reflect on their own mistakes in business plan writing by reviewing the work of their peers, and make suitable modifications. In this way, the reviewers can enhance the quality of their own business plans.

A business plan is particularly important for those who wish to start a business. Entrepreneurs need to contemplate and state the comprehensive function of their proposed business, and explore the inadequacies of the plan through the process of writing. A business plan is a form of self-examination as well as a resume to recommend the business to others. By observing and judging their peers' work, the reviewers have an opportunity to see past their blind spots. This may be the reason that the reviewer group made greater strides between the second review and the third review than the author group did.

A series of paired t-tests was used to analyze changes in the scores of participants across the three rounds of review. As seen in Table 5, the scores in the three assessment groups showed significant increases between the first review and the second review, and between the second review and the third review. These results suggest that the writing of business plans can be greatly improved, regardless of the assessment mode used.

Table 3: Analysis of changes in the scores between the first and second reviews, among the three assessment modes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.3438	2.0000	14.1719	2.3870	0.096
Within Groups	742.1250	125.0000	5.9370		
Total	770.4688	127.0000			

Table 4: Analysis of changes in the scores between the second and third reviews, among the three assessment modes

	Sum of Squares	df	Mean Square	F	Sig.	Post hoc
Between Groups	73.2656	2.0000	36.6328	4.1376	<b>0.018*</b>	Reviewer > Author
Within Groups	1106.7031	125.0000	8.8536			
Total	1179.9688	127.0000				

\*p < .05.

Table 5: Scores in the three-round reviews of the three assessment groups

Assessment mode	Round		Average	Standard deviation	t value
Reviewer group	1	Pre-test	72.875	3.150	-25.911***
		Post-test	81.344	3.686	
	2	Pre-test	81.344	3.686	
		Post-test	89.219	1.979	
Author group	1	Pre-test	77.375	5.912	-12.880***
		Post-test	84.531	4.032	
	2	Pre-test	84.531	4.032	
		Post-test	88.313	3.197	
Peer group	1	Pre-test	77.766	4.147	-27.857***
		Post-test	85.734	4.029	
	2	Pre-test	85.734	4.029	
		Post-test	89.922	3.538	

\*\*\* p < .001.

**Relationship between the Entrepreneurial Experience of Families and Assessment Mode**

The first review scores were used as a covariant in the analysis of covariance (ANCOVA) to analyze the influence of entrepreneurial experience in the family and assessment mode on the performance of business planning. The ANCOVA results (see Table 6) indicate a significant interaction between the entrepreneurial experience of the family and assessment mode with regard to business plan writing (F = 3.659, P = 0.029). The results shown in Tables 7 and 8 reveal that among participants whose family had entrepreneurial experience, those in the peer group demonstrated greater learning gains than those in the author group, and those in the author group outperformed those in the reviewer group (F=29.004; p<0.01). One possible explanation is that the families’ entrepreneurial experience enabled the peer group to extract more useful information from both peer observation and peer feedback. This implies that instructional design should consider the families’ entrepreneurial experience when conducting the activities of online peer assessment.

Moreover, students with entrepreneurial experience in the author group outperformed the reviewer group. This implies that families’ entrepreneurial experience is more beneficial for peer feedback than for peer observation. In other words, families’ entrepreneurial experience enables students get more helpful information from feedback than from observation. One possible explanation is that the teacher only provided the reviewer group with quantitative scores (no qualitative comments) with which to revise their business plans. In other words, although students in the reviewer group were able to review the business plans of their peers, they were unable to receive any suggestions with which to modify their own work from the evaluation of teachers. Thus, even if the students were inspired by entrepreneurial experience, they still could not apply the experience to improve their work when lacking specific suggestions for enhancing their business plans. This may have had a detrimental effect on the learning performance of those in the reviewer group. Although students in the author group were

unable to review the business plans of others, they were still able to modify the inadequacies of their business plans based on the reviewer feedback. Likewise, students in the author group likely applied what they saw and heard from their families to their business planning. This enabled them to analyze and compare the comments of their peers with those of their family. As a result, students in the author group demonstrated better learning gains than those in the reviewer group. Therefore, the teacher should consider the peer feedback approach as compared to peer observation for students with families with entrepreneurial experience.

Among students whose families had no entrepreneurial experience, no significant difference in learning performance was observed among the three groups. This implies that students in all three of the groups were insensitive to information related to the creation of a business when denied the benefit of entrepreneurial experience from their families. In other words, students could not extract useful information to improve their work based on peer observation, peer feedback or both. Therefore, from the perspective of instruction, hiring teachers with entrepreneurial experience might have a positive impact on learning. This issue could be investigated and discussed in greater detail in the future.

In both the author group and the peer group, students with entrepreneurial experience demonstrated better learning performance than those without such experience. As for the reviewer group, entrepreneurial experience from the family had no significant impact on business plan writing. This means that entrepreneurial experience in the family did not help the reviewer group integrate more useful information to improve their learning performance based upon peer observation. One possible explanation may be that in the role of the reviewer, which includes checking peers' work and providing suggestions about their work, is based on clear and concrete evaluation standards. In this case, students would just do their work by following the rules without the opportunity to reflect on their own job. Hence, entrepreneurial experience in the family had less influence on student performance in the peer group.

Table 6: Summary of 2x2 factorial design for the performance of business plan writing

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Family entrepreneurial experience	122.508	1	122.508	19.785	.000***
Assessment mode	132.605	2	66.302	10.708	.000***
Entrepreneurial experience of the family *assessment mode	45.314	2	22.657	3.659	.029*
Error	749.224	121	6.192		
Total	1069029.000	128			
Corrected Total	1585.867	127			

\*  $p < .05$ . ; \*\*\*  $p < .001$ .

Table 7: Simple main effects of the entrepreneurial experience of the family on the performance of business plan writing

Source	Sum of Squares	df	Mean Square	F value	Significant	Comparison
Entrepreneurial experience of the family						
With entrepreneurial experience	236.112	2	118.56	29.004	0.000***	peer > author > reviewer
Without entrepreneurial experience	52.149	2	26.075	2.606	0.081	---

\*\*\*  $p < .001$ .

Table 8: Simple main effects of assessment mode on the performance of business plan writing

Source	T value	Significant	Comparison
<b>Assessment method</b>			
Reviewer group	-1.380	0.178	---
Author group	-2.930	0.006**	experience > no experience
Peer group	-5.576	0.000***	experience > no experience

\*\*  $p < .01$ ; \*\*\*  $p < .001$ .

## CONCLUSIONS

### *Key Findings and Theoretical Contributions*

Governments and universities in Taiwan have established a large number entrepreneurship courses designed to encourage students to start their own businesses, and business planning makes up the core of these courses. Without a well thought out business plan, it is difficult to attract investors; therefore, ensuring the content and quality of business plans is a crucial issue in business management. Courses that teach business plan writing could be beneficial to those who want to start their own business. Unlike the vague aspirations of vision planning, the basic elements involved in writing a business plan include an integrated framework and concrete action.

Peer assessment has seldom been applied in courses on business planning, perhaps because this could increase the workload of instructors and make grading more difficult. Nonetheless, integrating an online learning platform with the functions of peer assessment clearly prescribed could overcome these shortcomings.

This study differs from previous studies in that we simultaneously observed the learning performance of a peer group, reviewer group, and author group. We then analyzed how the entrepreneurial experience of families influenced learning effectiveness in the three groups. Results showed that all three of the assessment modes help to increase the learning performance of students, particularly those in the reviewer group. Overall, the learning effectiveness of those in the reviewer group is far more successful than for those in the author group. Finally, our results also showed that if the student's family had entrepreneurial experience, the learning gains of the peer group would be better than those of the other two groups.

Our research findings make a concrete contribution to the promotion of peer assessment in entrepreneurship courses in higher education. This study suggests an alternative course design for instructors using a teacher-centered approach to teach courses in business planning. Instructors could arrange assessment modes with students from different backgrounds, such as those with entrepreneurial experience, to increase the effectiveness of instruction. Finally, we find that for students whose families have entrepreneurial experience, those in the author group had better learning performance than those in the reviewer group. This contradicts the findings of previous studies in which the reviewer group outperformed the author group (Li, Liu, & Steckelberg, 2010). This may also have been caused by other variables except for the lack of qualitative feedback, which is an issue worthy of further exploration in a future study.

### *Limitations and Suggestions for Future Research*

This investigation has some limitations. First, the generalizability of the findings may be limited to samples of a similar nature and are not necessarily applicable to learner groups within different educational settings or cultural backgrounds.

Second, the characteristics of a “business planning” course are very different from those of other learning domains, such as mathematics or information science. Thus, the conclusions of our study cannot be generalized to other disciplines.

Third, students who participated in this course assembled business plans and showed a willingness to start up new businesses; however, the instructors only observed learning performance through pre- and post-test scores, due to limitations associated with observational time. Thus, the researchers were unable to observe how the students fared in the implementation of their business plans.

Based on the above limitations, researchers who are interested in this issue might continue to explore the topic through the following: (1) investigate whether results differ in different educational settings or with different cultural backgrounds; (2) perform similar studies in different disciplines and compare their results with those of this study. (3) To overcome the practical difficulties in observing the continued entrepreneurial actions of students, researchers could encourage students to participate in entrepreneurial competitions within or outside of campus, to better observe entrepreneurial performance after the business planning course.

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## THE INFLUENCE OF LEARNER READINESS ON STUDENT SATISFACTION AND ACADEMIC ACHIEVEMENT IN AN ONLINE PROGRAM AT HIGHER EDUCATION

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### ABSTRACT

The purpose of this study was to measure the self-perceptions of distance education learners in terms of learner readiness and to determine the predictors of satisfaction and success in distance education. Learner readiness consists of five sub-dimensions: (1) computer/internet self-efficacy, (2) self-directed learning, (3) learner control, (4) motivation for learning, and (5) online communication self-efficacy. The subjects of the study are 84 English Language and Literature Distance Education Program students. In order to collect data, Online Learning Readiness Scale (OLRS), developed and validated by Hung, et al. (2010), was used. For the current study the Cronbach Alpha was found .88. The correlation analysis revealed that all the sub-dimensions of learner readiness correlate significantly with the concept of student satisfaction and student success. In addition, regression analysis was carried out in order to see the impact of each of the sub-dimensions of learner readiness on satisfaction. As a result of the regression analysis, it was found out that *motivation* is the most important dimension that influences student satisfaction in online learning. As a next step, another regression analysis was carried out in order to determine the impact of the sub-dimensions of learner readiness on student success. The results indicate that *self-directed learning* is the most important predictor of success. The next two most important predictors of success in distance education were found to be *learner control* and *motivation*.

**Keywords:** Learner readiness, student satisfaction, academic achievement, on-line EFL learning environment

### 1. INTRODUCTION

The concept of learner readiness was first proposed by Warner, Christie, and Choy (1998). They specified the three important aspects of readiness for online learning environments. These are: (1) students' preferences for the form of delivery as opposed to face-to-face classroom instruction; (2) student confidence in using electronic communication for learning and, in particular, competence and confidence in the use of the Internet and computer-mediated communication; and (3) the ability to engage in autonomous learning.

Online learning environments offer more opportunities for individualization and flexibility, which creates an increased demand for self-directed learning (Grabinger & Dunlap, 1995). Similarly, Wolfe (2000) states that distance education programs assign more demands on learners compared to traditional learning environments. Grabinger and Dunlap (2000) clearly state that students enrolled in online programs need a bulk of "well-developed lifelong learning skills and strategies, such as goal-setting, action planning, learning-strategy selection and assessment, resource selection and evaluation, reflective learning and time management." (p. 37). In short, self-direction and initiatives on the part of students are necessary components that distance education students are supposed to have in order to fulfill their learning goals.

### 2. THEORETICAL BACKGROUND

Learner readiness consists of five sub-dimensions. Self-directed learning focuses on learners' ability to take responsibility for the learning context to reach their learning objectives. The concept of learner control refers to online learners' control over their learning efforts to direct their own learning. Thirdly, motivation for learning is related to online learners' learning attitudes, and the concept of computer/internet self-efficacy is about online learners' ability to demonstrate proper computer and internet skills. Finally, the concept of online communication self-efficacy centered on describing learners' adaptability to the online setting through questioning, responding, commenting, and discussing (Hung et al., 2010).

#### 2.1. Sub-dimensions of learner readiness

The first dimension of learner readiness is computer and Internet self-efficacy, which is, according to Kuo, Walker, Belland, & Schroder (2013), not addressed as much as other variables. The authors point out the existence of evidence that support the influence of Internet self-efficacy on student satisfaction and indicate that it is not at a satisfactory level and does not lead to clear conclusions. There are, however, a few studies. Eastin and La Rose (2000), for example, found a positive correlation between Internet self-efficacy and expected learning outcomes. Chu and Chu (2010) found a positive correlation between Internet self-efficacy and

satisfaction. Rodriguez Robles' study (2006) found that Internet self-efficacy is not a significant predictor of student satisfaction.

Knowles (1975:18) defines self-directed learning (SDL) as “a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes”. This definition is highly comprehensive and indicates a complex learning process that makes high demands on students for choices (Boekaerts, 1999; Winne & Perry, 2000). Paris and Paris (2001: 89) stated that self-directed learning “emphasizes autonomy and control by the individual who monitors, directs, and regulates actions toward goals of information acquisition, expanding expertise and self-improvement”. To summarize, self-regulated learners are “metacognitively, motivationally, and behaviorally active participants in their own learning process” (Zimmerman, 1989a: 4).

The place of motivation in educational research has been accentuated by many researchers. There is no doubt that motivation is one of the leading factors in student success and other issues. In literature, intrinsic motivation was found to be influential on a lower dropout rate, higher-quality learning, better learning strategies, and greater enjoyment of school (Czubaj, 2004; Deci & Ryan, 1985). Similarly, extrinsic motivation is linked to getting higher grades on exams, getting awards, and getting prizes. Therefore, as an element of learner readiness, motivation assumes importance in measuring student satisfaction and academic achievement.

Learner control implies the degree to which learners can direct their own learning process (Shyu & Brown, 1992). By nature, distance education programs require learners to take hold of their own learning as opposed to traditional learning environments where learners are required to follow a developmental sequence by the help of coursebooks or other instructional materials. In distance education programs, learners are given control over their own learning process in terms of the amount of content, the sequence, and the pace of learning (Hannafin, 1984; Reeves, 1993). Now that learners are by themselves with the course material in distance education programs, especially in handling the asynchronous course materials, learner control assumes great importance. Another sub-dimension of learner readiness is computer and internet self-efficacy. Self-efficacy is derived from Albert Bandura's social cognitive theory and offers a conceptual framework to get a grasp of how self-efficacy beliefs affect student satisfaction and academic achievement in online programs (Bandura, 1977). Accordingly, Eastin and LaRose (2000) stressed that computer and internet self-efficacy leads both to increased performance in technical issues like downloading documents or managing the online system and better performance in solving problems in online learning. Therefore, it is hypothesized that increased computer and internet self-efficacy leads to increased students satisfaction and achievement. Tsai and Tsai (2003), for example, found that students with high Internet self-efficacy learned better than students with low Internet self-efficacy in a Web-based learning task.

