# INTEGRATING A DIGITAL CONCEPT MAPPING INTO A PPT SLIDE WRITING PROJECT

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## ABSTRACT
Carried out during a semester-long EFL (English as a foreign language) drama class, this research aimed to scrutinize the effects of digital concept mapping via LMS on English majors' (N=38) PowerPoint (PPT) slide writing skills in Taiwan. Students were instructed to follow the concept mapping agenda via university learning management system (LMS), idea webbing, spider mapping, and network tree making to read and analyze the dramatic texts and to present their analysis on PPT slides. Thus, analytical reading input (digital concept mapping via LMS) was expected to lead an EFL writing output (PPT slide writing). Students were pre-tested, summative assesses, and post-tested using in-class PPT presentations. Results confirmed that analytical reading with digital concept mapping strategies taught by the researcher could solve EFL students' PPT slide writing problems and improve their performance and the attainment of the task shares via LMS. The research offered a different perspective on teaching EFL writing with a specific focus on analytical reading to PPT slide writing and also implied the important consequence on analytical reading to analytical writing for future research.

## INTRODUCTION
With the swift advancement in technology, many English teachers incorporate technology into their writing instruction. However, Zhang (2008) and Lin (2009) indicated that students have a more positive attitude in class with teacher's feedback than without, since they consider their teacher's advice more experienced and authoritative. After following the teacher's suggestions, students' final writing has been shown to improve in the criteria of content, organization, grammar and mechanics (Lin, 2009). Though both teachers of non-technology and technology assisted EFL writing claim their strategies are more effective than the other, the current research seeks no preference for either one, but to get the benefits from both. Chou and Hayes (2009) probed EFL writing studies from 1989 to 2008 and found that though writing and technology among elementary school children and university students were the most studied areas but none of the research stated the interest in logical or analytical skills. Writing, in most Taiwanese EFL education perspective, is taught as a linguistic skill for written communications not an academic literacy or literary skill for logic flows or analytical analysis to pinpoint the key points.

The PowerPoint (PPT) presentation is a common oral report style at the university level which requires logical and analytical organization and accuracy of facts and wording. According to Badgett (1994), what the audience sees in the PowerPoint slides should be designed to supplement what presented or said (p.83). To help audiences distinctly grasp the wording problem is not allowed. Giving a PPT presentation in English can be a challenge for EFL English majors due to the spoken language proficiency but it is even more challenging for them because PPT slides are not text-heavy writing products. Instead, students need to write with a clear scenario that scopes the work and identifies the most important features, presents the logic flows and analytical literacy. Therefore, the present study combines the logic and analytical application for PPT slides writing with the importance of logical thinking ability in academic communication.

PPT slides share structural similarities with concept maps that demand logical and analytical thinking as well as the ability to organize information (Mitchell, n.d.). PPT slide writing for academic purposes requires a specific writing style and structure and at the same time can be considered as analytical writing tool instead of a presentation slide show only. Students need to write with a clear scenario that scopes the work and identifies the most important features, presents the logic flows and analytical literacy, all of which are the main concerns of the current study. Hence, the current study proposed that applying concept maps to logical thinking with key points and reading will help students transform their literary analysis into a visual written representation. In order to investigate the effectiveness of concept maps for PPT slide writing, this study was implemented in an English drama course as opposed to a normal writing course. It integrates the process-related skills (planning and outlining the research PPT slides; writing the abstract and the slide drafts; revising and editing the slide drafts) with product-related skills (writing the final slide copy of the referred tasks and presenting them).

## LITERATURE REVIEW
*Reading to Writing*
Though many educators view reading and writing as two distinct tasks, Tierney and Pearson (1983) claimed that the reading process is not only similar to the writing process, reading is also a form of composition. Berthoff (1983) also claimed that "how we construe is how we construct" (p.167). Gaining information and acquiring knowledge in the form of writing components through reading could help students construct their compositions more effectively because reading texts with a goal in mind helps students focus on the topic content and pay attention to the models of writing structure that they are reading. Stotsky (1983) reported that "better writers tend to be better readers" and that "better writers tend to read more than poorer writers" (p. 636). Tierney and Pearson (1983) also considered both reading and writing are forms of composition. Tierney (1992) compared the foci on reading and writing to show that the viewpoints toward these two activities in the 1990s were no longer separated, but were placed in a two-way co-construction of meaning (p. 248). Tierney's comparative study is displayed in Table 1.

**Table 1**: Changes in viewpoints toward reading and writing

| Criteria | 1970s | 1990s |
|---|---|---|
| Purpose | Reading is receiving; writing is producing. | Reading and writing are composing, constructing, and problem-solving activities. |
| Function | Reading and writing are means of translating or transmitting ideas. | Reading and writing are vehicles for thinking. |
| addresser/ addressee | Reading involves understanding the author's message; writing involves making your message clear for others. | Reading and writing involve interaction among participants as communicators, as well as the pursuit of self-discovery. |
| Register | Reading and writing occur in a social context. | Reading and writing involve social processes. |
| Process | Reading is a precursor to writing development. | Reading and writing development go hand in hand. Early writing is an avenue for reading development. |
| Skill | Writing development requires mastery of spelling conventions; reading development begins with mastery of skills and sub skills. | Writing development involves invention as students pursue temporary spellings, negotiate conventions, etc. Reading development occurs naturally as students explore meaningful literacy experiences. |

Advanced writing in college requires the ability to analyze, explain and form divergent information to generate meaning, to argue the alternative perspectives and to report and construct gained knowledge. The process the readers apply to make meaning of a text resembles the way writers compose a text, because writing is the process of creating meaning from both comprehending and composing a text (Carson, 1993). Carson and Leki (1993) proposed that "reading can be, and in academic settings nearly always is, the basis for writing" (p. 1). Grabe and Kaplan (1996) also claimed "reading and writing are reciprocal activities; the outcome of a reading activity can serve as input for writing, and writing can lead a student to further reading resources" (p. 297). As said by Hayes (1996), reading is an essential process in writing because analyzing reading texts, content, and information for composing require advanced reading competence. This cognitive process involves a great transition wherein students are no longer writing for expression but writing from resources.

