

ICT STRATEGIES AND TOOLS FOR THE IMPROVEMENT OF INSTRUCTIONAL SUPERVISION. THE VIRTUAL SUPERVISION

Esteban Vázquez Cano
M.^a Luisa Sevillano García
Faculty of Education

Spanish National University of Distance Education (UNED)

E-mail: evazquez@edu.uned.es, mlsevillano@edu.uned.es

ABSTRACT

This study aims to evaluate and analyze strategies, proposals, and ICT tools to promote a paradigm shift in educational supervision that enhances the schools of this century involved not only in teaching-face learning, but e-learning and blended learning. Traditional models of educational supervision do not guarantee adequate supervision of the teaching models based on Web 2.0 as well as the digital learning environments supporting classical lectures. The study has been approached from a quantitative perspective, in which we examined the practices and perceptions of 278 local supervisors in three different regions of Spain when supervising the 2.0 teaching model promoted by the Ministry of Education in 5th primary grade through a model “one laptop per student.” The analysis in this context led us to postulate that a supervision model that complements the techniques and strategies of traditional supervision and incorporates new ways of addressing the educational processes based on Web 2.0 is needed. This model may be called “virtual supervision” and it must be oriented towards an intervention to analyze, improve, and substantially transform schools and the teaching-learning processes.

INTRODUCTION

The objective of this study is to analyze and evaluate educational supervision techniques based on Web 2.0 that responds to the monitoring of teaching and learning processes in classroom environments that use e-learning in the educational process. The new school contexts based on ICT tools and Web 2.0 require new approaches, techniques, and strategies for improving inspectors and supervisory functions (Cartera, 2005; Pasa Memisoglu, 2007). In this study, we performed a quantitative analysis of perception of functionality of ICT by supervisors to improve educational supervision as well as to react and adapt to new circumstances on 2.0 society and schools. As pointed out by Ross L. Neagley and N. Dean Evans (1980), modern supervision consists of positive, dynamic, democratic actions designed to improve instruction through the continued growth of all concerned individuals, the child, teacher, supervisor, administrator, and parents or other lay person. In this virtualized world and digital schools, supervision needs to improve and integrate a digital model of supervision. Supervision has gone through many metamorphoses; supervisory behaviors and practices are affected by political, social, religious, and industrial forces in any country around the world. In Spain, we have instructional inspectors, inspectors from the Ministry of Education, “state supervisors” from the autonomy communities, and “local supervisors” whose duty is to check on teachers and schools. Nowadays, in Spain, we have a mix model of inspection/supervision: As inspectorates, they contribute towards achieving the Government’s overall purpose, its strategic objectives, and the compliance with educational standards; and as supervisors, they try to establish a collaborative, cooperative, democratic, and consultative climate in schools. In this study, we have used the term “supervisor” to refer to both inspection and supervision. We found a definite acceptance of the idea that instructional supervisors are employed to help teachers build on their strengths, improve, and remain in the profession, instead of probing teachers’ deficiencies and seeking their dismissal. We share the interpretation of Jane Franseth (1961:19): “Today supervision is generally seen as leadership that encourages a continuous involvement of all school personnel in a cooperative attempt to achieve the most effective school program”. However, the new school contexts based on ICT are in a constant and recurring mode, and need new forms of supervision to ensure proper alignment of laws as well as teaching-learning methodologies, resources, and evaluation on digital learning environments (Oliva, & Pawlas, 1997; Gordon, 1997; Bogden, 2003; Vázquez, 2011; Weld, 2012; Afshari & Abu Bakar, 2012). Besides, inspection services and educational supervision must face a technological restructuring of resources and networking, not only to develop their roles as supervisors, but to understand how to implement right supervisory processes in contexts highly digitized (Clark, 2001; Rutherford, 2004; Zapeda, 2003; Sevillano, 2009). It should be borne in mind that supervision does not mean an inquisition or fault finding, but rather signifies guidance, assistance, and sharing of ideas with all those involved in the process of teaching and learning (Firth, & Pajak, 1998; Wiles & Bondi, 2000; Clark, 2008). Thus, supervision must integrate ICT from different perspectives for the development of different subsystems in which it operates (Glatthorn, 1990). However, the supervisors generally observe the teachers, evaluate the performance of the teachers, and take appropriate action. Their activities involve inspecting, checking, telling, rating, and monitoring, and for the development of these activities, supervisors behave as coordinators, consultants, group

leaders, and evaluators. ICT can be a valuable resource that serves to enhance both these functions and processes of supervision of school contexts mediated by ICT.