The final sub-dimension of learner readiness is online communication self efficacy. Palloff & Pratt (1999) found that introvert students participate more in online learning environments than traditional environments. Roper (2007) claimed that successful students are supposed to take the advantage of classroom discussions as much as possible. In short, Hung et al (2010) concluded that communication self-efficacy in online learning is an essential dimension for overcoming the limitations of online communication.

## **2.2. Student satisfaction in online programs**

Although there is a bulk of literature emerging on distance education, there are no studies that focus on learner readiness and student satisfaction. According to Kuo et al. (2013), student satisfaction means the perceptions of learners of the value of a course and their experiences in the learning program. Thus, they point out that it deserves to be studied.

Higher education institutions consider student satisfaction as one of the major elements in determining the quality of online programs in today's markets (Yukselturk & Yildirim, 2008). Student satisfaction in online programs has been studied in relation to a number of factors. It has been studied in relation to persistence (Allen & Seaman, 2008), retention (Debourgh, 1999; Koseke, & Koseke, 1991), course quality (Moore & Kearsley, 1996), and student success (Keller, 1983; Pike, 1993). Findings indicate that high satisfaction leads to higher levels of retention, higher persistence in learning, and higher motivation (Keller, 1983; Koseke, & Koseke, 1991). There is no doubt that research studies on satisfaction help course designers, educators and administrators to work on areas that need improvement (Reinhart & Schneider, 2001).

### 3. RESEARCH METHODOLOGY

#### 3.1. Purpose

This paper aims to measure distance education students in terms of their self-perceptions about learner readiness. The next aim of the paper is to identify the predictors of students satisfaction and student success in the distance education program. Therefore, this paper tries to answer the following research questions:

1. What are distance education students’ self-perceptions about the following sub-dimensions of learner readiness?
  - (a) computer/internet self-efficacy,
  - (b) self-directed learning,
  - (c) learner control,
  - (d) motivation for learning, and
  - (e) online communication self-efficacy
2. What are the predictors of student satisfaction for distance education students?
3. What are the predictors of success for distance education students?

#### 3.2. Subjects of the study

The study included 84 students who attend the English Language and Literature Department at Karabuk University. The number of female students (N = 50) was greater than the number of male students (N = 34). In terms of age groups, there is almost the same number of students in the three age groups (21-25, 25-30, 31-35) while there are only two students who are over 36. The number of third level students (N=54) is greater than that of second level students (N=30). Table 1 presents the demographic characteristics of the students.

Table 1. Demographic characteristics of the participants

	N	P
<b>Gender</b>		
Female	50	59.5
Male	34	40.5
<b>Age</b>		
21-25	27	32.1
25-30	28	33.3
31-35	27	32.1
36-over	2	2.4
<b>Class level</b>		
2 <sup>nd</sup> class	30	35.7
3 <sup>rd</sup> class	54	64.3

#### 3.3. Data Collection Tool

In order to collect data, “Online Learning Readiness Scale” (OLRS) was used. OLRS was developed by Hung et al., (2010) and includes five dimensions. These dimensions are a) self-directed learning, b) motivation for learning, c) computer/internet self-efficacy, d) learner control, and e) online communication self-efficacy.

The reliability analysis of the research tool is given in the table below. Internal reliability coefficients (Cronbach’s Alpha) for all dimensions range from .64 to .88 and the total internal reliability coefficient is .88, which indicates a high level of reliability.

Table 2. Reliability analysis

Variables	$\alpha$	Number of items
student satisfaction	.88	5
computer/internet self-efficacy	.85	3
self-directed learning	.79	5
learner control	.64	3
motivation	.79	4
online communication self-efficacy	.79	3
Total	.88	23

#### 4. DATA ANALYSIS AND RESULTS

##### 4.1. Descriptive Statistics

Table 3 presents the descriptive statistics (range, minimum, maximum, mean, and standard deviation) of variables such as computer/internet self-efficacy, self-directed learning, learner control, motivation for learning, online communication self-efficacy, and student satisfaction.

Table 3. Descriptive statistics for the components of self-regulation

Student satisfaction and sub-dimensions of student readiness	N	Minimum	Maximum	Mean	SD
student satisfaction	84	5.00	25.00	17.904	4.082
computer/internet self-efficacy	84	6.00	15.00	11.369	2.029
self-directed learning	84	9.00	25.00	18.702	3.528
learner control	84	4.00	15.00	10.595	2.297
motivation	84	9.00	20.00	16.428	2.816
online communication self-efficacy	84	6.00	15.00	11.369	2.296

We can understand from Table 3 that students have the highest mean score in self-directed learning (M=18.702) followed by a relatively high level of satisfaction (M=17.904) and motivation (M=16.428). The lowest variable is learner control (M=10.595).

In order to further analyze the level of each dimension of learner readiness and student satisfaction, the results of 84 participants were grouped as *low*, *moderate*, and *high*. To do this, the maximum values were divided into three in order to find the cut-off points. The cut-off points for the variables are as follows: *student satisfaction* (low=1-8, moderate=9-16, high=17-25), *computer/internet self-efficacy* (low=1-5, moderate=5-10, high=10-15), *self-directed learning* (low=1-8, moderate=9-16, high=17-25), *learner control* (low=1-5, moderate=5-10, high=10-15), *motivation* (low=1-7, moderate=8-15, high=16-20), and *online communication self-efficacy* (low=1-5, moderate=5-10, high=10-15). The results are presented in Table 4. According to the results, we can say that the participants have high levels for all the dimensions of learner readiness as well as learner satisfaction in total.

Table 4. Distribution of the sub-dimensions of learner readiness

sub-dimensions of learner readiness	Low		Moderate		high	
	f	%	f	%	f	%
student satisfaction	3	3.0	18	21.42	63	<b>75.00</b>
computer/internet self-efficacy	0	0	19	22.61	65	<b>77.38</b>
self-directed learning	0	0	22	26.19	62	<b>73.80</b>
learner control	1	1.1	23	27.38	60	<b>71.42</b>
Motivation	0	0	27	32.14	57	<b>67.85</b>
online communication self-efficacy	0	0	19	22.61	65	<b>77.38</b>

##### Student satisfaction

The results pertaining to each item under each of the variables were presented in detail in this part. First of all, Table 5 presents the frequencies and percentages about student satisfaction. As we can understand from the table, a majority of the participants stated that the courses contribute to their educational development (65,5%) and to their professional development (65,5%), they are satisfied with the level of interaction that took place in the courses (61,9%), and they will continue their online education (60,7%). A moderate number of the participants stated that they were satisfied with the online courses (47,1%). In short, the participants report a high level of satisfaction in their online courses.

Table 5. Frequencies and percentages as regards student satisfaction.

Student satisfaction		Disagree	Undecided	Agree
1. Overall, I am satisfied with the classes.	N	9	27	48
	%	10,8	32,1	47,1
2. This course contributed to my educational development.	N	9	20	55
	%	10,8	23,8	65,5
3. This course contributed to my professional development.	N	10	19	55
	%	12,0	22,6	65,5
4. I am satisfied with the level of interaction that happened in this course.	N	10	22	52
	%	11,9	26,2	61,9
5. In the future, I would be willing to take a fully online course again.	N	12	21	51
	%	14,3	25,0	60,7



*Computer/internet self-efficacy*

Table 6 presents the descriptive statistics about computer and internet self-efficacy. The figures in the table report that a big number of the participants stated that they could comfortably use the Internet (75,0%), feel confident in their knowledge and skills of how to use online learning software, and finally feel confident in performing the basic function of office programs (70,2%). Computer and Internet self-efficacy is extremely important for distance education students and the findings of this study indicate that they have a high level of computer self-efficacy.

Table 6. Frequencies and percentages as regards computer/internet self-efficacy

<b>Computer/internet self-efficacy</b>		<b>Disagree</b>	<b>Undecided</b>	<b>Agree</b>
1.	I feel confident in performing the basic functions of Microsoft Office programs (Word, MS Excel)	N 11 % 13,1	14 16,7	59 70,2
2.	I feel confident in my knowledge and skills of how to manage software for online learning.	N 5 % 6,0	19 22,6	63 71,5
3.	I feel confident in using the Internet to find or gather information for online learning.	N 6 % 7,1	15 17,9	63 75,0

*Self-directed learning*

The third sub-dimension of learner readiness is self-directed learning. The descriptive statistics about self-directed learning are presented in Table 7. As we can understand from the table, a majority of the participants could carry out their own study plan (69,1%), have higher expectations for their learning (67,9%), and set up their learning goals (64,2%). A considerable number of the participants pointed out that they try to get help when they come across with problems (58,4%) and manage time well (55,9%). Overall, we can speculate that distance education students are highly proficient in self-directed learning, which is an extremely important skill for them.

Table 7. Frequencies and percentages as regards self-directed learning

<b>Self-directed learning</b>		<b>Disagree</b>	<b>Undecided</b>	<b>Agree</b>
1.	I carry out my own study plan.	N 6 % 7,2	20 23,8	58 69,1
2.	I seek assistance when I face learning problems.	N 7 % 8,4	28 33,3	49 58,4
3.	I manage time well.	N 11 % 13,1	26 31,0	47 55,9
4.	I set up my learning goals.	N 6 % 7,2	24 28,6	54 64,2
5.	I have higher expectations for my learning.	N 8 % 9,6	19 22,6	57 67,9

*Learner control*

The results about the fourth sub-dimension of learner readiness, learner control, are presented in Table 8. The table indicates that a majority of the participants stated that they repeat the material they learned in the course (64,3%) and can direct their own learning (61,9%), while a moderate number of the participants pointed out that they were not distracted by other online activities (47,6%). Therefore, we can understand that distance education students have a satisfactory level of control over their own learning process.

Table 8. Frequencies and percentages as regards learner control

<b>Learner control</b>		<b>Disagree</b>	<b>Undecided</b>	<b>Agree</b>
1.	I can direct my own learning progress.	N 12 % 14,3	20 23,8	52 61,9
2.	I am not distracted by other online activities when learning online (facebook, twitter, etc)	N 18 % 21,4	26 31,0	40 47,6
3.	I repeat the instructional materials on the basis of my needs.	N 8 % 9,5	22 26,2	54 64,3

**Motivation**

When it comes to motivation, the results are presented in Table 9. The figures in the table show that a huge number of the participants pointed out that they think that they learn from their mistakes (83,3%) and were open to new ideas (82,2%). A majority of the participants also stated that they liked sharing their ideas with others (75,%) and had motivation to learn (72,6%). To conclude, it is obvious that the participants have a high level of motivation to continue their online education.

Table 9. Frequencies and percentages as regards motivation

Motivation		Disagree	Undecided	Agree
1. I am open to new ideas.	N	4	11	69
	%	4,8	13,1	82,2
2. I have motivation to learn.	N	7	16	61
	%	8,4	19,0	72,6
3. I improve from my mistakes.	N	1	13	70
	%	1,2	15,5	83,3
4. I like sharing my ideas with others.	N	4	17	63
	%	4,8	20,2	75,0

**Online communication self-efficacy**

Finally, the last important sub-dimension of online learner readiness is online communication self-efficacy. The descriptive statistics are presented in Table 10. The results indicate that a majority of the participants stated that they felt confident in using online tools (72,6%), and in expressing themselves through text (64,3%), while a moderate number of the participants pointed out that they were confident in posting questions in online discussions (58,4%). In short, the figures indicate that the participants have a high level of online communication self-efficacy, which is a fundamental skill for distance education students.

Table 10. Frequencies and percentages as regards online communication self-efficacy

Online communication self-efficacy		Disagree	Undecided	Agree
1. I feel confident in using online tools (email, discussion) to effectively communicate with others.	N	6	17	61
	%	7,2	20,2	72,6
2. I feel confident in expressing myself (emotions and humor) through text.	N	3	27	54
	%	3,6	32,1	64,3
3. I feel confident in posting questions in online discussions	N	8	27	49
	%	9,5	32,1	58,4

**4.2. Correlation Study for Student Satisfaction**

As can be seen from Table 12, there were positive relationships between learner satisfaction and computer self-efficacy ( $r = .28, p < .01$ ), learner control ( $r = .28, p < .01$ ), online communication self-efficacy ( $r = .42, p < .01$ ), self-directed learning ( $r = .32, p < .01$ ), and learner satisfaction ( $r = .47, p < .01$ ). The highest correlation occurred between learner satisfaction and motivation ( $r = .47, p < .01$ ). Correlation results indicated that all of the independent variables were in positive relationships with students' satisfaction.

Table 12. Pearson Product-Moment correlations among measures for all subjects of the study

Variables	1	2	3	4	5	6
1. CSE	-	.38**	.36**	.51**	.12	.28**
2. LC		-	.22*	.47**	.21	.28**
3. OCSE			-	.28*	.44**	.42**
4. SDL				-	.23*	.32**
5. MO					-	.47**
6. LS						-

Notes: \* $p < .05$ ; \*\* $p > .01$

Computer self-efficacy: CSE

Learner control: LC

Online communication self-efficacy: OCSE

Self-directed learning: SDL

Motivation: MO

Learner satisfaction: LS

### 4.3. Regression analysis for satisfaction

Table 13 below reports the results of multiple linear regression analysis for variables predicting the satisfaction levels distance education students. The multiple correlation coefficient was .57 revealing that nearly 32% of the variance in the sample can be accounted for the linear combination of computer self-efficacy, self-directed learning, learner control, motivation, and online self-efficacy. T-test results for the significance of regression coefficients illustrated that motivation was the only significant predictor of satisfaction ( $\beta = .33, p < .05$ ). Other variables were not significant in predicting in distance education students' satisfaction ( $\beta = .08, p > .05$ ;  $\beta = .11, p > .05$ ;  $\beta = .09, p > .05$ , and  $\beta = .20, p > .05$ , respectively). Relying on this finding, it may be speculated that motivated learners become satisfied with their language learning studies. Distance education students work alone without any guidance by either from their teachers or peers, and thus may feel de-motivated without such a lack of guidance. To eliminate this problem, their instructors should help them improve their motivation and thus feed their satisfaction by providing them enjoyable online learning activities so that they can take on responsibility. In return, this is expected to give rise to learner autonomy within a constructivist point of view.