Nelson (1998) agreed with Grabe and Kaplan's idea and asserted that reading and writing could be mixed acts of composing. She further explained:

> Now there is an awareness that many acts of literacy are hybrid in nature, in that they involve both composing and comprehending. In this hybrid acts the two processes cannot be neatly separated…In such acts, reading and writing processes tend to blur and a person is in two roles concurrently─a reader building meaning from a text and a writer building meaning for a text. (p. 279)

Parkinson and Thomas (2000) listed ten reasons for teaching literature in the EFL classroom, including cultural enrichment, linguistic modeling, mental training, authenticity, memorability, rhythmic sense, motivating material, encouraging interpretation and convenience. That is to say, literature reading proficiency could be the foundation for college students' success in academic contexts in terms of the analytical reading ability. Also, when writing across different genres, students must recognize different writing techniques to adapt the purposes of writing. Toward this end, Grabe (2001) made a list to explicate the processes that writers should use when composing:

1) Planning for writing;

2) Using language resources;
3) Using background knowledge;
4) Solving rhetorical problems;
5) Reading to review text to that point;
6) Balancing processes strategically;
7) Monitoring outcomes; and
8) Revising plans and text appropriately (p.21).

Grabe (2001) said like reading, writing requires efficient cognitive processes. Students should possess the abilities to plan, organize, comprehend, integrate and criticize during the writing process. This idea coincides with Parkinson and Thomas's ten reasons of analytical reading in literature that literary texts can be an interpretation tool since literature invites students to engage actively in reading and thinking. From reading to questioning or from reading to interpreting, students' literary analysis in academic writing could be enhanced.

*Logic Flow*
Logic is the backbone of education, including math, science, history, music, and reading and writing (Geisler & Brooks, 1990; Dewey, 1997; McInerny, 2004). According to Dewey (1997), "The mind becomes logical only by learning to conform to an external subject-matter." We can strengthen our logical thinking ability when our everyday conscious reasoning simultaneously becomes stored knowledge as well as the schemata for the next related event of reasoning. Geisler and Brooks (1990) pointed out that we use logic to do almost everything in our daily lives even when we do not realize that we are. They further indicate that writing requires logic, because we must presume that the author is communicating a thought; the only way to comprehend the thought is to gather the clues and arrange them in a logical order. However, most research on writing mainly focuses on students' writing performance and changes in their attitudes toward writing. Even though the corpus, concordancer, and extracurricular readings help to enlarge students' vocabulary size and enhance their understanding of many words, they do not help students with logical or analytical writing. Higher education in general requires a higher level of thinking, just like academic writing, which involves logical and analytical thinking (Paltridge, 2004).

According to Newfields (2003), most Asian EFL students has writing logic problem, besides, overtly focus on sentence-level grammar and ignore some discourse-level features, such as coherence and cohesion. He further explained that overgeneralization, contradiction, errors of causality and unsupported claims are common logical errors in Asian EFL students' writing. Liu and Wang (2011) found that Taiwanese students contradict themselves in English writing because they do not produce proper outlines before writing. Most of their participants in Liu and Wang's study have vastly influence from Chinese writing onto their English writing, the writing process, and the value of writing within their specific academic disciplines. Chinese writing style focuses less on logical flow, so it is not easy for teachers to persuade students to be aware of their writing coherency. Because of that, the neglect of the topic sentences usually causes the loose organization in writing. Without logic, students fail to complete good writing, even if they have a large vocabulary size and grammar knowledge size.

In Liu and Wang's (2011) study, more than half of the participants self-reported that the lack of writing practice and knowledge about coherence in paragraph writing were the main reasons they produced loose organization in their writing. Without logical thinking ability, students cannot systematically explain their claims, and they have no concept of paragraph cohesion to connect their ideas for a coherent essay. The findings imply that the lack of logic flow brings negative results in writing performance. The failure to purvey related information to support the topic suggests their great struggle with paragraph development. A complete plan before composing helps students to create a clear construction of writing and connection between ideas. Taking into account the students' weakness in logical and analytical writing and the necessity of logical and analytical thinking ability in their future employment, teachers should consider the training to develop students' logical thinking and expression as crucial.

While McInerny (2004) stated that "logic" and "human reason" refers to the same process, Lohman and Lakin (2009) indicated that better reasoning requires credible bases which are consistent with a logic rule. Although logical thinking ability does not manifest itself, it is a natural human potential that can be aroused through training. In applying "flow" to PPT slide writing, words and phrases in a unified PPT slide presentation work together to support one main point. According to Michael (2003), a successful presentation hinges on its structure, which includes logical organization of the main points, transitions between those points and prioritized supporting details. The logical order of writing brings slide coherence.
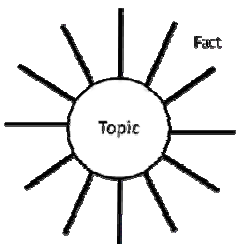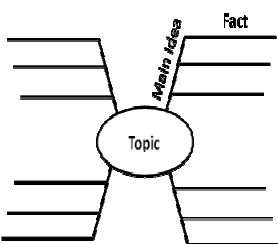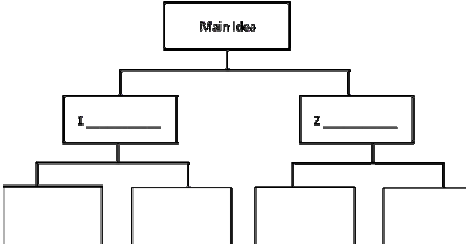
*Concept maps*

Concept mapping reflects Vygotsky's (1986) idea that the relation between thought and words is a process because it requires the students to visualize the relationship and connections among different concepts. As Novak and Gowin (1984) argued, concept mapping can assist this "psychological-linguistic" transformation. With concept mapping, people classify the new information as separate chunks and systematically integrate their schemata with the new information chunks to save meaningful information into the long term memory. Cassata and French (2006) found that concept maps have a positive effect on facilitating young children's metacognitive control, such as teaching them how to plan, evaluate and correct their own work and furthermore, to enhance learners' regulatory thinking skills. Dias (2010) suggested that concept maps empower students to develop autonomy to organize knowledge that they acquire from texts, and heighten students' awareness so that they read for academic purposes.

Most concept mapping researchers in the last decade place their focus on effectiveness of content comprehension, academic achievement, reading comprehension and memory retention (Carnot, 2006; Chen, 2007; Dias, 2010). However, Chuang (2007) and Mohamed and Omar's (2008) study suggested that mind mapping helps students distinguish the main idea from the details and to make a plan before writing and could also be used as an evaluation tool to assist teachers with reviewing and evaluating students' writing. Concept mapping is an effective strategy for writing, as writing requires these same activities. As it offers features of visualized illustration, concept maps could also be used as an evaluation tool to assist teachers with reviewing and evaluating students' writing. Cañas and Novak (2006) claimed that while paper-based concept mapping is effective for educational purposes, digital versions and strategies have their advantages: digital concept maps can be easily archived, copied/multiplied, modified, transported, and organized.