THE NEED FOR VIRTUAL SUPERVISION

In any job, it is important to assess a person's performance in completing the tasks required by the employer. Businesses and corporations supervise and evaluate employee performance for a variety of reasons, including retention, promotion, and accountability for completing job-related tasks. Education is no different, requiring supervision of classroom instruction to evaluate a teacher's effectiveness. This generally involves an administrator observing and evaluating lessons in a classroom, documenting the teacher's performance, and sharing suggestions for improvement (Waite, 1995; Sullivan & Glanz, 2005; Zapeda, 2007; Charles Farley, 2010; Shohet, 2011; Weld, 2012). As viewed by Carolyn J. Snyder (1997:20), "the supervisor's task is to develop professional learning communities, in work teams, that not only acquire new knowledge and skills but also learn how to study and respond exceptionally well to their natural work and learning environments." Today, more and more school contexts incorporate the use of ICT, and this needs a new supervision model to guide, advice, and monitor the teaching-learning mediated by ICT. Thus, educational supervision of 2.0 learning processes needs new ways of addressing the techniques of educational supervision and monitoring of Web 2.0 in schools. We call this "virtual supervision" (Vázquez, 2008; Vazquez, & Sevillano, 2011) that requires researchers to examine instructional supervision in digital learning environments (Rosendale, 2009).

Supervisory practices need to be adapted to online learning environments, so that inspectors could observe lessons by logging onto Learning Management Systems to evaluate its functioning. This trend towards virtualized education needs new ways to monitor, control, counsel, and guide the entire school community for an effective and appropriate development of interactive models and virtual training. Sensitive areas, such as data protection and the suitability of certain ICT tools, need to be monitored with deep understanding of these mechanisms for teaching on e-learning environments (Sevillano, 2004; Behar-Horenstein, Mitchell & Dolan, 2004; Larreamendy-Joerns & Leinhardt, 2006). The current teaching and basic skills development are moving towards the evolution of virtual learning environments to support classroom education with certain educational activities based on e-learning. Thus, schools are quickly migrating to an online environment, and supervisory practices must adapt to the changing landscape of education (Nolan, 1997; Smith et al., 2006; Alper & Gülbahar, 2009; Vázquez, 2011). The school 2.0 is emerging strongly in different processes, such as school management, organization, communication among different members of the educational community, and educational processes with teaching and learning dynamics based on Web 2.0. To fulfill these expectations, supervisors need considerable knowledge and skills to motivate and guide the teachers in their uses of ICT (Sevillano, 2007; Ukpokodu, 2008; Ferdig, et al., 2009). This not only requires them to be computer literate (Akbaba-Altun, 2006), but also capable of helping teachers use computers and the Internet in teaching and learning (Oliva & Pawlas, 1997) as well as course design (Wiles & Bondi, 2000). Even where classrooms are well equipped with ICT, Rutherford (2004) observes that it is unlikely that most teachers will be able to exploit the power of these tools without encouragement and support; hence, the first step towards the effective use of technology in classrooms should be fostering positive attitudes in teachers towards technology (Bates & Poole, 2003; Albirini, 2006). Thus, this study has been carried out to describe the practices, criteria, and tools used in the supervision of an online learning environment, and for the development of supervisory functions. The rapid growth of online learning has not been supported by research on how inspectors supervise and evaluate the performance of online activities. It seems obvious that online learning does not require physical attendance in a school, and differs from models of traditional instruction and supervision (Hoy & Forsyth, 1986; Sergiovanni & Starratt, 1993). As more teachers and students participate in online learning, inspectors will need to observe, guide, and evaluate instruction in this digital environment that has altered the face-to-face classroom observation and evaluation model of instructional supervision (Collins, 2004; Anderson, 2004). For example, the U.S. Department of Education, Office of Information Technology (USDOE-OIT, 2004), has recommended e-learning and virtual schooling opportunities for high schools; however, there is little research describing the process of supervising teaching and learning environments. Educational change in these new schools inserted into the information society and communication needs the transformation of schools in learning organizations (Fullan, 1995; Razik & Swanson, 2001; Leithwood, 2001). This implies a substantial change in educational supervision models that have traditionally been applied in Spain and all over the world.