Table 13: Results of regression analysis for variables predicting satisfaction

Variables	B	SE	$\beta$	t	p
Constant	.93	.59		.158	.88
Computer self-efficacy	.08	.11	.08	.68	.50
Self-directed learning	.12	.14	.11	.91	.37
Learner control	.10	.12	.09	.83	.41
Motivation	.38	.12	.33	<b>3.129</b>	<b>.00</b>
Online self-efficacy	.22	.12	.20	.184	.07

Notes:  $R = .57$ ;  $R^2 = .32$ ;  $F(5, 83) = 7.43$ ;  $p = .00$

### 4.4. Correlation Study for Academic Achievement

As can be seen in Table 14, there are positive relationships between academic achievement and computer self-efficacy ( $r = .21, p < .01$ ), self-directed learning ( $r = .40, p < .01$ ), learner control ( $r = .24, p < .01$ ), motivation ( $r = .24, p < .01$ ). However, the relation between online self-efficacy and academic achievement was too weak ( $r = .03, p < .01$ ). The highest correlation occurred between self-directed learning and academic achievement ( $r = .40, p < .01$ ). Correlation analysis indicated that there is a positive relation between all of the variables and academic achievement.

Table 14. Pearson Product-Moment correlations among measures for all subjects of the study

Variables	1	2	3	4	5	6
1. CSE	-	.51**	.38**	.12	.36**	.21
2. SDL		-	.47**	.23*	.28*	.40**
3. LC			-	.21	.22*	.24*
4. MO				-	.43**	.24*
5. OCSE					-	.03
6. AC						-

Notes: \* $p < .05$ ; \*\* $p > .01$

Computer self-efficacy: CSE

Learner control: LC

Online communication self-efficacy: OCSE

Self-directed learning: SDL

Motivation: MO

Academic Achievement: LS

### 4.5. Regression analysis for academic achievement

Table 15 reports the results of multiple linear regression analysis for variables predicting academic achievement levels of distance education students. The multiple correlation coefficient was .46 revealing that nearly 22% of the variance in the sample can be accounted for the linear combination of computer self-efficacy, self-directed learning, learner control, motivation, and online self-efficacy.

Table 15. Results of regression analysis for variables predicting academic achievement

<i>Variables</i>	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>p</i>
Constant	.1.36	.30		.4.59	.00
Computer self-efficacy ( $R = .21$ ; $R^2 = .05$ )	.16	.07	.21	1.96	.05
Self-directed learning ( $R = .40$ ; $R^2 = .16$ )	.33	.08	.40	<b>4.00</b>	<b>.00</b>
Learner control ( $R = .24$ ; $R^2 = .06$ )	.18	.08	.24	<b>2.26</b>	<b>.03</b>
Motivation ( $R = .24$ ; $R^2 = .06$ )	.20	.09	.24	<b>2,26</b>	<b>.03</b>
Online self-efficacy ( $R = .03$ ; $R^2 = .00$ )	.02	.83	.03	.26	.79

Notes:  $R = .46$ ;  $R^2 = .22$ ;  $F(4, 33) p = .00$

Table 15 indicates that the relation between computer self-efficacy levels of distance education students and their academic achievement is meaningful ( $R = .21, p < .05$ ). The results of regression analysis, however, indicate that computer self-efficacy is not a significant predictor of academic achievement for distance education students ( $\beta = .21, p > .05$ ). As for self-directed learning, the table shows that the relation between academic achievement and self-directed learning is significantly meaningful ( $R = .40, p < .05$ ). The results of the regression analysis show that self-directed learning is the most important predictor of academic achievement for distance education students ( $\beta = 4.00, p > .05$ ). Table 15 indicates that the relation between learner control, motivation and academic achievement was also found to be meaningful ( $R = .24, p < .05, R = .24, p < .05$ , respectively). The results of the regression analysis demonstrate that learner control and motivation other important predictors of academic achievement ( $\beta = 2.26, p > .05, \beta = 2.26, p > .05$ , respectively). Finally, the relation between online self-efficacy and academic achievement was not found to be significant ( $R = .03, p < .05$ ). Therefore, online self-efficacy is not one of the predictors of academic achievement among distance education students. As a result, depending on the results of the multiple regression analysis, self-directed learning is the most important predictor of success. The next two most important predictors of success in distance education are learner control and motivation.

## 5. DISCUSSION AND CONCLUSION

The purpose of this study was to investigate the relation between learning readiness and student satisfaction at higher education. The dependent variable in the study was student satisfaction and the independent variables were *computer self-efficacy, self-directed learning, learner control, motivation, and online self-efficacy*, which are the sub-dimensions of learner readiness. To this end, the sub-dimensions of learner readiness were investigated in the first place in order to understand the level of learner readiness of the participants. The results indicated that the participants have a high level of learner readiness and satisfaction.

In order to collect data, the OLRS developed by Hung et al. (2010) was used for the purpose of the study. This scale includes 18 items under five dimensions. These five sub-dimensions of learner readiness formed the independent variables of the study. These variables are: (a) *self-directed learning, (b) motivation for learning, (c) computer/internet self-efficacy, (d) learner control, and (e) online communication self-efficacy*.

Descriptive statistics pertaining to each of the items under the five sub-dimensions were run in the study. The results have indicated that distance education students think that their courses contribute to their educational and professional development. They also stated that they were satisfied with the level of interaction provided in online courses. With regard to computer and Internet self-efficacy, it was found that the participants could comfortably use the Internet effectively as well as online learning software, and finally feel confident in performing the basic function of office programs. The study found in terms of self-directed learning that the participants could carry out their own study plan and have high expectations from their learning. They can also set learning goals. In addition, as for motivation the participants were highly motivated in their online course. Finally, it was found that the participants view themselves highly proficient in terms of online communication self-efficacy.

In order to investigate the correlation between the dependent and independent variables of the study, correlation analysis was carried out. The results indicated an optimum level of correlation between and among the variables. Therefore, further statistical analyses could be carried out. The next analysis was to run a linear regression analysis in order to see the multiple influences of (a) *self-directed learning, (b) motivation for learning, (c) computer/internet self-efficacy, (d) learner control, and (e) online communication self-efficacy* on student

*satisfaction*. The obtained multiple correlation coefficient (.57) indicated that nearly 32% of the variance in the sample could be accounted for the linear combination of computer self-efficacy, self-directed learning, learner control, motivation, and online self-efficacy. In addition, t-test results for the significance of regression coefficients illustrated that motivation was the only significant predictor of satisfaction ( $\beta = .33, p < .05$ ). It was once again confirmed in this study that motivation variable was found to be highly influential on student satisfaction.

The next important step in the study was to investigate predictors of academic achievement in the distance education program. A correlational analysis was conducted in order to see the relation between the variables of the study and the dependent variable, academic achievement. The results indicated that there was a positive correlation between the dependent and the independent variables. As a next step, a multiple regression analysis was carried out in order to determine the predictors of academic achievement. The results indicated that *self-directed learning* was the most important predictor of success in the distance education program. The next two important predictors were found to be *learner control* and *motivation*.

In terms of the relation between computer/Internet self-efficacy and satisfaction, the results of the study found a positive correlation and support the findings of Chu and Chu's (2010) study. However, although a positive correlation was found, the regression analysis indicated that computer/Internet self-efficacy is not one of the predictors of satisfaction. This finding is in line with the findings of Rodriguez Robles' study (2006).

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## THE PEDAGOGY OF FLIPPED INSTRUCTION IN OMAN

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### ABSTRACT

“Flipping the classroom”, or reverse instruction has been hailed the new pedagogical approach for preparing students for the 21<sup>st</sup> century. The idea behind this method is relatively simple. Instead of structuring class work to deliver direct instruction from the teacher in class and giving homework to students to practice outside of class, the sequence is reversed, or “flipped” to provide content instruction as homework and practice or application in the classroom. This paper focuses on the pedagogy of flipped instruction and the experiences of the flipping method with graduate students in Oman. The paper concludes with thoughts about the intrinsic value of flipped instruction within traditional educational systems.

### INTRODUCTION

At Sultan Qaboos University, educators recognize the need to provide authentic and relevant content and skills for their students with the support of the new technologies. The College of Education at SQU has begun to rethink not only *what* we teach students but also the pedagogical *ways* with which we teach the new technologies. Exploring the pedagogy and the method of flipping instruction and the role technology plays in delivering the content is the purpose of this investigation. *Flipping*, or reverse instruction reorganizes the classroom instruction and particularly, the time and place instructors deliver content. A group of Omani graduate students experienced flipped instruction in their educational technology course during the spring semester of 2013. The journey made by this group of Omani graduate students through the flipped landscape is investigated here.

### FLIPPING INSTRUCTION

The term *flipping* was coined when two chemistry high school teachers, Jonathan Bergman and Aaron Sams, decided to record videos of their chemistry lectures for students missing their classes. The videos were a big hit, other students asked to use them and soon, Jon and Aaron noticed substantial improvements resulting from their change of content delivery. The two applied flipped instruction to entire classes and the flipped classroom was born (Bergmann and Sams, 2012).

The concept behind this approach is relatively simple. The flipped classroom flips where and when homework and lecture takes place. Instead of structuring class work to deliver direct instruction from the teacher in class and giving homework to students to practice outside of class, the sequence is reversed to provide direct instruction as homework and applied practice in the classroom. Instead of the teacher using classroom time to deliver the content, the students engage in direct content delivery through technology supports outside of class time. As simple as this may sound, the process is often misunderstood.

When content delivery can be provided outside of class time, the students’ class time with the instructor can be used for review of the content learning, deeper discussion of the content information, or application of the content knowledge. Freeing up that “lecture” time allows the instructor to pay more attention to the students’ needs in relation to their mastery of the content and adjust the supports to better fit individual needs.

What flipping is not is only using digital videos to increase students’ seat time in front of computers. The students may be listening to a podcast or watching a video during that homework time but these modes of delivery do not extend into longer periods or into the class time. Flipping is also not synonymous to online videos, or online courses, nor are students expected to learn without structured activities. The students are no more passive than they are when they are traditionally sitting in their classroom seats listening and taking notes during an instructor’s lecture. In fact, with flipped instruction, note taking is an integral part of homework as it requires students to summarize meaning from the direct instruction and provides the instructor with needed information on the students’ understanding (Bergmann and Sams, 2012). This is not a movement to replace instructors with the new technological delivery tools either. Perhaps more than ever, the instructors’ importance in the classroom is critical for learning to take place beyond rote memorization and theoretical learning (Bennett, 2011).

## **SUPPORTING LEARNING IN THE 21<sup>ST</sup> CENTURY**

What flipping also is not...is new. John Dewey (1938) promoted the focus of class time on application and “learning by doing” early in the last century. Bergmann and Sams saw the opportunity to utilize the new technology tools to support an alternative way of teaching and learning that frees up class time.

We do not claim to have invented some new pedagogy, and we have not tried to brand an innovation. We simply saw a need and met it with an available technological tool – and have been so excited with the results that we felt compelled to tell the world (Bergmann and Sams, 2012, p. 111).

Flipping also reminds us again what John Dewey and others described at the turn of the last century: learning must center on students and allow them to show their mastery in more authentic ways. Perhaps the most notable instructional philosophy behind flipping is Benjamin’s Bloom Mastery Learning approach made famous in the 1960s. In the Mastery Learning classroom, students are provided multiple methods of mastering the knowledge and multiple opportunities for demonstrating their knowledge both formatively and summatively. Mastery learning helps students with content where a strong foundation is needed before moving into more complex, higher order thinking and reasoning (Bloom, 1974). Flipped instruction provides the content instruction outside the classroom before students and teachers begin applying the content to deeper exploration and application in the classroom. Exploring the pedagogy and the method of flipping instruction is about examining the way we teach, not just about considering how we use technology to deliver content. As importantly, flipping allows full utilization of the technology tools available to 21<sup>st</sup> century teachers to further enhance the direct instruction experience for students.

## **THE CONTEXT**

Students at Sultan Qaboos University are now connected to the Internet both in school and at home. In spite of the students’ rich-technology resources, their cultural paradigm for teaching and learning remains traditional with an educational system that relies almost entirely on the teacher to deliver course content. However, with the convergence of technological innovations and pedagogical shifts, Sultan Qaboos University is restructuring classroom teaching and changing traditional strategies to improve content delivery and update practices for teaching and learning. The purpose of this study is to help understand the potential impact flipped instruction has when used to integrate new technologies in the Omani classrooms.

## **RESEARCH DESIGN**

Small-scale implementation using exploratory qualitative methodology was chosen to deeply investigate the processes of flipped instruction within the cultural context of Oman. Educational researchers advocate identifying the teaching practices and underlying assumptions of participants when developing research designs (Bednar, Cunningham, Duffy, and Perry, 1992). Data was collected and analyzed through surveys to establish a baseline of the teachers’ demographics as well as a baseline measure of their attitudes and current practices in education. Though the group was small, the purpose of this qualitative investigation was to go deeper than a large group quantitative study could produce (Kitzinger, 1995; Patton, 1987). The intent to explore the cultural implications required the participants speak authentically on these potential cultural responses that might challenge traditional practices. Open-ended questions were used to allow the participants to respond in their own words that can encourage rich and deeper insights to emerge (Denzin and Lincoln, 2000). The use of open-ended questions allows responses to be more meaningful and culturally salient to the participants, especially when the researcher may not anticipate their content thus allowing for new ideas to emerge that were not anticipated at the onset of the research (Patton, 1987). Using multiple methods triangulates the data and strengthens the credibility of the study (Stake, 1995). Interviews and participant observations can describe attitudes and feelings that would be difficult to measure using quantitative methodology.

## **Participants**

The Instructional and Learning Technologies Department provides one educational technology course as part of the two year Educational Master’s program. The course goals are to present opportunities to explore a variety of powerful technologies that support teaching and learning framed within a sound pedagogical educational technology framework. By providing graduate students opportunities to explore technology-supported strategies, new methods can be assimilated into their own learning to develop innovative teaching techniques themselves (Poole, 1997). These participants are master teachers who are recognized by the Omani Ministry of Education as well experienced, highly qualified practitioners demonstrated by past performance evaluations, head master references, and peer-teacher recommendations. They are being prepared to develop innovative teaching techniques with a variety of technologies, perfect their metacognitive skills, and prepare for educational leadership among Omani educators.