Therefore, the current study integrated digital concept mapping into a PPT slide project for an academic purpose. Idea webbing, spider webbing and network tree making were implemented in the study due to their features (see Table 2). Idea webs are for the brainstorming phase, while spider webs are for the organizing phase and network tree for the layout phase.

**Table 2**: Concept maps chosen in the research

| Idea Web | Spider Map | Network Tree |
|---|---|---|
|  |  |  |
| Adopted from Bellanca's Web (2007, p. 8) | Adopted from Bellanca's Spider Map (2007, p. 87) | Adopted from Bellanca's Prediction Tree (2007, p. 108) |

## METHODOLOGY

*Research Framework*

While article writing focuses on format and euphuism, PPT slide writing aims to deliver the main ideas of a topic so that the audience can gather a précis within a short time. Hence, PPT slide writing stresses accurate wording, impressive writing manner, fluent logic flow and well-organized construction. It was assumed that concept mapping is a practical tool for PPT slide writing. To bridge the non-technology and technology assisted EFL writing, digital concept mapping integrated in the university LMS was chosen as a means to empower students PPT slide writing in English, a technology input (digital concept mapping via LMS) leading to a non-technology output (logic flows and literary analysis).

*Problem analysis in PPT slide writing.* The problem analysis (N=110) with a census nature was conducted to investigate the PPT slide writing problems and to lessen the content analysis bias of the major study. The results showed that most English majors' PPT slide writing problems are construction, accuracy, technique, coherence and harmony which were also found top five in the pre-test of the major study (N=38). The results of the census study and pre-test show the need to solve students PPT slide writing with a special concern on construction, accuracy, technique, coherence and harmony which was called the $C_1ATC_2H$ slide writing problems in this

research. Besides, based on the result of the problem analysis, a $C_1ATC_2H$ rubric was set to scaffold and to assess the learning, the final version of $C_1ATC_2H$ rubric (see Table 3) was formulated after being reviewed by an expert panel (Cronbach's Alpha = .90). The $C_1ATC_2H$ rubric turned the writing problems into achievement scale; the achievement timeline was established in the course procedure. Concept mapping strategy was chosen to help students improve their PPT writing skills. Therefore, a $C_1ATC_2H$-led agenda with the treatments of concept mapping was then set as the research framework (see Figure 1). Therefore, the negative $C_1ATC_2H$ slide writing problems were expected to be decreased and turned into positive $C_1ATC_2H$ slide writing skills.
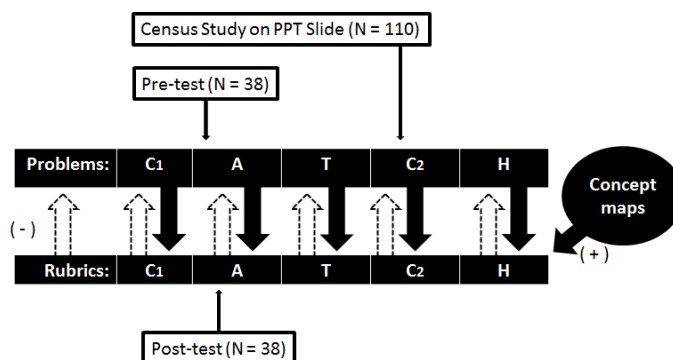


**Figure 1**: Research Framework

## PARTICIPANTS

Hunt (1985) suggested that "we cannot simply use texts to teach writing; we have to teach reading as well─that is, we have to find ways to help students learn how to read in order for them to be able to use reading as a tool for learning to write" (p. 162). McGinley's (1992) study also showed that better readers have better abilities to organize, select and connect ideas for writing. Krashen (1993) believed that a significant amount of self-directed reading, or voluntary reading, provides students with input to shape the development of their writing ability. Similar to Krashen's reading input hypothesis, Greene (1993) reported that reading is important in the writing classroom, because students can acquire writing techniques through imitating professional prose. A general way to view this process is that students are transforming information from input to output. Therefore, the present study suggests that what writing instructors should do is give students procedures that will help them to comprehend the reading texts and construct efficient writing. Regular writing classes, thus, were not the target classes for this study; instead, a drama class which demanded heavy readings was chosen to carry out the theory of reading to writing. Besides, efficient writing skills cannot be taught in a large size classroom if the achievement is emphasized. Due to the reasons mentioned above, the drama class with 41 students was chosen to be the target sample. The participants of the study were 38 English majors (N=41, valid N=38) aged between 19-21, 8 males and 30 female, studying in a national university in eastern Taiwan. The students had similar backgrounds concerning the amount of writing and literature classes they previously received. None of them had any prior experience in digital concept mapping for PPT slide writing purpose.

## RESEARCH SETTING AND COURSE PROCEDURE

According to Novak and Gowin (1984), concept mapping requires a higher level of thinking from students before they can build a high quality concept map. Students go through the process of comprehension, inference and decision-making to visualize their thoughts on the maps. Burke and Brumfit (1986) claimed literature is beneficial for promoting literacy and analytical and critical ability because it invites students to engage actively in reading and thinking. Therefore, literature reading activities in the current research were arranged to assist students with their logical thinking development and information organizing abilities. Integrating concept maps with $C_1ATC_2H$ rubric for the dramatic text analysis, students were asked to read the selected texts with specific literary purposes before they mapped out their analysis onto concept maps (see Table 3). The participants needed to read and analyze the texts before they write.

**Table 3**: Sequence of concept maps application

| 1 | 2 | | 3 | 4 | 5 | | 6 |
|---|---|---|---|---|---|---|---|
| Pre-Test | Reading to Writing Tasks | | Mid-Term | Revised Mid-term | Reading to Writing Tasks | | Post-Test |
| | Concept-mapping task 1 | Idea Web | | | Concept-mapping task 6 | Spider Map + Network Tree | |
| | Concept-mapping task 2 | | | | Concept-mapping task 7 | | |
| | Concept-mapping task 3 | | | | Concept-mapping task 8 | | |
| | Concept-mapping task 4 | Idea Web + Spider Map | | | Concept-mapping task 9 | | |
| | Concept-mapping task 5 | Spider Map | | | Concept-mapping task 10 | | |
| | | | | | Concept-mapping task 11 | Network Tree | |
| Idea Web (brainstorm); Spider Map (clarify the ideas); Network Tree (identify the logic order) | | | | | | | |

Sequencing as Robinson suggested (2001) was done according to the complexity and the cognitive demands of the writing tasks. Earlier tasks in the present study were cognitively less demanding than those in later units. The idea web, along with a brainstorming activity was introduced to students to help them generate key points and ideas first. The spider map, which is featured for classifying information, was used to help students arrange the collected information and key ideas. Finally, the hierarchical graphic organizer of the network tree was applied to help students organize the logic order and link the key concepts. The three types of concept maps had distinctive features in the research and were expected to improve students' logical and analytical thinking ability in English PPT slide writing. Due to different feature of concept maps, idea webs, spider maps and network trees were chosen as the thinking tools to analyze the dramatic texts, at the same time were to help students solve their C1ATC2H PPT writing problems. A detailed course description is listed in Table 4.

**Table 4**: Instructional procedures and pedagogical foci



| Phase | Digital concept mapping Task | | Task Foci | Objective |
|---|---|---|---|---|
| Pre-test | Students' prior PPT slides | | $\boxed{C_1ATC_2H}$ | To scrutinize STs' PPT slide writing problems. |
| Idea webbing and brain storming for different reading focus (voice, inner voice, tone, rising actions | Idea Webs | 1.1 Use idea webs to reorganize events or trivial issues happened in Susan Glaspell's *Trifles*. | $\boxed{C_1A}TC_2H$ | To develop STs' analytical reading for key points. |
| | Idea Webs | 1.2 Use idea webs to analyze Cal's emotional and non-emotional verbs in Terrence McNally's *Andre's Mother* to understand the title character, Andre's mother. | $C_1\boxed{A}TC_2H$ | To improve STs' sense of wording and lexical meaning for key points. |
| | Idea Webs | 1.3 Use idea webs to catch the emotions in sample monologue and Terrence McNally's *Andre's Mother*. | $\boxed{C_1A}TC_2H$ | To integrate STs' sense of wording and lexical meaning with character analysis. |
| Spider mapping for character analysis (a flat or a round character) | Spider Maps | 1.4 Turn analysis in the idea webs into spider maps to analyze the verb and adjective use in sample monologue and *Andre's Mother*. | $\boxed{C_1A}TC_2H$ | To integrate STs' planning and wording in PPT slide writing. |
| | Spider Maps | 2.1 Use spider maps to list convincing reasons for believing (or not) in Moony after reading Tennessee Williams's *Moony's Kid Don't Cry*. | $C_1\boxed{AT}C_2H$ | To turn STs' analytical reading into analytical writing for PPT slides |
| Mid-term (Part I: Literary Knowledge) | | | | |
| Mid-Term (Part II: Digital | Rewrite Terrence McNally's *The Last Gasps* with one new character added (paper version of PPT | | $\boxed{C_1ATC_2H}$ | To examine STs' learning state (character add is |

| | | | | |
|---|---|---|---|---|
| concept mapping) | slides) | | | only a section of the exam). |
| Revised Mid-term | Revise the new *The Last Gasps*. | | C$_1$**A**TC$_2$H | To arouse STs' focus on accuracy when writing. |
| Spider mapping for character analysis | Spider Maps | 2.2 Finalize the new *The Last Gasps*. | **C$_1$ATC$_2$H** | To help STs' logical thinking for planning, coherence, and harmony. |
| Spider mapping for stage blocking | Spider Maps | 2.3 Use spider maps to design blocking instructions a scene from *The Last Gasps* (entry and exit). | C$_1$AT**C$_2$H** | To increase STs' logical thinking for written and spoken communications. |
| Network tree for stage directions and the shifts of scenes | Network Trees | 3.1 Use network trees to stage block a scene from *The Last Gasps* and see what works best for the second vision (entry and exit). | C$_1$A**TC$_2$H** | To improve STs' description and logic order for written and spoken communications. |
| | Network Trees | Use network trees to analyze dramatic structure of the *Snow White* (two versions), 5-part plotline oriented: storyboard making | C$_1$**ATC$_2$**H | To reinforce STs' focus on dramatic structure and analyze the plotline. |
| | Network Trees | 3.2 Finalize the sage blocking for *The Last Gasps* with lighting and give all movements purpose (entry and exit) | C$_1$A**TC$_2$**H | To synchronize STs' description, logic order and the harmony for the stage feel. |
| | Network Trees | 3.3 Compare three versions (cartoon, modern BBC and news form) of Shakespeare's *The Taming of the Shrew* (5-part plotline oriented) | C$_1$**A**T**C$_2$** | To have STs pay attention to the structures of the three products. |
| Network tree for scrip writing | Network Tree | 3.4 Use network tree to read and analyze 13 lines (content without context) from Edward Bond's *Bingo: Scenes of Money and Death* and complete the scene with added lines (content with context). | C$_1$**ATC$_2$**H | To have STs improvise lines to build meaning and logic order and to harmonize and balance the power of words. |
| Final Exam (Part I: Literary Knowledge) | | | | |
| Final Exam (Part II: Post-test) | PPT presentation on *Bingo: Scenes of Money and Death* | | **C$_1$ATC$_2$H** | To scrutinize the effect of digital concept mapping tasks on PPT slide writing. |

## Research Tools
*Research tool 1, C1ATC2H rubric.*

By categorizing the PPT writing problems analyzed in the census study, a C1ATC2H rubric (see Table 5) was formulated for an academic purpose as a scaffold guideline and the writing assessment at the same time. Participants' writing problems resulted from a lack of structural arrangement such as introduction, focus on the topic, support on the topic and conclusion, which all belong to C$_1$, "Construction." The writing problems caused by failing to recognize the needed information and appropriate wording, such as accuracy of facts and word choice, are parts of A, "Accuracy." The writing problems that showed students' inability to decide suitable writing styles, such as adding personality, are classified into T, "Technique." The writing problems that originated from a weak logical thinking flow, such as sequence, are grouped into C$_2$, "Coherence." Finally, the rubric of "Harmony" integrates "Construction", "Accuracy", "Technique" and "Coherence" into the complete assessment criteria, C$_1$ATC$_2$H. The rubric was used to describe student achievement in PPT slide writing which articulates gradations of quality for each criterion, from excellent (5) to poor (1). In the meanwhile, it was designed to help participants revise for organization by offering some basic step-by-step guides to help them understand what "flow" means; by offering some specific strategies for digital concept mapping and improving "flow"; and by offering a list of requirements that can improve "flow." Therefore, *C1ATC2H rubric* was considered a tool for purposes of both teaching and assessment for the teacher-researcher and learning and self-assessment for the participants.

Rubric C1 means writing construction, including the planning, introduction, the topic focus, and conclusion. Rubric A means accuracy which concerns about the accuracy of facts, lexical words, wording and grammar. Rubric T means technique which concerns about writer's styles and descriptive narratives or structural analysis. Rubric C2 stands for coherence, including the criteria of writing flows, writing sequences and storylines. Rubric H stands for harmony (slide scenario) which exams writers' overall consistency on introduction, transitions and

conclusion in slide writing. With regard to the content validity, five English teaching professors were recruited to the reivew panel to examine the definitions and criteria of the $C_1ATC_2H$ rubric (Cronbach's Alpha = .90).