**Instruments**

Four methods of data collection were used – surveys, participant reflections, instructor observations, and a focus group interview. Participant surveys are three 10 question surveys that asked specific questions about participants’ demographics, their general attitudes about education and their current educational practices. The questions on general attitudes toward education were designed to elicit participant information on currently held assumptions toward education in general, particularly the role of active learning, direct instruction, homework, and professional development. The questions on current educational practices were designed to elicit participant assumptions on the same topics but focused on the participants’ own practices in the classroom and the practices they experienced at university. The relationship between the two sets of questions hoped to shed light on both the currently-held assumptions the participants had toward and the realities they experienced in their own teaching and learning. Course Unit reflections elicited feedback from the participants about each unit’s content, how the participants felt about the experience, their successes, challenges, and how they would improve it. Instructor journal observations focused on participants’ skill readiness, educational habits, attitudes toward the activities, and performance with the assignments. A focus group interviews was chosen for this pilot to encourage research participants to explore the issues of importance to them, using the group dynamics to prompt discussion. Open-ended questions were used to promote reflection by the participants.

The surveys was administered in class during the second week of the course with the online program *SurveyMonkey* to establish a foundation of information about the participants as well as their experiences and attitudes toward education. Unit 1 reflections were completed during Week 4 to elicit participant feedback on the Unit 1 content experience. At the end of Unit 2 in week 8, and again in Week 12 after Unit 3, participants were asked to reflect on the units’ content and experiences. All three unit prompts were made available to the participants on *Moodle* throughout the semester where they could add or edit their feedback throughout the course. During the last week of Unit 4, a focus group session was held to reflect on the flipped instruction and considerations for teaching and learning in Oman. The focus questions prompts were distributed to the participants the week before. The instructor journal observations began in Week 2 and continued through Week 15 that recorded observations of participant interactions with the course content, activities, colleagues and materials.

**RESULTS**

All the data was collected and analyzed during the spring of 2013. Participant surveys, unit reflections, journal observations, and focus group interviews provided the summation of data. Results from the surveys, reflections, interview, and observations were analyzed using coded classification to identify patterns, connections, and emerging themes. Each data source is reviewed separately here and conclusions drawn based on the outcomes summarized in the tables below.

**Participant Surveys**

The participant group was made up six high school teachers and one primary grade teacher with six females and one male. All students had over four years of teaching experience, all were internet-connected at home and at the university, and all owned internet-accessible smart phones as well as either a laptop, tablet, or iPad.

The researcher’s observations from the past three years suggest the demographic profile of this group of participants were typical of other groups of master teachers. The only observable change noted was the better internet connectivity this group enjoyed compared to groups from prior years. This change parallels the observed increase of internet connectivity among the general SQU student population as Omani higher education catches up with the 21<sup>st</sup> century technological advancements.

**Table A:** Shows the Participant Information Survey results. The percentage of participants’ responses is presented with the number of participants responding out of the total of seven provided in parenthesis.

Do you have Internet connection at home?	Yes	No
Do you have a mobile phone?	100% (7 out of 7)	00% (0 out of 7)
Do you have “smart” phone (Internet accessible)?	100% (7 out of 7)	00% (0 out of 7)
Do you have a laptop, tablet, or iPad?	100% (7 out of 7)	00% (0 out of 7)
Used Internet before coming to SQU?	Yes 85.71% (6 out of 7)	No 14.29% (1 out of 7)

Gender		Female 85.71% (6 out of 7)	Male 14.29% (1 out of 7)
Choose the number of years of teaching experience.	4-7 years 57.14% (4 out of 7)	8-12 years 28.57% (2 out of 7)	More than 12 years 14.29% (1 out of 7)
Choose the grade level of your students.	1-4 grades 14.29% (1 out of 7)		5-12 grades 85.71% (6 out of 7)

Participant surveys were distributed that focused on general attitudes about education and current educational practices. The currently held assumptions by participants revealed that all agreed active learning was important in the learning process and instructional delivery strategies were major components for best practices. All participants agreed that learning new strategies was a life-long learning trait in the learning process and all agreed that professional development workshops were useful for teachers. Not all agreed that their schools and their university program encouraged the use of new strategies in their teaching and that they were provided frequent opportunities to “learn by doing” in their teaching or their learning. Most participants (5) agreed direct instruction was a sound instructional delivery method but only 3 agreed that direct instruction was their main teaching strategy for delivering content. Most respondents generally agreed (6) or remained neutral that other methods such as problem-based learning and discovery learning can be as effective as direct instruction. This may indicate that this group of students used a variety of teaching methods for content delivery.

All agreed homework was frequently required from their university program though not all agreed they frequently required homework from their students. Even though all participants stated they frequently take time in class to complete homework with their students, less than half of the participants agreed their students completed the homework when it was assigned. Only 2 participants agreed their instructors at the university take time in class to complete homework with them.

Note taking was also established as important for the learning process and they all agreed they frequently take notes during their own learning process; not all participants however, agreed they required note taking from their students during class.

**Table B:** Shows the Participants Survey results from General Attitudes about Education and Current Educational Practices. The percentages of participants’ responses are provided below with the number responding out of the total of seven in parenthesis.

SA = Strongly Agree (5) A = Agree (4) Neutral (3) D = Disagree (2) SD = Strongly Disagree (1)	Frequency of Responses %				
	1	2	3	4	5
<b>General Attitudes about Education</b>					
1. Instructional delivery strategies are one of the major components for best practices in the educational process.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	28.57% (2 out of 7)	71.43% (5 out of 7)
2. My university program of studies in my department encourages exploration of new strategies of instructional delivery.	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	28.57% (2 out of 7)	57.14% (4 out of 7)
3. Active learning is an important component in the process of learning.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	85.71% (6 out of 7)
4. Direct instruction is a sound method of instructional delivery for providing learners with new information.	00% (0 out of 7)	14.29% (1 out of 7)	14.29% (1 out of 7)	28.57% (2 out of 7)	42.86% (3 out of 7)
5. Other methods of providing new information to students such as problem-based learning and discovery learning can be as effective as direct instruction.	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	28.57% (2 out of 7)	57.14% (4 out of 7)
6. Learning new strategies in teaching and learning is a life-long process for teachers.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	85.71% (6 out of 7)



7. Note taking is an important skill for learners to enhance their retention of new materials.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	85.71% (6 out of 7 - 1Skipped)
8. Homework is a necessary element in the learning process.	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	42.86% (3 out of 7)	42.86% (3 out of 7)
9. All my students complete their assigned homework.	14.29% (1 out of 7)	14.29% (1 out of 7)	28.57% (2 out of 7)	00% (0 out of 7)	42.86% (3 out of 7)
10. Professional development workshops for teachers are generally useful.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	42.86% (3 out of 7)	57.14% (4 out of 7)
<b>Current Educational Practices</b>					
1. My school encourages me to use new strategies in my teaching.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	57.14% (4 out of 7)	42.86% (3 out of 7)
2. My main strategy for delivering content is direct instruction.	00% (0 out of 7)	42.86% (3 out of 7)	14.29% (1 out of 7)	14.29% (1 out of 7)	28.57% (2 out of 7)
3. My students are provided frequent opportunities to “learn by doing” in their learning process.	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	57.14% (4 out of 7)	28.57% (2 out of 7)
4. I am provided frequent opportunities to “learn by doing” in my learning process at SQU.	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	42.86% (3 out of 7)	42.86% (3 out of 7)
5. I frequently require my students to take notes during class.	00% (0 out of 7)	14.29% (1 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	71.43% (5 out of 7)
6. I frequently assign homework to my students.	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	14.29% (1 out of 7)	71.43% (5 out of 7)
7. I frequently take notes during class in my own program of studies at SQU.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	14.29% (1 out of 7)	85.71% (6 out of 7)
8. My instructors at SQU frequently require me to complete homework.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	28.57% (2 out of 7)	71.43% (5 out of 7)
9. I take time in class to complete homework with students.	00% (0 out of 7)	00% (0 out of 7)	00% (0 out of 7)	42.86% (3 out of 7)	57.14% (4 out of 7)
10. My instructors at SQU take time in class to complete homework with me.	00% (0 out of 7)	42.86% (3 out of 7)	28.57% (2 out of 7)	00% (0 out of 7)	28.57% (2 out of 7)

### Unit Reflections

Several dominant patterns emerged from the responses in the Unit Reflections. Coded classification was used to track those words and ideas most frequently emerging that helped to identify the themes. All the participants claimed positive impressions of the flipped experience, stating “it is a really great technique” and the “Ministry of Education in Oman should rethink and review the teachers’ guides to flip teaching”. One commented that “by summarizing the discussions of the flipped tasks” may help students better understand the materials. One participant cautioned however, that “teachers need to be careful not to over-flip as this can be overwhelming for students”. Another warned that “locus of control” of the classroom was changed by flipping and would require planning for flipping to be successful in Omani classrooms. Several complained on the unreliable internet access that was experienced throughout Omani schools. One student pointed out that “most of our students do not have internet access at home.” Several themes emerged from these discussions that have been identified by the researcher tabled below.

**Table C:** Summarizes the major themes that emerged from the Unit reflections on flipping.

Topic	Emerging Patterns
Flipped Instruction	Enthusiasm about flipping and its educational value
	Several saw using this method in workshops with fellow teachers
	All struggled with somewhat when flipped lesson planning
	All had concerns about using this method in the Omani classrooms
	Internet access was not consistent or reliable in Oman

### Focus Group Interview

During the focus interview, participants demonstrated both enthusiasm and trepidation with the flipping strategy. “The pedagogical use [of flipping] was at first confusing” as “we shift education to learning”. Several participants identified the only the “slow learners” benefitting from this method, allowing more time in the classroom for teachers one-on-one assistance. There were also participants’ comments on surprise of “being so highly inspired” by the processes and that many classrooms in America already had the flipped method in place. There was some participants questioning the “added value” to students’ learning and stating there was a need to “feel it first, to experience it” in order to fully understand it. Participants repeatedly identified obstacles to technology integration in Omani education – outdated machines, inconsistent connectivity, and lack of teacher training.

These emerging patterns are identified from the open-ended discussion questions using coded classification to track words and ideas most frequently emerging that identified the themes. Limitations present using open-ended questions include multiple interpretations by the participants as well as multiple responses unrelated to the discussion. The value of emerging information from an open-ended question interview is that new information is allowed surface that may not have been anticipated by the researcher (Patton, 1987). Below is a summary of the major themes identified by the researcher from the focus group interview.

**Table D:** Summarizes the major themes that emerged from the participant focus group session.

Topics	Emerging Patterns
Flipped Instruction	Flipping backed by sound pedagogical reasoning for reversing content delivery
	Flipping required to rethink activities and timings
	Flipping required educating school administration, colleagues, and parents
	Flipping required observing cultural mores in Oman

### Instructor Journal Reflections

As with the participants’ reflections, several patterns weaved throughout the journal entries that were identified by the frequency of the words and ideas used throughout the observations. The one course instructor, who observed the participants behaviors and attitudes with the flipped activities, noted positive responses from all the students when introducing the new flipping approach. “The students seem to welcome the challenges I present them as they think of examples about flipping. They seem to have easily absorbed the methodology”. The instructor noted however, though the participants appeared enthusiastic, they were also impatient with the theoretical in-class discussions, and “they often seem hungry for more hands-on experience with these processes”. The participants often asked for explanations for using this strategy in their course curriculum. Participants appeared to struggle with applying the flipped strategy in homework activities at times. They did well when their own direct content learning as homework though note taking was not always evident. However, when participants were asked to design lesson plans for K-12 students, they stumbled when transferring the experience to lesson design. The lesson plans consistently ran over the assigned time frames within the lesson and the participants struggled with their own due dates for the lesson plan assignments.

The participants’ seemed reluctant to use the flipped method with their K-12 students. Several were willing to use flipped instruction with their colleagues in workshops but all expressed concern that K-12 Omani students were not ready for flipping in the classroom. Concerns with classroom management, lack of support from their colleagues, administrators and parents, and questionable educational added value were most often raised during the discussions.

**Table E:** Summarizes the major themes that emerged from the instructor journal reflections.

Topic	Emerging Patterns
Flipped Instruction	Instructor observed enthusiasm and curiosity among all students
	Instructor struggled with timing and engagement of activities in planning
	Instructor observed some students not completing the note taking with homework assignments
	Instructor recorded concerns among students about using the flipped method in Omani classrooms
	Instructor observed convenience of anytime anywhere connectivity

## DISCUSSION

The purpose of this study is to help understand the potential impact of flipped instruction with Omani educators as well as examining what this may mean to the wider educational community. Results of the data collected through the different instruments provided both participants and instructor opportunities to observe and consider the realities of teaching and learning in Oman. Participant surveys disclosed assumptions of best practices were not always experienced in their own teaching and learning. Participant reflections and interviews allowed for considerations of cultural affects to surface with the flipped experiences. Instructor observations provided a difference source to reiterate the mismatch of participant assumptions – flipping was a positive experience for participants – with expectations – flipping was not considered appropriate to extend to the K-12 Omani classroom. Limitations of this study were the small number of participants, the one semester timeframe, and open-ended questions with a foreign researcher. Perhaps with a larger group over a longer time period with Omani researchers framing specific questions, new data could better inform this inquiry.

Flipped instruction appears to the researcher, an appropriate bridge to integrate new technologies into a traditional educational system and the participants seemed motivated to adopted the flipped instruction to their own learning and that of their colleagues, Given their own struggles to design flipped lessons, their expressed concerns with the wider Omani community, and perhaps the unexplored concern of what to do with the freed-up time in class from giving lectures, it appears that the participants do not seem ready to apply this to the Omani K-12 classrooms. Though a small step, it can be viewed as a starting point for teachers to begin experiencing, considering, and eventually applying new learning strategies to their own teaching with K-12 students.

More time and extended experiences may be required for integrating flipped instruction to the K-12 classrooms in Oman. Educators recognize that change in schools happens slowly when individuals take the small steps toward transforming the experiences of their students (Fullan, 1995). Educators may need to expand the width of exposure to flipped instruction by including it in other courses in the Masters’ program. In addition, it may also require extending the experiences of flipped instruction to undergraduate teacher preparation courses to expose larger numbers of Omani educators to flipping earlier in their university education. Lastly, active teaching in class may need further exploration when teachers free up lecture time in class. This may also be the next group of participants for the researcher with an Omani colleague to widen the inquiry with numbers of participants and to deepen the investigation into the cultural impact this change may stimulate.

## CONCLUSION

The added value for flipped instruction in Omani classrooms may rest on Oman’s tradition of direct instruction in education. Flipping could walk that fine line between progress and cultural responsiveness by providing a palatable approach toward improving the technology integration and how to think about transforming educational practices.

Strong constructivists and die-hard project-based learning advocates will say that we have not gone far enough in handing over the learning to our students. They may be right. However, flipping the classroom is an easy step that any teacher can take to move away from in-class direct instruction to more student-directed and inquiry-based learning (Bergmann and Sams, 2012, p. 111).

Perhaps this study’s achievement is how the inquiry successfully extends this conversation to stimulate further discussion and action among local faculty, students and administrators. Exploring the method of flipping instruction is about considering better ways to support teaching and learning with all the tools available to us. Equally important, this inquiry is about considering the cultural contexts that surround potential changes in educational institutions and how these challenges may be faced. In the end, it is not just about reversing the place we deliver content but it is also revisiting the contextual reasons why we would do so.

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## THE PLACE OF TECHNOLOGY INTEGRATION IN SAUDI PRE-SERVICE TEACHER EDUCATION: MATCHING POLICY WITH PRACTICE

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### ABSTRACT

The current study aims at understanding the place of technology integration in Saudi pre-service teacher education curriculum. To achieve this, a sequential qualitative approach was implemented in two main stages. First, national and curriculum policies were thematically analysed. Based on this, semi-structured interviews with three key policymakers were conducted in the second stage. Main findings associated with document analysis revealed the importance of technology in advancing the country at all levels including pre-service teachers' preparation. In contrary, pre-service teachers' curriculum policies, structure and guidelines severely lack the vision of the effective integration of technology. Progressive interviews with key policymakers showed that the effective integration of technology is considered a high priority in their mission. However, the strong tendency toward cultural-religious conservatism seems to slow the change. Based on the current study's findings in association with previous research, context-appropriate recommendations are proposed. These involve two main domains: enforcing innovative technology-based pedagogical models and developing effective leadership.

**Keywords:** Technology integration, Higher education, pre-service teacher education, Saudi Arabia

### INTRODUCTION

Technology and educational development, especially in the current era, cannot be separated. Digital technologies are acknowledged as powerful tools in the development of education that is meaningful in the 21<sup>st</sup> century (Peeraer & Van Petegem, 2011; Norhayati & Siew, 2004). Optimising the use of technology can create competitive economies, construct knowledge-based societies, and enhance the process of innovative education (Bongo, 2005; Fong, 2009; Nasab & Aghaei, 2009; Poorfaraj, Samimi & Keshavarz, 2011; Norhayati & Siew, 2004).

A case in point, the new generation of children are extremely familiar with a variety of digital technologies in their daily lives (Prensky, 2001a, 2001b; Robertson, Fluck & Webb, 2007). Therefore, pre-service teacher education programs are now challenged to prepare teachers who can effectively understand, guide and teach these digitally competent children (Robertson et al., 2007; Smolin & Lawless, 2007).

Conversely, current efforts towards gaining full advantages of technology integration into pre-service teacher education curriculum are unsatisfactory. More than a decade ago, researchers reported that teacher education programs globally seemed to be heavily dominated by traditional approaches to teaching and learning (Katyal, 2010; Liu, 2012; Peeraer & Van Petegem, 2011; Polly, Mims, Shepherd & Inan, 2010; Norhayati & Siew, 2004; Song, 2010; Vannatta, 2007).

Therefore, the effective integration of technology seems to be problematic and challenging (Gale, 2007; Peeraer & Van Petegem, 2011; Polly et al., 2010; Smolin & Lawless, 2007). As Smolin and Lawless (2007) argue, 'technology-based reform is especially challenging because it is a multifaceted endeavour' (p. 2). This endeavour can be further described as a 'terrain of complexity, multiplicity and interconnectedness' (Gale, 2007, p. 471).

To deal with this complexity for the purpose of the current study research, main technology integration-related issues considered in the literature were identified. They include a) the pedagogical perspective that focuses on the curriculum design and its associated technology-based pedagogical practices; b) the administration perspective that discusses key roles of leadership that connect theory with practice.

### THE PEDAGOGICAL PERSPECTIVE

Technology-based curriculum and technology practice cannot be separated in the process of promoting effective integration of technology in pre-service teacher education curriculum. Literature suggests that technology must be integrated more systematically, effectively and cooperatively into all facets of pre-service teacher education curriculum (Culp, Honey & Mandinach, 2005; Liu, 2012; Smolin & Lawless, 2007).



Accordingly, pre-service teacher education institutions should provide pre-service teachers with three main skills: basic computer literacy; specific knowledge in relation to teaching with technology; and practical experiences through increased exposure and practice to connect technology and the real pedagogical approaches (Liu, 2012; Teo, Lee & Chai, 2008).

Although the need for a new curriculum that integrates technology is evident, pre-service teacher education is undergoing dated standards in terms of curriculum development, which only offers pre-service teachers with older and simpler instruction methods (Peeraer & Van Petegem, 2011). Consequently, the literature supports initiatives to develop intensive curriculum-based technology training rather than basic computer skills or literacy (Altun, 2007; Smith & Kelley, 2007).

### **THE ADMINISTRATION PERSPECTIVE**

Effective leadership contributes to enhancing the effective integration of technology into pre-service teacher education (Altun, 2007; Culp et al., 2005; Lessen & Sorensen, 2006; Robertson et al., 2007). Theoretically, its role in this process can be demonstrated in proper guidance, enhancing values and developing strategic plans for the effective integration of technology (Culp et al., 2005; Robertson et al., 2007).

Practically, effective leadership has four key actions: considering the use of technology as a priority, establishing an adequate technological infrastructure, focusing on development processes, and maintaining training and supporting opportunities for students and academic staff (Altun, 2007; Lessen & Sorensen, 2006; Smith & Kelley, 2007).

An effective leadership role and view can be translated in the shape of educational policies that promote effective integration of technology into the pre-service teacher education curriculum. Policymaking is important due to its investigation of the what, how and why of the educational institutions; how they set their priorities of pedagogical beliefs and practices (Altun, 2007; Culp et al., 2005; Gale, 2005; Robertson et al., 2007; Robertson & Al-Zahrani, 2012). Therefore, they should be revised and carefully improved, that is, to critically narrow the gap between the prospective of technology integration and the way that technology has been implemented (Culp et al., 2005; Robertson & Al-Zahrani, 2012).

### **SAUDI ARABIA AND GLOBAL TRENDS**

Saudi Arabia is essentially driven by strong social and religious beliefs. Islamic law, known as Shariah, dominates Saudi identity, culture and the entire social life, especially education (Al-Issa, 2009, 2010; Bingimlas, 2010; Krieger, 2007; Onsmann, 2011; Oyaid, 2009; Robertson & Al-Zahrani, 2012).

Although Saudi Arabia presents a highly closed and conservative context, it is a rapidly developing nation. “international competitiveness is likely to ... impact significantly and possibly irrevocably on Saudi cultural traditions and religion norms” (Onsmann, 2011: 1). Largely through earnings linked with the oil industry, Saudi developments within economy have supported education, and level of consumption of technology (Hartley & Al-Muhaideb, 2007; Joseph & Lunt, 2006; Krieger, 2007; Nelson, 2010; Onsmann, 2011; Ramady, 2010; Sutton, 2007). Hence, many observers such as Krieger (2007), Ramady (2010), and Onsmann (2011) noted that the Saudi government’s primary aim is to lessen the dependence on its oil industry that is predicted to come to an end in less than 100 years.

In relation to policy, the main goals of the educational policy are to eliminate illiteracy among Saudi citizens; to ensure more efficiency for education, and finally to meet the country’s needs in its religious, social, cultural, and economic development (MoE, 1980; Ramady, 2010). However, there is a clear gap between policy and practice of dominant leadership due to the strong tendency toward conservatism (Abu-Arrad & Fosaiel, 2006; Al-Asmari, 2008; Al-Miman, 2003; Al-Saleh, 2002; Robertson & Al-Zahrani, 2012). As a result, pre-service teacher education curriculum is still conditional upon the traditional vision of instruction. The integration of technology into curriculum such as online instruction is yet unknown (Al-Jarf, 2006). Further, curriculum design concentrates on quantity rather than quality and prevents pre-service teachers and instructors performing efficiently (Al-Asmari, 2008; Al-Miman, 2003; Robertson & Al-Zahrani, 2012).

### **RESEARCH PROBLEM, AIM, SCOPE AND KEY QUESTION**

In Saudi Arabia, there is a lack of teacher preparation and training in digital technologies and that it should be improved (Abu-Arrad & Fosaiel, 2006; Al-Jarf, 2003, 2006; Al-Miman, 2003; Al-Saleh, 1999, 2002, 2003; Alsharidah, 2012; Bingimlas, 2010). In line with this, there is a paucity of studies conducted in this area.

Therefore, the aim of this study is to investigate the place of the effective integration of technology into Saudi pre-service teacher education curriculum. To achieve this, a critical examination of the current situation of technology-related policies of Saudi pre-service teacher education was conducted. The research key question is:

- What is the place of technology integration in Saudi pre-service teacher education curriculum?

**METHODOLOGY**

The current study implemented a qualitative approach with two main sequential stages. First, national and curriculum policies were thematically analysed. Based on this, semi-structured interviews with three key policymakers were conducted.

Qualitative research usually aims at in-depth understanding of human behaviour and the motives behind such behaviour (Mertens, 2005). It is especially effective in gaining culturally-specific information and intangible factors relevant to religion, values, norms, emotions and social practices.

**DOCUMENT ANALYSIS**

The current study begins with a critical analysis of the most relevant documents. Taking into consideration the fact that Saudi Arabia is a highly policy-driven context, policy is expected to play a major role in the establishment of educational and pedagogical practices. In relation to this, the following sub-questions were posed:

Table 1: Investigative perspectives, related questions

Issue	Questions
The place of technology in Saudi national policies	1. How do national policies view the role of digital technologies?
	2. How does cultural-religious conservatism affect the role of digital technologies?
The place of technology in pre-service teacher education policies	3. How do pre-service teacher education policies present and maintain the effective integration of technology into the curriculum?
	4. How does cultural-religious conservatism affect pre-service teacher education?

According to Merriam (1988), the concept documents in research refer to ‘a wide range of written, visual, and physical materials ... Documents of all types can help the researcher uncover meaning, develop understanding, and discover insight relevant to the research problem’ (pp. 109–118).

Thematic analysis is the analytic method used in the current stage. Thematic analysis ‘should be seen as a foundational method for qualitative analysis’ (Braun & Victoria, 2006: p. 4). It stresses recording and examining themes within a set of qualitative data that are important to the understanding of the phenomenon under investigation.

Theoretical purposive sampling was implemented to elicit a smaller number of documents that are available, eligible and more indicative of the phenomenon under investigation (Mertens, 2005). The analysed documents were classified into two main categories:

1. National policy documents that are relevant to the effective integration of technology and govern the practices of the whole community and provide the country’s general framework (see Appendix 1).
2. Curriculum documents that were specifically designed for pre-service teachers’ preparation and include curriculum structure, goals, objectives and guidelines (See Appendix 2).

**SEMI-STRUCTURED INTERVIEWS**

In the second stage, in-depth semi-structured interviews were conducted with three policymakers based on the findings obtained from the document analysis. Interviews with policymakers may uncover views, attitudes and factors affecting the integration of technology in Saudi education through a so-called governmental or quasi-governmental voice. Deemed as ‘elites’, it is believed that people in positions of authority can be uniquely helpful (Gillham, 2005, p. 54).

Interview participants were contacted based on their willingness to participate. Personal connections helped to facilitate this process. Probing was one of the main strategies used in the semi-structured interview questions (Gillham, 2005). In order to avoid misinterpretation, some participants were contacted to clarify the point they had made. Then, three Arabic native speakers were contacted and asked to review the translation to ensure its validity (Mertens, 2005).

Appendix 3 provides a brief overview of the interviewees' profiles. Their real names have been replaced with fictitious names due to confidentiality issues. Information in terms of their position is also kept confidential to protect their identity.

## RESULTS

### ANALYSIS OF NATIONAL POLICY DOCUMENTS

Thematic analysis of national policy documents unveiled two major themes: the important position of technology in Saudi national policies; and the fundamentalism of Islam and mono-cultural domination.

#### *The important position of technology in Saudi national policies*

The emphasis given to technology in Saudi national policies took a significant place when the early Saudi planners realised its importance. For instance, the Educational Policy in the Saudi Arabian Kingdom (EPSA) from the Ministry of Education (MoE), third edition, which was released in the early 1970s, acknowledged the crucial role of technology in the advancement of the country in coordination with science (MoE, 1980). For example, in the first part that concerns the most important principles, it explains the importance of the 'harmonious coordination with science and technology, being the most important means of cultural, social, economic and physical development, to raise the standard of our country and nation and to fulfil our role in world cultural progress' (p. 7). In addition, one objective of Saudi higher education is to 'perform a positive role in the field of scientific research which contributes to world progress in arts, sciences and inventions, and finding sound solutions for the requirement of developed life and technological trends' (pp. 21–22).

As another example, the Ministry of Economy and Planning (MoEP) announced the Eighth Development Plan (EDP) (2005–2009). It stresses four important demands: the improvement and expansion of the current technology infrastructure; the expansion of Arabic online content; bridging the digital gap between all segments of the nation; and the application of electronic government (pp. 499–501).

In addition, the Ministry of Communications and Information Technology (MCIT) took the initiative of formulating and implementing the National Communications and Information Technology Plan (NCITP) in 2007. This plan sets out a long-term vision for transforming Saudi Arabia into an information society, increasing productivity through providing technology services for all sectors of the Saudi community (MCIT, 2007).

With regard to the Saudi educational sector, MoE (2005) released its Ten-Year Plan 2004–2014. One of the most important factors in this plan is 'the industrial and technological changes that have resulted in the transformation of society's needs and the nature of the labour market' (p. 2). To fulfil this view, relevant goals and objectives are set out including developing 'the required infrastructure for technology to be better implemented in education' (p. 16); establishing an 'integrated system' for the application of both information and communication technologies in schools (p. 16), and enhancing 'the integration between machine and human knowledge' (p. 16).

#### *Fundamentalism of Islam and mono-cultural domination*

All Saudi national policies are substantially concerned with strengthening the Islamic ideology that should govern all facets of Saudi life including organisations, individuals and the mutual relationship between them. For example, the fundamental goal of the EPSA policy is to fulfil the duty of religion, the society's needs and the nation's overall objectives (p. 5). In addition, notions to the Islamic principles are mentioned in many other places in the EPSA such as 'religious education is the basic element' (p. 7); the 'Islamic orientation' (p. 7); the 'Islamic solidarity' (p. 8); the 'absolute faith in the fundamentals of the Islamic nation' (p. 11); the 'Islamic idea' (p. 41); the 'Islamic objectives' (p. 44); and the 'provisions of Islam' (p. 44). With regard to preserving the Arabic language, the EPSA strongly states that 'Arabic is the language of education in all its items and stages unless need dictates otherwise' (p. 9).