**Table 5**: $C_1ATC_2H$ Rubric for PPT slide writing

| Category | 5 Excellent | 4 Good | 3 Fair | 2 Adequate | 1 Poor |
|---|---|---|---|---|---|
| **C**onstruction | The PPT slide writing flow is perfectly organized with a focused topic. | The PPT slide writing flow is well planned, but the topic is not properly focused. | The PPT slide writing flow is planned, but the focus is rather unclear. | The PPT slide writing flow is not planned, and the topic is not well focused, either. | The PPT slide writing flow is confusing without a clear focus. |
| **A**ccuracy | Accurate facts are presented. Wording, lexical words, grammar and facts are used for main idea in the PPT slides properly. | Accurate facts are presented. Few wording, lexical words, grammar and facts are found in the PPT slides appropriately. | Accurate facts are somewhat presented but with many wording, lexical words, and grammar errors. | Accurate facts are not properly presented. Wording, lexical words, and grammar errors somewhat impede understanding. | Accurate facts are not properly presented. Wording, lexical words, and grammar errors seriously impede understanding. |
| **T**echnique | A clear descriptive narrative or structural analysis and a strong style are expressed. | A clear descriptive narrative or structural analysis is expressed but without a style. | A descriptive narrative or structural analysis is somewhat expressed with a style. | An unclear descriptive narrative or structural analysis is expressed. | A confused descriptive narrative or structural analysis is expressed. |
| **C**oherence | Details are placed in a logical flow with a clear storyline in the PPT slides. | Details are mostly placed in a logical flow with a storyline in the PPT slides. | Details are not placed logically, and the storyline is less clear in the PPT slides. | Details are not placed logically, and the storyline is unclear in the PPT slides. | The writing flow and the storyline are confusing in the PPT slides. |
| **H**armony | Presents a clear slide scenario and keeps overall consistency on introduction, transitions and conclusion. | Presents a clear slide scenario and the overall consistency on introduction, transitions and conclusion are mostly retained. | Presents a planned slide scenario and some inconsistency on introduction, transitions and conclusion. | Presents rather a planned slide scenario and frequent inconsistency on introduction, transitions and conclusion. | Presents no clear slide scenario and very frequent inconsistency on introduction, transitions and conclusion. |

*Research tool 2, concept maps.*
When constructing concept maps, students analyzed literary texts and externalizing their personal observations by openly illustrating the ideas and clarifying information. Idea web was used to help students brainstorm information and generate concepts related to the dramatic texts. Students listed facts, description, key words or any examples concluded in the related topic or theme. It was hoped the participants could solve their planning problems (introduction, focus on the topic, supporting on the topic, planning and conclusion) and exactitude problems (accuracy of facts, different lexical words and wording) through brainstorming. Therefore, ideas webs were to correct students C1A writing problems.

Spider Map was chosen to help the participants make connections and arrange the relationships between a main topic and the facts. It was to enable them presenting information in an orderly manner and also addressing the writing technique problems (adding personality, style and description). Spider maps, thus, were the treatment tools for C1T writing problems. Network Tree making was used to provide the participants a hierarchical structure for presenting a story with one theme followed by the facts and details. With the logical hierarchy structure, students were expected to organize the sequence of ideas to solve their writing coherence problems (sequence and story line). Hence, students' TC2 writing problems were expected to be reduced by network tree making.
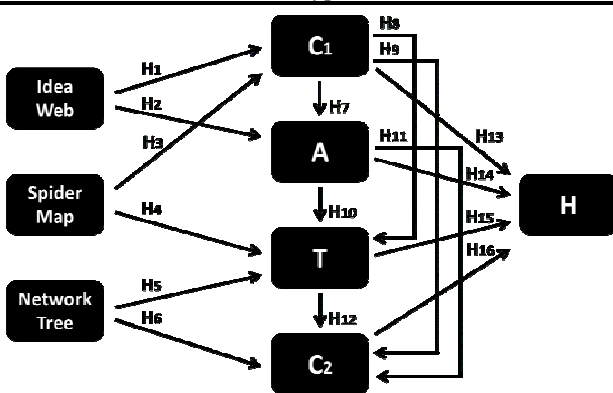
With different functions, these three concept maps were considered helpful for students to resolve their English

PPT slide writing problems and eventually to overcome the overall consistency problem to achieve the writing harmony as a whole after their C1ATC2 writing problems have been lessened. Therefore, the correlations among these three concept maps in helping to solve English majors' PPT slide writing (C1ATC2H) were tested.

## RESEARCH HYPOTHESES AND RESEARCH QUESTIONS
Assuming that the digital concept mapping activities would have positive effects on English PPT slide writing, sixteen research hypotheses and research questions were formulated and addressed in Table 6.

**Table 6**: Research hypotheses and research questions

| Code | Hypotheses |
|---|---|



| $H_1$ | **Idea web** will help solve students' problem of writing **construction** in PPT slide writing |
|---|---|
| $H_2$ | **Idea web** will help solve students' problem of writing **accuracy** in PPT slide writing |
| $H_3$ | **Spider map** will help solve students' problem of writing **construction** in PPT slide writing |
| $H_4$ | **Spider map** will help solve students' problem of writing **technique** in PPT slide writing |
| $H_5$ | **Network tree** will help solve students' problem of writing **technique** in PPT slide writing |
| $H_6$ | **Network tree** will help solve students' problem of writing **coherence** in PPT slide writing |
| $H_7$ | **Construction** will help solve students' problem of writing **accuracy** in PPT slide writing |
| $H_8$ | **Construction** will help solve students' problem of writing **technique** in PPT slide writing |
| $H_9$ | **Construction** will help solve students' problem of writing **coherence** in PPT slide writing |
| $H_{10}$ | **Accuracy** will help solve students' problem of writing **technique** in PPT slide writing |
| $H_{11}$ | **Accuracy** will help solve students' problem of writing **coherence** in PPT slide writing |
| $H_{12}$ | **Technique** will help solve students' problem of writing **coherence** in PPT slide writing |
| $H_{13}$ | **Construction** will help solve students' problem of writing **euphony** in PPT slide writing |
| $H_{14}$ | **Accuracy** will help solve students' problem of writing **euphony** in PPT slide writing |
| $H_{15}$ | **Technique** will help solve students' problem of writing **euphony** in PPT slide writing |
| $H_{16}$ | **Coherence** will help solve students' problem of writing **euphony** in PPT slide writing |

**Research Question 1:** Do the skills enhanced in **idea webbing** in LMS have a positive effect on students' writing **construction** and writing **accuracy** for PPT slide writing in English?

**Research Question 2:** Do the skills enhanced in **spider mapping** in LMS have a positive effect on students' writing **construction** and writing **technique** (writing styles) for PPT slide writing in English?

**Research Question 3:** Do the skills enhanced in **network tree making** in LMS have a positive effect on students' writing **technique** (writing styles) and writing **coherence** for PPT slide writing in English?

**Research Question 4:** What are the correlations of the participants' $C_1ATC_2H$ PPT slide writing skills before and after the concept mapping treatments?

## DATA COLLECTING
The study aimed to scrutinize the effects of concept mapping for English majors' writing skills in PPT slides, the researcher had to understand what problems students encounter before the major study. English majors' (N=110) PPT slides were analyzed for the census purpose first. Data of the major study (N=38) were collected from multiple sources: formative assessments on digital concept mapping on a task basis, a pre- and a post-course task, and students' LMS PPT slide writing tasks. The employment of mixed methods allows the results to be cross-validated and increase the depth and breadth of the understanding of the study.

## FINDINGS
The analysis of PPT slide writing achievement in this study had two objectives. One was to identify learning
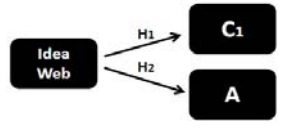
effectiveness of the concept mapping treatments along with the C1ATC2H rubrics of the participants. Another objective was to compare the $C_1ATC_2H$ writing problems before and after the concept mapping treatments of the participants. The following results were found according to the problem statement and hypotheses of the study. The statistical significance α was set at .05.

**Research Question 1 and H$_1$ and H$_2$: Idea Webs vs. Construction and Accuracy**
*Do the skills enhanced in **idea webbing** making have a positive effect on students'* writing **construction and** writing **accuracy** for PPT slide writing in English?*

The writing performance in LMS was rated by the researcher and an observer based on the rubric scheme, $C_1ATC_2H$, with a perfect score of 5. To write at the accuracy level, the participants must understand the expected writing conventions without intrusive errors in spelling, punctuation, grammar, syntax, or paragraphing. Unfortunately, the participants' digital concept mapping in LMS before midterm failed the requirement since they still wrote lengthy sentences for each slide. Though their scores rose from 1.42 to 3.11 in construction in the first four formative assessments, there is no significant difference (*p*=.086) of the *t*-test (see Table 7) for the pre-test and midterm on construction skill. Opposite to those of construction skill, the accuracy skill is not shown improved in the formative assessments but with a significant result (*p*=.000) on *t*-test.

**Table 1**: Summarized Data Analysis and Coding: Research Question 1 and H$_1$ & H$_2$

| | | Paired Differences | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 95% Confidence Interval of the Difference | | | *Sig.* |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *T* | (2-tailed) |
| Pair 1 | preC1 - MidC1 | .289 | 1.011 | .164 | -.043 | .622 | 1.765 | .086 |
| Pair 2 | preA – MidA | -1.263 | 1.057 | .172 | -1.611 | -.916 | -7.364 | .000* |

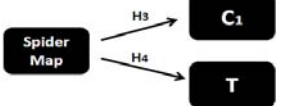*\*p < .05 (p is the p-value, \* means significant)*

To investigate the effect of idea web on the participants' construction skill in slide writing in LMS, they were asked to revise their mid-term for analytical PPT slides with a special focus on construction and to lessen their written texts. A *t*-test performed both on the construction and accuracy scores show significant difference between the pre-test and the revised mid-term with *t*=-2.431, *p*=.020 and *t*=-11.221, *p*=.000 correspondingly (see Table 8). Since web was the main concept map used in the tasks before the mid-term, the participants' increased mean scores and the significant results of the *t*-test in the revised mid-term imply that the web making is helpful to improve their construction and accuracy.

**Research Question 2 and H$_3$ and H$_4$: Impact of Spider Maps on Construction and Technique (Styles)**
*Do the skills enhanced in **spider map making** in LMS have a positive effect on students'* writing **construction and** writing **technique (writing styles)** for PPT slide writing in English?*

Spider mapping in LMS was applied in class after the students revised the mid-term. Therefore, the scores on the pre-test and the post-test and the revised mid-term and the post-test on construction (pairs 5 and 7) and technique (pairs 6 and 8) were compared (see Table 8).

**Table 2**: Summarized Data Analysis and Coding: Research Question 2 and H$_3$ & H$_4$

| | | Paired Differences | | | | | | | Sig. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Std. Deviatio | Std. Error | 95% Confidence Interval of the Difference | | | | (2-taile |
| | | Mean | n | Mean | Lower | Upper | *t* | *df* | d) |
| Pair 1 | preC1 - MidC1 | .289 | 1.011 | .64 | -.043 | .622 | 1.765 | 37 | .086 |
| Pair 2 | preT - MidT | .211 | 1.018 | .165 | -.124 | .545 | 1.275 | 37 | .210 |
| Pair 3 | preC1 - ReMidC1 | -.500 | 1.268 | .206 | -.917 | -.083 | -2.431 | 37 | .020* |
| Pair 4 | preT- ReMidT | -.395 | 1.152 | .187 | -.773 | -.016 | -2.113 | 37 | .041* |
| Pair 5 | ReMidC1 - postC1 | -2.211 | 1.298 | .211 | -2.637 | -1.784 | -10.500 | 37 | .000* |
| Pair 6 | ReMidT - postT | -2.184 | 1.062 | .172 | -2.533 | -1.835 | -12.681 | 37 | .000* |
| Pair 7 | preC1 - postC1 | -2.711 | .984 | .160 | -3.034 | -2.387 | -16.983 | 37 | .000* |

| Pair 8 | preT - postT | -2.579 | .889 | .144 | -2.871 | -2.287 | -17.876 | 37 | .000* |
|---|---|---|---|---|---|---|---|---|---|

*p < .05 (p is the p-value, * means significant)

A *t*-test performed on test results regarding both skills showed no significant difference between the pre-test and the mid-term results, $t=1.765$, $p=.086$ and $t=1.275$, $p=.210$, respectively, but there was a significant difference between the pre-test and the revised mid-term results: $t=2.431$, p=.020. The $t$ values of pairs 5 and 7 on construction were 10.500 ($p=.000$) and 16.983 ($p=.000$), and those of pairs 6 and 8 on technique were 12.681 ($p=.000$) and 17.876 ($p=.000$), respectively. The significant differences of the six tests showed that spider mapping has a positive effect on PPT slide writing construction and writing techniques, which supports research hypotheses 3 and 4.