The influence of EPSA on other Saudi national educational policies is evident. For instance, the MoE, in its Ten-Year Plan 2004–2014, articulated clearly the vision of 'the graduation of male and female students with Islamic values and the appropriate knowledge and practice' (p. 14). In addition, this plan considers 'Islamic religious basics and society's original values' (p. 7) as the first point of its basics and determinants. Moreover, one of its methodology matters is 'Saudi society's distinguished nature and its Islamic and social privacy' (p. 9). Its ninth goal is a practical one, that is, 'to develop syllabi based on Islamic values' (p. 15). This goal's relevant objectives includes 'to develop syllabi that will ensure the development of the Muslim learner's personality to make him proud of his faith and to be loyal to his country in practice and conduct' (p. 15) and 'to develop syllabi in accordance with contemporary international trends according to the Islamic values' (p. 15).

## ANALYSIS OF CURRICULUM DOCUMENTS

Saudi pre-service teachers must undertake an intensive eight-level course over a minimum of four years to be awarded a Bachelor in Education. This certificate is in a specific discipline of teaching that includes Islamic studies, Arabic language, Social Studies, English Language, Natural Sciences such as Biology, Chemistry, and Physics, Maths, Computer Science, Special Education, and Physical Education.

For most of the teaching disciplines, pre-service teachers study four specific units/levels making seven accredited units in the educational technology preparation. Each unit/level has its own set of objectives in terms of theory and practice. According to the Faculty of Education at King Abdulaziz University, the main goals of the Department of Educational Technology (DET) (2014a, 2014b) mainly focus on providing pre-service teachers with compulsory courses in the field of educational technology as well as providing technical assistance and support to faculty members.

After reviewing the policies goals, guidelines as well as curriculum structure in Saudi pre-service teacher education, the following themes emerged.

### *Islamic principle-guided goals, policies and curriculum structure*

Saudi pre-service teacher education must reflect Islamic values and morality. As stated in the EPSA, the first goal is that teacher preparation ‘shall be in line with the nation’s basic objective in rearing up a Muslim generation which understands the Islamic creed and law’ (p. 30). The aim is also to preserve cultural aspects such as the Arabic language and the total reliance on it as the solo language of education. This is ‘to enable graduates to teach with a high Islamic spirit and correct Arabic language’ (p. 30). A case in point is that the process of recruiting administrative and teaching staff in pre-service teacher education is mainly dependent on ‘Islamic morality’ in addition to ‘scientific standards and educational competence’ (p. 30).

### *Technology integration-free policies, curriculum structure, goals and objectives*

It can be argued that, firstly, the goals of Saudi pre-service teacher education as well as the overall goals of the curriculum and the units that pre-service teachers must take in terms of educational technology preparation do not contain any explicit reference to ‘technology integration’ (DET, 2014a, 2014b). Rather, the educational technology preparation goals and objectives only describe the scope of educational technology learning and training in terms of the pre-service teachers’ proficiency and capability to use technology in general. The focus is on understanding theories, concepts and knowledge with less emphasis on the practical side.

In addition, the overall goals and objectives of the educational technology preparation show a clear absence of any performance standards in the related teaching and the required technology skills that pre-service teachers should be able to demonstrate. The documents briefly state only what pre-service teachers should be able to accomplish after completing the program, rather than what they should be able to do in their future classrooms.

## POLICYMAKERS’ INTERVIEWS

Based on the key findings obtained in the analysis of both national and curriculum documents, this sub-section investigates the policymakers’ perspective as technology practitioners including factors affecting the integration of technology into the pre-service teacher education curriculum and their pedagogical perspective and administration perspective. Table 2 presents key issues, questions and focus for the major themes.

Table 2: Key issues, questions and focus of policymakers’ interviews

Major Themes	Key Issues	Interview Questions
Policymakers’ technological perspective	• The impact of global technological developments on effective technology integration	➤ What is the impact of the global pressure of technological developments on the integration of technology into pre-service teacher education?
	• The impact of cultural-religious conservatism on effective technology integration	➤ What is the impact of cultural-religious conservatism on the integration of technology into pre-service teacher education?
Policymakers’ pedagogical perspective	• The policymakers’ conceptualisation of a globalised curriculum	➤ How do the policymakers conceptualise the globalised curriculum?
	• Their views of the quality versus quantity curriculum	➤ How do the policymakers view the quality v. quantity curriculum?
Policymakers’	• Leadership vision of effective	➤ What is the current leadership view of effective

administration perspective	integration of technology	integration of technology into pre-service teacher education?
	<ul style="list-style-type: none"> <li>• Current leadership practices to integrate technology effectively</li> </ul>	➤ What are the leadership current practices to integrate technology effectively into pre-service teacher education?

***Policymakers’ technological perspective***

First, the global pressure of technology refers to the pressure generated by the massive, rapid and global developments of technology on any society, which evokes a technological transformation. Ali confirmed that:

Technology has become a must and cannot be avoided or ignored whether we like it or not! We must get out of being local to global. We should get out of the box and take advantage of the global developments in technology.

Hamad also elaborated that:

Most global trends are now about technology.

Second, cultural-religious conservatism appears in the policymakers’ responses as an important issue that affects their perceptions with regard to technology. Ali clearly stated that:

We are afraid of the inappropriate or harmful use of technology. Therefore, we must impose new kinds of censorship in order to effectively use it.

***Policymakers’ pedagogical perspective***

First, the globalised versus traditional curriculum. Both the global pressure of technology and cultural-religious conservatism influence the policymakers’ views with regard to the necessary curriculum developments. For instance, Ali articulated that:

We now have more choices in education in the presence of modern technology, which becomes a global language. Therefore, we must abandon our old teaching methodologies and adopt new ideas including the integration of digital technologies.

However, this transformation seems to be more concerned with the curriculum format not with its content:

We completely differentiate between importing curriculum and importing only curriculum styles and approaches. Specifically, we emphasise the originality of the curriculum, but we wish to benefit to the maximum possible extent from the scientific and technological aspects. (Saeed)

Second, quantity versus quality curriculum. Saudi teacher preparation has focused for decades on the preparation of an adequate number of teachers who can cover the shortfall of teachers in general education. Hamad confirmed that:

The desire of the Ministry of Education is that graduated teachers should be multi-disciplinary so that they can easily teach any subject.

***Policymakers’ administration perspective***

The first issue is leadership theory of the effective integration of technology. The interviewed policymakers considered the integration of technology as a priority. According to Ali:

The integration of technology is one of the very, very, very important issues that we have. It has become a modern necessity.

Therefore:

The Faculty of Education has established two micro-teaching centres and improved the Educational Resources Centre. There are digital laboratories for Mathematics and Arts. We also have audio laboratories for the English language and Quran studies. Also, there are more than 20 classrooms equipped with data projectors and are ready for use. (Saeed)

**DISCUSSION AND CONCLUSIONS**

The current study reveals two major findings. The first is the importance of technology that reflects its global pressure and rapid development. This is acceptable in light of the current global competition to make the most of technology and its rapid developments in building knowledge-based societies as well as strong and competitive digital economies (Bongo, 2005; Fong, 2009; Nasab & Aghaei, 2009; Poorfaraj et al., 2011; Norhayati & Siew, 2004).



The second finding is the domination of cultural-religious conservatism. Conservative and traditional contexts such as Saudi Arabia may bear witness to a legitimate resistance to adopt some new global trends, such as the integration of technology on a wide scale (Al-Asmari, 2008; Krieger, 2007; Onsmann, 2011; Ramady, 2010; Robertson & Al-Zahrani, 2012). As a case in point, Saudi education has less emphasis on issues relating to globalisation (Al-Issa, 2009, 2010).

Saudi conservatism can be attributed to the so-called ‘cultural sheltering’ (Al-Asmari, 2008, p. 250). Usually, authorities in conservative contexts such as Saudi Arabia take ‘proactive measures’ to protect the local culture by reducing interaction with foreign cultures that may reduce the value of the native culture (Al-Asmari, 2008, p. 250). Further, Saudi Arabian people are usually committed to their social and religious values and tend to reject new ideologies that may cause confusion (Krieger, 2007).

The notion of conservatism can be also found in other relatively similar contexts. For example, Abuhmaid (2010) revealed that the national Jordanian project, named the Education Reform for the Knowledge Economy, was proceeding very slowly as it was in conflict with the dominant culture of the local system. In Turkey, which is another similar context, E. Çakirogoelü and J. Çakirogoelü (2003) argue that:

We believe that there are many things that we can learn from the international literature on the field of education. However, we also believe that there needs to be a filter of critical perspectives for any knowledge that is being used in other cultures. (p. 262)

However, it can be argued that the Saudi outlook with regard western-based cultures is shifting from sheltering toward selectivity. Onsmann (2011) argues that Saudi cultural-religious norms are subject to a significant impact that could be permanent due to the pressure of ‘international competitiveness’ (p. 1).

As a result of conservatism, traditionalism is widely prevailing as the obvious model of education. This result strongly supports the assumption that teacher preparation in Saudi Arabia is still conditional upon the old vision of instruction through applying traditional methodologies of teaching and learning (Al-Asmari, 2008; Al-Issa, 2009, 2010; Robertson & Al-Zahrani, 2012). The overall structure of the Saudi pre-service teacher education curriculum, guidelines, goals and objectives severely lack the vision to integrate technology effectively. Pre-service teachers’ educational technology preparation is provided through traditional technology-related courses that have no connection with their current or future pedagogical approaches.

While the curriculum tends to be more standardised and focuses on quantity rather than quality, little opportunity for the effective integration of technology seems to be offered. This conflicts with the findings of the literature in this regard. The literature stressed the effectiveness, efficiency, productivity and competency of the curriculum design. Technology should be an integral part of all facets of the pre-service teachers’ curriculum to meet their needs, preferences and learning styles as well as the challenges of digital societies (Altun, 2007; Smith & Kelley, 2007; Smolin & Lawless, 2007).

As the effective integration of technology was found to be a high priority in the policymakers’ mission, many technology-related developments were introduced. This can be a promising result as a great deal of literature emphasises that this positive vision or theory should be the first stage to ensure the effective integration of technology into pre-service teacher education (Culp et al., 2005; Lessen & Sorensen, 2006; Robertson et al., 2007).

All in all, the effective integration of technology into Saudi pre-service education curriculum seems to have less attention, at least in the present time. Based on the current study’s findings in association with previous research, context-appropriate recommendations are proposed. These involve two main domains: enforcing innovative technology-based pedagogical models and developing effective leadership.

The efficiency of the curriculum can be increased reinforcing innovative educational models to lessen the impact of traditionalism and the focus on quality rather than quantity. Further, updating courses and content relevant to educational technology preparation is critical to enhance the pre-service teachers’ effectiveness and eligibility for practice. Moreover, increasing the number of online courses and embedded technology-based activities may enhance communication, collaboration and flexibility of learning.

As leadership is critically important, leadership is required to clarify issues surrounding the effective integration of technology at both levels of theory and practice. It must provide answers to the following questions: what technology should be used; why it should be used; how it should be used; and when it should be used?

Leadership is also required to create effective cooperation and partnerships with advanced international educational organisations. This may increase the quality of Saudi teacher preparation by observing successful expertise by the means of knowledge sharing and exchange of experience. Cooperation with the private sectors is also important to support the provision of expensive technologies as well as training and support.

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**APPENDICES**

**Appendix 1**

Selected national policy documents

No.	Policy/Document	Description/Significance/Content	Source
1	The Educational Policy in the Saudi Arabian Kingdom	The highest Saudi educational policy that controls all facets of Saudi education and related systems	MoE (1980)
2	The Ten-Year Plan of The Ministry of Education (MoE)	The National strategic plan for the MoE for the period (2004-2014)	MoE (2005)
3	Education Development National Report of the Kingdom of Saudi Arabia (2000-2004)	National report regarding education development in Saudi Arabia produced by the MoE in cooperation with the Ministry of Higher Education (MoHE) and Technical and Vocational Training Corporation (TVTC)	MoE (2004)
4	Report on Identity and Development	National report on Saudi education development in terms of knowledge economy	MoE (2008)
5	King Abdullah bin Abdulaziz Public Education Development Project	The project aims at involving the community to formulate a future vision for Saudi education through dialogue and partnerships between state institutions	Tatweer (2010)
6	The National Communications and Information Technology Plan: The Vision Towards The Information Society from the Ministry of Communications and Information Technology (MCIT)	A comprehensive ICT plan that consists of a long-term vision for ICT in SA for the next 20 years plus a five-year plan that projects the long-term vision for the first five years of the plan	MCIT (2006a)
7	Information And Communications Technology (ICT) Policy Statement from the MCIT	This document is to state the policies that have been adopted by MCIT in the past few years, as well as those MCIT plans to pursue over the next few years in the development of the ICT sector in Saudi Arabia	MCIT (2006b)
8	The Universal Access And Universal Service Policy from the MCIT	This policy implies that 100% of a population can obtain, at a minimum, public access to a defined ICT service at a defined quality, through reasonably available and affordable public or community facilities	MCIT (2006c)
9	The e-Government Program from the MCIT	The program ( <i>Yesser</i> ) translates the Saudi Government's keen interest in implementing the e-government concept as a part of many initiatives aimed at achieving sustained growth and development	Yesser (2009)
10	The Saudi Arabian Home Computing Initiative (SAHCI) from the Communication and Information Technology Commission (CITC)	This policy has the core mission of enabling all Saudi families to obtain a personal computer through easy and affordable instalment plan	CITC (2010)
11	The Long Term Strategy of The Saudi Economy 2025 from the Ministry of Economy and Planning (MoEP)	A strategy designed to provide a framework for four successive five-year plans until 2024 and aimed at achieving a comprehensive socioeconomic vision by the end of the period	MoEP (2005a)
12	The Eighth Development Plan (2005-2009) from the MoEP	This development Plan has been prepared in the context of a long-term vision and economic and developmental strategy geared to achieving sustainable development	MoEP (2005b)
13	Millennium Development Goals from the MoEP	National policy that aims at formulating a common development vision that would respond to existing needs and rise to new challenges; all within a framework of partnership at national and international levels	MoEP (2010)