### Research Question 3 and H$_5$ and H$_6$: Effect of Network Trees on Technique (Styles) and Coherence
*Do the skills enhanced in **network tree making** in LMS have a positive effect on students' writing **technique (writing styles) and** writing **coherence** for PPT slide writing in English?*

Featuring a hierarchical structure, network tree making tasks in LMS were expected to help the participants improve their slide writing style and employ logical orders, that is, to solve their writing technique and coherence problems. The participants had difficulty in the 7$^{th}$ (mean=2.47, SD=1.310) and the 8$^{th}$ formative assessments (mean=1.95, SD=.567) on writing technique, and earned mean scores of 2.55 (SD=1.329) and 2.71 (SD=.768) on writing coherence (see Table 9). However, with the progressive scores in the following assessments related to their technique and coherence performance showed that they gradually applied the skills they gained in network tree making for PPT slide writing. Integrating the acquired skills of information classifying and logical order arranging when completing these tasks, the participants' technique and coherence performance on the 11$^{th}$ formative assessment were good (mean=3.87, SD=.963 and mean=3.87, SD=.704).

**Table 3**: Summarized Data Analysis and Coding: Research Question 3 and H$_5$ & H$_6$

| | | Paired Differences | | | 95% Confidence Interval of the Difference | | | | *Sig.* |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *t* | *df* | (2-tailed) |
| Pair 1 | ReMidT - postT | -2.184 | 1.062 | .172 | -2.533 | -1.835 | -12.681 | 37 | .000* |
| Pair 2 | ReMidC2 - postC2 | -2.526 | 1.202 | .195 | -2.921 | -2.131 | -12.954 | 37 | .000* |

*p < .05 (p is the p-value, * means significant)

This data showed that as participants enhanced their skills in network tree making, their slide writing technique and coherence improved. Comparing their revised mid-term with their post-test on technique (Pair 1) and coherence skills (Pair 2), significant differences for both pairs with the $t$ value of 12.681 ($p=.000$) and 12.954 ($p=.000$) were found. Students showed improvement in both skills, which confirmed the research hypotheses 9 and 6 that network tree making will significantly influence writing technique and coherence. Thus, research question 3 was answered.

### Research Question 4 and H$_7$ to H$_{16}$: C$_1$ATC$_2$H Correlations
*What are the correlations of the participants' C$_1$ATC$_2$H PPT slide writing skills before and after the concept mapping treatments?*

Correlation and multiple regression analyses were conducted to examine the relationship between participants' C$_1$ATC$_2$H skills. Figure 2 explains what the correlations of the participants' slide writing skills are before the concept mapping treatments. Their writing construction and technique have positive significant correlations with their slide writing performance in terms of coherence and harmony (C$_1$-A, $r=.462$[**], $p=.003$; C$_1$-T, $r=.861$[**], $p=.000$; C$_1$-C$_2$, $r=.610$[**], $p=.000$; C$_1$-H, $r=.653$[**], $p=.000$; T-C$_2$, $r=.485$[**], $p=.002$; T-H, $r=.500$[**], $p=.001$; C$_2$-H, $r=.942$[**], $p=.000$). But their accurate wording, grammar and syntax skills are not significantly correlated to their writing technique, coherence, and overall writing harmony (A-T, $r=.202$, $p=.223$; A-C$_2$, $r=.462$, $p=.231$; A-H, $r=.275$, $p=.095$).
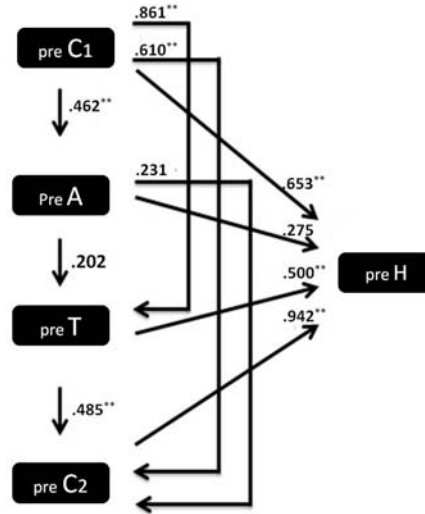
**Figure 24:** Pearson correlation of $C_1ATC_2H$ writing problems (pre-test)

The post $C_1ATC_2$ scales had significant positive correlation weights, indicating participants with higher scores on $C_1ATC_2$ scales were expected to have higher H scores (see Figure 3). The $C_1ATC_2$ skills enhanced in the concept mapping have a positive effect on students' writing harmony (slides euphony) for PPT slide writing in English. Hence, when one of the PPT slide writing skills was enhanced, the others improved as well.
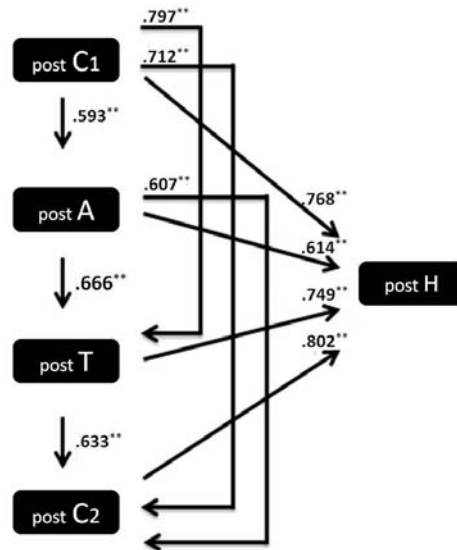


Figure 3: Pearson correlation of $C_1ATC_2H$ (post-test)

For a further understanding of the $C_1ATC_2H$ relationship after the concept mapping treatments, the regression analysis has been done. Tables 10 and 11 summarize the analysis results of the regression. The $R^2$ values of $C_1ATC_2H$ showed in Table 10 shows accuracy alone does not have a linear relationship with technique ($\beta$=.483, $R^2$=.443, p < .05), coherence ($\beta$=.523, $R^2$=.069, p < .05), or harmony ($\beta$=.496, $R^2$=.377, p < .05) though the correlations of $C_1ATC_2H$ are statistically significant. The $\beta$ weights of $C_1$-A, $C_1$-T, $C_1$-$C_2$, $C_1$-H, T-$C_2$ and T-H (.651, .636, .672, .750, .682, .833 and .753, p < .05) show that logical flow of the writing construction influences participants' writing technique ($R^2$ = .636), coherence ($R^2$ = .506) and writing euphony ($R^2$ = .590). Technique and coherence are not greatly correlated ($R^2$ = .401) but might have some influence on final writing performance ($R^2$ = .560). Writing coherence has most significant score to writing euphony among all $C_1ATC_2$ skills ($R^2$ = .642).