**Appendix 2**

## Selected curriculum documents

No.	Policy/Document	Structure/Description	Source
1	Main goals of Saudi teacher preparation	The general framework for teacher preparation in Saudi Arabia	MoE (1980)
2	Main goals of the DET, Faculty of Education, King Abdulaziz University	Teachers' technological preparation according to the DET	DET (2014a)
3	The Educational Technology Preparation Module	This module consist of 4 units that are compulsory for graduation: - Introduction to Educational Technology - Production of Instructional Means - Using Instructional Means - Design and Production of Educational Computer Programs	DET (2014b)

**Appendix 3**

## Overview of the policymakers' profiles

Policymaker	Age	Education	Relevance/Position	Site	Duration	Time
Ali	50s	PhD in Education Curriculum and Teaching Methodologies	Full professor, Key policymaker in Saudi pre-service teacher education	Ali's office	14.48 min	11:30 AM
Saeed	40s	PhD in Education Islamic Studies	PhD, Key policymaker in Saudi pre-service teacher education	Saeed's office	25.48 min	1:30 PM
Hamad	50s	PhD in Education Curriculum and Teaching Methodologies	PhD, Key policymaker in Saudi pre-service teacher education	Hamad's office	39.24 min	2:00 PM

**Appendix 4**

## Educational Technology units/levels

Level	Unit title	Unit code	Accredited units	Type	Prerequisite code
1	Introduction to Educational Technology	TTEC 100	One Unit	Theoretical	N/A
2	Production of Instructional Means	TTEC 200	Two Units	Theoretical & Practical	TTEC 100
3	Using Instructional Means	TTEC 201	Two Units	Theoretical & Practical	TTEC 100
4	Design and Production of Educational Computer Programs	TTEC 300	Two Units	Theoretical & Practical	TTEC 100

## USING MOBILE-ASSISTED EXERCISES TO SUPPORT STUDENTS' VOCABULARY SKILL DEVELOPMENT

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### ABSTRACT

The use of mobile phones for learning has become well-known and is widely adopted in many language classes. The use of SMS for transmitting short messages is a fast way of helping students to learn vocabulary. To address this issue, this study was conducted to examine the effects of mobile-assisted vocabulary exercises on vocabulary acquisition of first-year students. Eighty students from two sections enrolled in a fundamental English course participated in the study. Each section consisted of 40 students. One of the groups was chosen as the experimental group, and the other as the control group. All students received the same amount of new words and dictation in class. Then only the students in the experimental group did vocabulary exercises on mobile phones via SMS. Those in the control group received paper-based exercises to be done in class. The instruments were pre-and post-vocabulary tests and a questionnaire surveying the students' attitudes toward mobile-assisted exercises. The findings revealed that vocabulary knowledge of students in the experimental group outperformed the control group. They used and learned target vocabulary better than those in the control group. Mobile-assisted vocabulary exercises had a significant effect on vocabulary ability of the students. The results of the questionnaire also illustrated their positive attitudes toward doing mobile-assisted exercises as a whole. It can be concluded that using mobile phones as a learning tool contributes to the success of students meanwhile increases their learning motivation.

**Keywords:** vocabulary learning, teaching vocabulary, m-learning, mobile-assisted learning

### INTRODUCTION

The advancements of mobile technologies have changed the way teaching and learning processes are being conducted inevitably (Cavus, 2011). Mobile technologies including mobile phones, pocket electronic dictionaries, personal digital assistants (PDAs), MP3 players, and tablet PCs are being used for educational purposes. The term 'mobile learning' or m-learning is, therefore, defined for learning through mobile technologies. It is as a new type of learning model which allows learners to receive learning materials anywhere and anytime through wireless telecommunication network and the Internet (Lan and Sie (2010). Likewise, Guy (2009) defines m-learning as electronic learning (e-learning) through mobile computational devices. M-learning combines strategies, practices, tools, applications, and resources with proven advances in technology to support anywhere, anytime learning (Brown, 2008). As Kee and Samsudin (2014) put up, the teenagers in this mobile-technology era can perform ubiquitous learning easily. They can simply gain access to the information and content from different resources in the web. So, they have more variety of choices to obtain knowledge and information.

Among various mobile technologies, mobile phones have a high potential of improving the teaching and learning processes. Teenagers in the 21 century are in the digital age; their lifestyle has been altered accordingly (Chanprasert & Han, 2013). Their daily lives depend on mobile phones which are mainly used for communication and entertainment. However, mobile phones are not only beneficial for personal use; they can make learning activities more motivational, interesting, and different from traditional ones (Cui & Bull, 2005). Mobile devices such as Wi-Fi, Bluetooth, Short Message Services (SMS) and camera can be applied for various educational practices (Kizito, 2012). Hoppe (2009) states that students can use browsers to read materials such as e-books, and watch lecture. According to Kafyulilo (2012), downloading feature on mobile phones can be used to get various kinds of materials and video. In addition, most of the mobile phones have features which can be used for recording and playing multimedia contents, so students can use a camera on mobile phone for documenting visual materials and collecting scientific data (Cui & Wang, 2008). With emails and even access to the Internet, mobile phones will be greatly useful for learning English. Learning through mobile phone can occur anywhere and anytime (Brown, 2008). In short, mobile phones can introduce a new learning environment due to the emergence of mobile and wireless technologies.

Although mobile phones are banned in many classrooms since faculty perceive them as intrusive stuffs which may distract the learners from learning, they can be turned to be a learning device if the faculty know how to use them to create learning tasks wisely. Many studies show that mobile phones can create pleasant learning environment and have a positive effect on learning (Cobcroft, Towers, Smith, & Bruns, 2006; Serrano-Santoyo & Organista-Sandoval, 2010). In addition, a positive view was demonstrated by learners in terms of mobile phone usage for learning (Cavus & Ibrahim, 2009; Lu, 2008; Stockwell, 2008; Stockwell, 2010). During the past ten years, mobile phones have been used to facilitate language learning in all skills. However, the skill which is much developed by this kind of technology is vocabulary. Adoption of mobile phones for vocabulary learning is, therefore, increasing (Stockwell, 2010; Zhang, Song, & Burston, 2011). The critical significance of vocabulary is placed on two issues: establishing knowledge structure and facilitating communication (Coady & Huckin, 1997). Vocabulary acquisition requires more efforts and time in second language (L2) than in first language (L1). Vocabulary is deemed important for student academic achievement, particularly for EFL learners with limited exposure to the target language. To form a meaningful and grammatically correct sentence, all the language components have to fall into place, the most prominent ones being grammar and vocabulary (Orawiwatnakul, 2013). L2 learners need at least 95 per cent coverage of the running words in the input in order to gain comprehension (Nation, 2001).

### **Learning Vocabulary via SMS and MMS**

The lack of sufficient vocabulary can be solved by mobile-assisted language learning (MALL). Among many tools, mobile phones are increasingly used in academic activities because they are cheap when compared to other ICTs, and everyone can afford them. Nowadays, mobile phones are becoming more commonly used in learning vocabulary, and many studies show the increase of adoption of the cell phone in the classroom. Mobile phones have different features such as short message service that can be used for pedagogical purposes. Short message is one of the features of mobile phones that have the capacity to contribute to enhancing language learners' vocabulary knowledge (Lu, 2008). One of the possible learning tasks is the use of SMS for transmitting short messages of vocabulary lessons, exercises or assignments. An advantage of deploying mobile applications on SMS is that almost all mobile phones are SMS enabled.

Sending text messages by SMS has been carried out to motivate students to learn and develop their vocabulary knowledge as demonstrated in many studies. For instance, Jolliet (2007) designed a collaborative model for teaching beginner-level L2 via mobile phones based on an inventory of 50 basic vocabulary modules (20 words) and related short dialogues organized around daily-life themes (i.e., food, transportation, etc.). Learners used a phone link to practice and record pronunciation of the vocabulary and dialogues, which were distributed via email or a website, and role-play the scenarios with other learners via SMS or voice communication. Cavus and Ibrahim (2009) developed a system in a form of SMSs to send technical English words together with the meanings to students. The finding indicates that sending words is useful for learners' vocabulary improvement. Song & Fox (2005) reported on a pilot study that explored the use of mobile phone SMS to support the L2 English vocabulary learning of working adults. The system was trialed for four weeks by 10 volunteers as a complement to a web-based multimedia tutorial program. New words and expressions were delivered via SMS twice a day, four days a week. Test results demonstrated a marginal improvement in performance and a positive learner attitude towards the use of the combined technologies.

In some studies, the use of SMS was compared with the traditional approach to see what worked better for students. Lu (2008) investigated students' performance after they had learned two sets of English vocabulary through mobile phones and by a paper-based format. The finding revealed that students who learned via SMS knew more words than those learning with the paper-based tasks. Similarly, Tabatabaei and Goojani (2012) conducted a two-month mobile phone-based study to study the effectiveness of SMS for L2 English vocabulary acquisition. 30 high school students wrote sentences between five and six words, which were sent via SMS to the instructor and fellow students. A control group of 30 did similarly by exchanging written papers. The SMS group significantly outperformed the control group on a vocabulary post-test. Both students and their teachers had positive attitudes toward the application of SMS on vocabulary learning. In addition, a study conducted by Baçoğlu and Akdemir (2010) investigated the effectiveness of a mobile phone-based flashcard application for L2 English vocabulary acquisition used by students in an experimental group, compared to its printed counterpart used by a control group. The results from the posttest confirm that the flashcards on mobile phones is more efficient in enhancing students' vocabulary knowledge than the paper-based flashcards. Students found learning English vocabulary through mobile phones fun and really useful. Another study investigated the effectiveness of mobile phone SMS compared to printed paper for the rote learning of L2 English vocabulary. For 16 sessions, three times a week over a period of five weeks, 34 university students were sent a total of 50 words with definitions and example sentences. Half of the group received these via SMS, while the other half got a printed

hand-out. Based on the results of a post-test, participants in the SMS group showed significantly better vocabulary retention than those in the printed paper group (Motallebzadeh & Ganjali, 2011).

A few studies were conducted to compare the effectiveness of sending messages on mobile phones with the other two techniques. All of the cases were found to use three groups of students to compare the results. For instance, Hayati, Jalilifa, & Mashhadi (2013) did a study to compare among three modes of instruction of English idioms, comprising Short Message Service (SMS)-based learning, contextual learning and self-study learning. This study demonstrated SMS affordance to deliver bite-sized English idiom lessons on spaced intervals to the learners. More precisely, the application of SMS in teaching and learning English (idioms) revealed that students receiving short mini-lessons on their mobile phones via SMS were more enthusiastic and learned more than their counterparts on paper or contextual groups. A post-study survey to find out students' perceptions and attitudes toward mobile learning also revealed positive results. In another study, Choi and Jeong (2010) investigated the effects of using mobile Long Message Service (LMS) lessons on L2 English vocabulary learning. Three modes of instruction were employed: LMS lessons without student interaction; LMS lessons with teacher-student interactive messages; and a control group using paper materials. A total of 72 L2 English college students were assigned to one of three groups. The results showed that using LMS lessons was more effective than using paper materials for vocabulary learning, but there were no significant differences in performance between interactive versus non-interactive LMS. Similarly, Saran, Seferoglu, and Cagiltay (2012) studied the effectiveness of using mobile phone-based multimedia messages (MMS) in learning L2 English vocabulary compared to delivery through web pages and printed form. The MMS included the definitions of words, exemplary sentences, related visual representations, word formation information, and pronunciation. The four-week trial involved 103 English preparatory school students and tests indicated that students who were sent MMS learned more words than those who studied the web-and paper-based materials.

Recognizing the effectiveness of mobile phones on vocabulary development, we decided to implement them in a fundamental course to solve traditional learning problems and to make the learning process more efficient. Our main focus was put only on vocabulary skill. It is hoped that the first-year students taking this course would take part in a new learning environment that motivates them to learn without limit of time and place. After that, it is necessary to evaluate the success of using mobile phones for vocabulary learning. The findings of this study may potentially provide insights into unlocking how students learn a foreign language. That is, learning is taking place by blending or integrating a mobile technology into the learning process. The information derived from the study will be useful for the administrators in adjusting the teaching and learning process to attract students' attention. Also, the findings will be useful for any teachers interested in adopting the use of mobile phone in developing learners' language proficiency. The two research questions guiding this study included:

**Research Question 1:** Is there a significant difference in students' vocabulary ability after the intervention between those doing paper-based exercises and those doing exercises via SMS?

**Research Question 2:** How do the students respond to mobile-assisted vocabulary exercises?

## RESEARCH METHODOLOGY

The present study was done based on the Theory of Behaviorist Learning which identified that learning has occurred when learners evidence the appropriate reinforcement of an association between a particular response and stimulus (Smith and Ragan, 2005). Learning is, therefore, focused on information or content delivery in mobile learning. In this study, SMS on mobile phones was used for vocabulary improvement of the learners.

### Participants and the Setting

The participants of this research were students from two sections, each of which contained 40 students, got from cluster sampling since students were already assigned to their sections by the university. Forty of the participants were randomly assigned to the experimental group (paper-based exercises); the other forty formed the control group (SMS-based exercises). The research was conducted in the first semester of 2014 academic year. The students were enrolled in the Fundamental English I course; they met in class two times a week. Each time covered 140 minutes. The length of the semester was seven weeks. The two dependent variables were the students' vocabulary capabilities which were measured by the pre-test, the post-test and their attitudes towards mobile-assisted vocabulary exercises which were evaluated by the questionnaire. The independent variable was the methods of vocabulary learning comprising paper-based and SMS exercises.

### Research Instruments

Two instruments were used in this study. These were 1) the pre-test and the post-test and 2) the questionnaire used for gathering information about the students' attitudes towards mobile-assisted vocabulary exercises.

## 1. Vocabulary Tests

To study the students' vocabulary ability, the same test was used as a parallel test for pre-and post-testing phases. However, the researchers shuffled the questions and multiple choices. The pre-test and post-test were composed of 50 multiple-choice questions designed to assess the students' vocabulary proficiency, covering the content in the textbook which was used for EN011 in the first semester of 2014 academic year.

### Validity and Reliability of the English Vocabulary Tests

At first, the vocabulary test consisted of 60 questions. Each question had four possible answers. After the test was created, it was given to three experts at the Language Institute of Bangkok University to check and comment on the content. The experts were also asked to rate each item so as to see whether it was congruent with the objective. Then, the Item-Objective Congruence (IOC) Index was calculated by assigning scores to three kinds of answers: congruent = 1, questionable = 0, incongruent = -1. In this study, all items were rated higher than 0.5 of the IOC index, indicating that they were acceptably congruent with the objectives. Its content validity measured by the IOC Index was between 0.66-1.00. However, five items were removed due to difficulties and miscommunication. At this stage, there were 55 questions left.

After that the test with 55 questions was piloted with 40 students enrolled in EN011 who were not the target group. The vocabulary scores received from the pilot were used to find difficulty and discrimination values. According to the criteria, the test items of which difficulty indices range between 0.20 and 0.80, and the discrimination of indices which are equal to or higher than 0.20 were chosen for the main study. Only 50 items in the test met the criteria and could be kept for the experiment. The reliability coefficient of the overall test calculated by Kuder-Richardson-20 formula (KR-20) was 0.79, which can be interpreted that the test had high reliability. This was done to see if the test items obtained the same binary (right/wrong) results over a population of testing subjects.

## 2. Questionnaire

The last instrument was an attitudinal questionnaire relative to mobile-assisted vocabulary exercises, investigating how the students felt about it. It consisted of ten items. The Likert five-rating scale (1= strongly disagree, 2= disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree) was used for a post-study survey. The draft questionnaire items were checked for content validity by three experts in English teaching field. The items with IOC index higher than 0.6 are acceptable. In order to test the proper reliability, the questionnaire was piloted with 40 undergraduate students who were not the target group and calculated by using Cronbach's Alpha. According to Cronbach and Shevelson (2004), coefficient ranges in value from 0 to 1. The higher the score, the more reliable the generated scale is. They have also indicated 0.7 to be an acceptable reliability coefficient. The coefficient value of the overall questionnaire was 0.98. After that, the questionnaire was distributed to students in the experimental group at the end of period on week 7.

## TEACHING AND LEARNING PROCEDURE

Based on the course syllabus, all students enrolled in EN011 had to join the dictation activity for vocabulary skill development. This activity helps students to acquire newly learned vocabulary in meaningful contexts. For each dictation, the teacher chose 10 words from the vocabulary list of the textbook and made up a sentence from each word. Students were required to take dictation in a form of sentence. The procedure to carry out this activity comprised three steps. First, students listened to the whole sentence without any pauses. Second, the teacher repeated and stopped after each meaningful chunk, and students wrote down what they heard. In the third stage they listened again to the whole sentence to check what they had written. After the dictation, the teacher showed the correct sentences followed by meanings in English and parts of speech. They would learn from the dictations they had written and the errors they had made. They checked their writing by themselves. Each dictation would take around 15 minutes. The dictation started from week 2- week 6. Since the class met twice a week, students were required to join 10 times of dictation. The total number of vocabulary was 100 words. By so doing, students would be more familiar with new words. As well, they could learn the instances in which each word was correctly used. After that, they were required to do two kinds of vocabulary exercises. The first one is giving students different sentences with missing words (week 2, 4, 6). They were required to fill in the blanks with correct words they learned on that week. The second one is using words to make a story (week 3, 5, 7). Students chose seven words they learned on that week to write a short story.

In the current study, mobile-assisted exercises were employed as a teaching technique for improving students' vocabulary ability. Although both groups had to do the same exercises on the same week, the ways they acquired knowledge were different. Paper-based exercises were provided for the control group while SMS-based exercises were given to the experimental group. Regarding the first exercise, students would increase their vocabulary knowledge from using the new words in the proper context. Students in the control group did a



paper-based exercise in class, while those in the experimental group got the message of exercise from the teacher after class. They were required to send the answers via SMS from their mobile phones to the teacher on that week. The exercise was done in a form of competition where the first three students whose answers were all correct would receive a reward of extra points. The teacher revealed correct answers along with useful explanation before the next exercise would be sent to them. For the second exercise, students in the control group wrote a story in class and submitted it to the teacher. They received feedback on their assignment when the paper was returned the following week. In contrast, students in the experimental group did the assignment after class and sent the teacher a text-message containing a paragraph they had composed by the end of that week. The teacher gave necessary feedback explicitly as soon as she received the story.

This empirical study was carried out in two classes where the researcher was their teacher. At the beginning of the semester the students in two groups were allotted 60 minutes to do the 50-question vocabulary pre-test. The vocabulary list was taken from the textbook used for EN011 course. Each student’s performance was recorded in terms of points. Then for the next six weeks they were required to join the activity provided. On week 7, both groups were given the post-test. After that, only the experimental group rated their opinions of mobile-assisted vocabulary exercises on a 10-item questionnaire.

**DATA ANALYSIS**

Two independent t-tests were run for the difference between the mean scores of the experimental group and the control group on the pre-test as well as the post-test. A paired t-test was run to find the difference between the means of the scores on the following tests: the pre- and post-tests for the control group as well as for the experimental group to see if there was any difference between the performance of the subjects on the pre- and post-tests. P values < 0.05 were considered statistically significant. Moreover, in an attempt to learn what the students in the experimental group thought about mobile-assisted vocabulary exercises, they were asked to do a questionnaire after the post-test. The scores were taken to analyze for means and standard deviations. Data obtained from the questionnaire were calculated by using mean and standard deviation and interpreted as levels to indicate how students perceived learning vocabulary via SMS. A mean score of 1-1.50 indicated having an attitude at a very negative level, 1.51-2.50 at a negative level, 2.51-3.50 at a moderate level, 3.51-4.50 at a positive level, and 4.51-5.00 at a very positive level.

**RESULTS**

The pre-test mean scores of control group (paper-based exercises) and experimental group (SMS based exercises) were compared to see if they were the same or different before the experiment started, using an independent samples t-test. The Levene’s Test for equality of variances shows  $F=.233$  and  $p=.631$ , proving that the variance of the groups was equivalent. It was found that the pre-test mean score of students in the SMS group was a little bit lower than that of students in the paper-based group (22.57, 22.85). As evident in the table, the result showed  $t = .205$ ,  $df = 78$ , and  $p = .838$ , indicating that there was no significant difference between the two groups before the experiment started and the two groups started with the same proficiency level. Therefore, it can be concluded that both groups were not initially different but homogeneous at the outset of the study.

**Table 1:** Comparison of Pre-test Scores between Paper-based Group and SMS Group

Group	Mean	SD	df	t	p
Paper-based exercises (n=40)	22.85	6.21	78	.205	.838
SMS-based exercises (n=40)	22.57	5.81			
Mean Difference	0.28				

**Research Question 1:** Is there a difference in students' ability after the intervention between those doing paper-based exercises and those doing exercises via SMS?

The result indicated that the post-test mean score of SMS-based group ( $M = 33.25$ ,  $SD = 5.67$ ) was higher than that of the paper-based group ( $M = 29.70$ ,  $SD = 5.57$ ). To find out whether there was a statistically significant difference between the two groups, the post-test mean scores were compared by using an independent samples t-test. The result revealed a statistically significant difference in the test scores at the level of .05 as shown in Table 2 ( $p = .008$ ).

**Table 2:** Comparison of Post-test Mean Scores between Paper-based Group and SMS Group

Group	Mean	SD	df	t	p
Paper-based exercises (n=40)	29.70	5.57	78	-2.35	.008
SMS-based exercises (n=40)	33.25	5.67			
Mean difference	3.55				

In order to see how much improvement each group had from the pre-test to the post-test, paired samples *t*-tests were conducted. Table 3 shows descriptive statistics for the results of the pre- and post-tests for both groups. Before the intervention, the vocabulary mean scores of students in paper-based group and SMS group were 22.85 and 22.57 from 50 points, and those scores increased to 29.70 and 33.25 respectively after the intervention. It is noticed that standard deviation of the two groups also changed a little bit. From *t*-test analysis, the post-test mean scores were significantly higher than the pre-test mean scores in both groups ( $p = .000$ ). This means that the students in paper-based and SMS-based groups improved their vocabulary knowledge. However, it is noted that students who did exercises via SMS improved more ability than those who did traditional paper-based exercises.

**Table 3:** Comparison of Pre-test and Post-test Mean Scores of Students in Both Groups

Groups		Pre-test (n=40)	Post-test (n=40)	t	p
Paper-based exercises	Mean	22.85	29.70	15.19	.000
	SD	6.21	5.57		
SMS-based exercises	Mean	22.57	33.25	19.39	.000
	SD	5.81	5.67		

**Research Question 2:** How do the students respond to mobile-assisted vocabulary exercises?

The students in the experimental group were asked to express their attitudes towards mobile-assisted vocabulary exercises. Table 4 showed the overall attitude at a positive level (Mean = 3.98). When considering each item, it was found that the highest mean score was on no. 1 (SMS exercises are useful,  $M = 4.30$ ), followed by no. 2 (SMS exercises help me memorize new words, Mean = 4.15). There were two items for the third ranking. They were no. 3 (SMS exercises make learning vocabulary more interesting, Mean = 4.10) and no.9, SMS exercises provide freedom of learning, Mean = 4.10). The item that had the lowest mean score was no.10 (SMS exercises increase awareness of vocabulary usage, Mean = 3.67). However, the attitudes in all items were found to be positive.

**Table 4:** Mean, Standard Deviation, and Level of Attitudes of the Students

Statements	Mean	SD	Level
1. SMS exercises are useful.	4.30	.56	positive
2. SMS exercises help me memorize new words.	4.15	.58	positive
3. SMS exercises make learning vocabulary more interesting.	4.10	.54	positive
4. SMS exercises are convenient and easy to get access.	4.02	.80	positive
5. SMS exercises enable me to review the vocabulary.	3.80	.68	positive
6. SMS exercises increase my vocabulary knowledge.	4.00	.64	positive
7. SMS exercises make me want to learn new vocabulary.	3.82	.78	positive
8. SMS exercises help to solve the problem of being unable to complete the exercises in class.	3.90	.71	positive
9. SMS exercises provide freedom of learning.	4.10	.59	positive
10. SMS exercises increase awareness of vocabulary usage.	3.67	.57	positive
<b>total</b>	<b>3.98</b>	<b>.29</b>	<b>positive</b>

## DISCUSSION

This study was carried out to determine whether the use of mobile learning approach was effective in enhancing students' vocabulary. The findings are discussed in relation to the research objectives as follows:

First, the increased writing score in both groups provides sufficient support that the use of exercises can help students improve their vocabulary knowledge. This might be because students had a chance to practice and work

on vocabulary they had learned. Exercises play an important role in vocabulary development, especially when new words were introduced. Furthermore, writing a short story gave them a chance to make use of new vocabulary. Although both groups were improved by exercises, the ways they learned were much different. It is interesting to see that students in SMS-based group gained higher scores when compared to those in paper-based group. Also, a statistically significant difference found between the two groups after the intervention can be used to support the findings of previous studies (Başoğlu & Akdemir, 2010; Lu, 2008; Tabatabaei & Goojani, 2012) in that students in the message sending group outperformed those in paper-based group. This is probably because mobile phones can build learning environment where students can study anywhere and any time. They had flexibility in how long they would devote to the given assignments and when they did them. Moreover, doing exercises on mobile phones seemed to be motivating when compared with a paper-based exercises. Since Thai students usually have mobile phones with them, mobile phones provide a ubiquitous learning that closely fits their habits. As such, it was more convenient for all students in the SMS-based group to do exercises whenever they want to, while students in paper-based group had to complete the tasks in class. The old way of teaching was probably the cause of boredom. They seemed to have less motivation in doing exercises and were controlled by time. Teaching vocabulary is not an easy task; students always feel discouraged because of the traditional learning process which does not support learning. This fact was consistent with Coady and Huckin (1997) who stated that the critical significance of vocabulary is placed on two issues: establishing knowledge structure and facilitating communication. Sending messages is a mean of communication. When vocabulary learning was transmitted through the technological device which can promote communication like SMS, students preferred to do the given tasks. As Jones, Edwards, and Reid (2009) stated, students check for text messages on their mobile phones frequently and always respond to them. Therefore, a significant feature of text messaging is the immediate capture of the recipient's attention. Such attention may lead to an increase in motivation (Martinez-Torres et al. 2007). If they had any urgent questions concerning the study, the communication channel used for asking questions was the same SMS. We cannot totally say that students in the SMS group put more effort into the exercises they did, but we can grasp their motivation to learn and enthusiasm from fast sending messages to the teacher. They know that once messages were sent, they would receive feedbacks.

The effectiveness of mobile-assisted learning is also supported by positive attitudes students demonstrated toward mobile-assisted vocabulary exercises ( $M = 3.98$ ,  $SD = .29$ ). Doing exercises on mobile phones was deemed satisfying. The results suggest the acceptance of using mobile phone as a learning tool. This might be because they realized the advantages of sending messages via mobile phones for language learning as the highest mean score was item no. 1 (SMS exercises are useful). Learning will no longer be limited only in class due to its potential for autonomous flexible learning. The finding can be supported by Ushioda (2013) who stated that autonomy, flexibility, freedom and choice are intrinsic features of mobile learning, and by exploiting these features may well be able to promote internalized motivation for independent learning. Moreover, students in the 21st century are accustomed to using technologies, and mobile phone is a part of their lives. They always have phones on them. It allows fast responses without having to be at computer. That is why adoption of mobile phone for vocabulary learning is increasing (Stockwell, 2010; Zhang, Song, & Burstson, 2011). The present findings were in accordance with those in previous studies which found that students demonstrated a positive view on mobile learning (Cavus & Ibrahim, 2009; Lu, 2008; Song & Fox, 2005; Stockwell, 2008; Stockwell, 2010). However, we should not overlook what students perceived regarding the awareness of vocabulary usage after learning via SMS exercises because it appeared to be the lowest mean score in the survey (Mean = 3.67,  $SD = .57$ ). It reflects that most students still lack basic rules of language use. This is really true and can be seen from their writing tasks. Although students know more words, they cannot use them correctly. So, knowing the meanings of new words is not enough. With this in mind, teachers need to provide supplementary materials that explain about sentence structure and parts of speech to help them realize what is right or wrong when they are writing a story. Moreover, mistakes in their writing should be corrected and informed as soon as possible.

## CONCLUSION

The present study shows how mobile phones can be implemented in a language course. The focus is on the use of SMS to create ubiquitous learning experiences of undergraduate students. The positive outcomes provide an opportunity to implement mobile phones for language development in future courses. One of the most noticeable advantages of mobile learning is the increase of learners' autonomy. Students have the freedom to access the learning tool and resources anytime and anywhere. Making use of the tool students are using in daily lives for academic purposes makes learning easier and convenient. Useful activities can be provided for improving not only vocabulary knowledge, but also other skills. However, in designing the course that uses mobile learning, an adjusted pedagogy is not the only issue to be considered, but other factors should be taken into account such as choosing activities that fits students' needs, the appropriateness of activities, the readiness of learners' learning tools etc. All these can affect the success of language learning development. For instance, although learning with mobile phones can occur all the time, the teachers should consider the amount of time students have to spend on

it. Joining too many activities or doing a lot of assignments may be a big burden for them and can build boring learning environment.

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