**Table 10:** Summarized data analysis and coding: research question 4 and $H_7$- $H_{16}$

| Code | Hypotheses | B | $R^2$ | Sig. |
|---|---|---|---|---|
| H7 | **Construction** skill → writing **accuracy** | .651 | .352 | .000[*] |
| H8 | **Construction** skill → writing **technique** | .636 | .636 | .000[*] |
| H9 | **Construction** skill → writing **coherence** | .672 | .506 | .000[*] |
| H10 | **Accuracy** skill → writing **technique** | .483 | .443 | .000[*] |
| H11 | **Accuracy** skill → writing **coherence** | .523 | .069 | .000[*] |
| H12 | **Technique** skill → writing **coherence** | .750 | .401 | .000[*] |
| H13 | **Construction** skill → writing **harmony** | .682 | .590 | .000[*] |
| H14 | **Accuracy** skill → writing **harmony** | .496 | .377 | .000[*] |
| H15 | **Technique** skill → writing **harmony** | .833 | .560 | .000[*] |
| H16 | **Coherence** skill → writing **harmony** | .753 | .642 | .000[*] |

*$p < .05$ ($p$ is the $p$-value, * means significant)

The multiple regression model with all four predictors produced $R^2 = .752$, F = 24.959, p < .05 (see Table 11) which indicates that the regression post H shown by post-test $C_1$, A, T, $C_2$ is statistically significant. The $R^2$ fraction indicates that the participants' scores on $C_1$, A, T, and $C_2$ explained about 75.2% (adjusted $R^2$=72.1%) of their scores related to writing harmony. There was a positive correlation between each writing skill so the participants' overall performance on writing harmony could be estimated by their scores of $C_1$, A, T, and $C_2$. Increases in one skill were correlated with increases in rating of another. Thus, the research question 4 is answered. The research hypotheses 4 to 17 are supported, too.

**Table 11:** *Model Summary of Regression Post H by Post C1, A, T, C2* **ANOVA**[b]: research question 4 and $H_7$-$H_{16}$

| Model Summary | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Adjusted | Std. Error of | Sum of Squares | df | Mean Square | Change Statistics | | |
| Model | R | $R^2$ | $R^2$ | the Estimate | 11.175 | 4 | 2.794 | $R^2$ | F | Sig. F |
| dimension0 1 | .867[a] | .752 | .721 | .335 | 3.694 | 33 | .112 | .752 | 24.959 | .000* |
| a. Predictors: (Constant), post$C_2$, postA, postT, post$C_1$ | | | | | | | | | | |
| b. Dependent Variable: postH | | | | | | | | | | |
| c. *p < .05. | | | | | | | | | | |

*$p < .05$ ($p$ is the $p$-value, * means significant)

**DISCUSSION**
The results of paired-T test on the pre-test and post-test show that the participants' PPT slide writing skills on Construction, Accuracy, Technique, Coherence, and Harmony improved after the concept-mapping tasks. Therefore, research hypotheses one to six are supported, that is, the concept maps chosen are helpful to solve the $C_1ATC_2$ problems in English PPT slide writing. On top of these, the one-way ANOVA on the participants' post-test suggests that the enhanced $C_1ATC_2$ skills will help improve the final writing performance. The research hypotheses seven though sixteen are supported because the results indicate that Construction, Accuracy, Technique, and Coherence skills are positively correlated and will lead to better writing harmony According to the results discussed above, the concept-mapping tasks helped the participant integrate the English PPT slide writing skills of Construction, Accuracy, Technique, Coherence, and Harmony. And the improved Construction, Accuracy, Technique, Coherence skills will bring Harmony for the PPT slide writing in English as a whole.

**CONCLUSIONS**
This study reported on the implementation of a literature class for both literary and language purposes that combined literary analysis instruction with digital concept mapping tasks, for the second-year English majors in Taiwan. In comparison with a traditional writing class in which the assessment of students' writing performance is usually carried out through a summative evaluation, the participants' marks were presented in the rubric form that stated objectives with specific performance characteristics and degrees arranged in levels via LMS. The research might have provided a different result without the $C_1ATC_2H$ agenda with LMS. Digital concept mapping allows a writer to make graphic representations of knowledge; however, this research concludes that it can also assist students in learning how to form new knowledge by linking their schemata (technology input of

digital concept mapping via LMS) with new knowledge and defining the new concepts (a non-technological output of PPT slide writing).

As with all educational research of this nature, it is difficult to conclude direct causality between the characteristics of the experiment and the learning effect of analytical and critical writing through digital concept mapping in a literature class since a number of contextual factors may implicitly affect the learning process. However, by considering the various limitations, both practical and pedagogical, that have been taken into account in this work, it has been possible to make some reasonable interpretations of the results. This implementation was found to be helpful in enhancing students' PPT slide writing skills by offering an analytical learning experience to students who were able to engage in meaningful interaction with reading and writing, and improve in the areas where they saw an obvious analytical need for improvement. These indicate that literature reading with digital concept mapping shows potential for presenting critical analysis in PPT slides, although not all types of students benefited equally well.

Literature reading with digital concept mapping may have a positive impact on the students' critical analysis in PPT slides if some conditions are met. Firstly, students need to have a basic knowledge of the relational understanding of the literary terms. Secondly, students should have prerequisites, especially a good literary analysis basis. Third, the syllabus design is important, such as choice of slide writing task types that are adapted to the students. Then, teachers' digital concept mapping expertise, both methodological and didactical, is important. Furthermore, the time aspect needs to be considered, both for the literature learning and use of digital concept mapping. Finally, the integration of digital concept mapping into the LMS could increase the value and benefit of the class for literature learning. This may be an important condition for improving student achievement and performance in slide writing.

Though the digital concept mapping tasks in LMS helped students improve slide writing skills (construction, accuracy, technique, coherence, and harmony), accuracy of correctness of facts, lexical words, wording, and grammar knowledge necessary for university-level writing would not result in good analytical or critical writing directly. That is, the training focus on accuracy of EFL writing would not improve advanced writing skills at the university level. Accuracy might be considered to be a part of the students' mechanical and prior writing knowledge, which can produce correct insights but also can produce mistakes that confound the educators' best efforts to deliver ideas accurately. Students' accuracy problems would not be solved in a short time since their prior knowledge concerning accuracy brings about many mistakes, which means that they need a longer time to enforce a theoretical and practical shift and make error correction a conceptual change.

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