The virtual supervision needs to have direct access to digital activities of teachers and students on Learning Management Systems, and use in a proper way the 2.0 tools in the supervisory functions; i.e. through the utilization of Internet Protocol -or IP-based videoconferencing equipment- supervisors can be empowered with the ability to make observations in any room that has a network or Internet connection. With several formats currently available, videoconferencing has not yet been standardized. However, IP is the preferred video format for this type of project due to its flexibility and cost. With IP video, there is no need for proprietary video lines,

costly equipment or a high degree of technical skill. In addition, the size, price and quality of IP cameras vary a great deal and, like most evolving technologies, are always changing.

This supervisory application of technology offers several advantages:

- The technology enables the observation to occur as scheduled and archives it for subsequent review by the supervisor at another time.
- A valid assessment of teacher and student performances is often compromised by the presence of an observer in the classroom. So, while we are not advocating this approach for every observation, the technology certainly offers an interesting option to address this issue.
- Finally, the teacher can view the archived observation prior to or during a post-observation conference. The ability to zoom in on a particular teaching episode will enrich the conversation about best instructional practice as it relates to improved student performance.

RESEARCH QUESTIONS

The goal of the present study was to gain more insight into the characteristics of supervising digital learning environments in the highest grade of primary education and the use of ICT to develop supervisory functions. The focus was on answering three research questions:

- (1) What perceptions do supervisors have about the need to observe and evaluate online virtual learning environments in the highest grade of primary education?
- (2) What practices do supervisors use to supervise online didactic processes and integrate ICT in supervisory functions?
- (3) What challenges and difficulties do supervisors encounter in their supervisory functions when dealing with online supervision?

METHOD

The purpose of this multicase study was to examine the instructional supervision of teachers of primary level using ICT techniques in online didactic processes by 278 inspectors in Madrid, Castilla-La Mancha, and Andalucía (Spain), and the use of ICT tools in the development of supervisory functions. The purpose of phenomenological research is not to obtain generalizations, but to describe in detail the breadth and depth of individual experience with the phenomenon and meaning structures of such experience (Creswell, 2003). The commonality of this particular study was three educational inspection services in three different communities in Spain, three regions with more than 17 million people and more than 2 million students. The range and types of institutions, rather than representing a difficulty, symbolize a methodological enrichment that generates greater validity to the findings, providing a general explanation in multiple contexts. Thus, contrasting these different educational inspection services and testing our hypotheses and conclusions in multiple educational settings, we provide a method to generate substantive theories, with different levels of depth concerning the amount of information collected and the sample of people involved: school inspectors, teachers, and principals. The phases in the research process were as follows:

1. Refined instruments were applied in the first phase of immersion in all inspection services; prior to this, validation of the questionnaire and data collection instrument by the Education Inspection Services and faculty members was carried out.
2. The results were contrasted in the different educational areas and questionnaires or unreliable results were discarded.

Spanish technological context

The 2.0 School program has been developed for innovation and modernization of Spanish education system. It is an innovative program to integrate ICT in schools sponsored by the Spanish Ministry of Education, which includes the use of a laptop by each student. This program aims not only to provide access and connectivity to students sporadic and apart from their daily learning activity, but to make technology resources continuously available. For this, the goal of the Ministry of Education is to transform traditional classrooms into the twenty-first century digital classrooms that will have whiteboards and technology infrastructure as well as basic Internet connectivity that will open the classroom to reality. The program has been implemented for the period between 2009 and 2013, and will focus on the third cycle of primary education and the first cycle of secondary compulsory education. An important part of the program, in addition to the provision of computers for each student, is conducting training courses for teachers and tutors to develop the program, not only on technological aspects, but mainly on the methodological aspects and social integration of digital educational resources in their daily teaching practice. The creation of these digital classrooms means an adaptation of school organization, including staff of the centers. Furthermore, as an extension of space-time in the classroom, mentoring and contacts will form virtual families and virtual classrooms. This is a radical change in the way of teaching, learning, and assessment.

Data collection and analysis

The multicase study was carried out during 2010/2011 in three educational inspection services in Madrid, Castilla-La Mancha, and Andalucia (Spain), and our key informants and macrovariables in the sample were as follows:

Table 1: Research's macrovariables.

<i>Macro Variables</i>	<i>Items</i>	<i>F</i>	<i>%</i>
Gender	Male	214	76.91
	Female	64	23.07
Teaching experience (years)	1-5	64	23.07
	6-10	135	48.71
	11-15	36	12.82
	16-20	25	8.97
	+20	18	6.41
Supervision experience (years)	1-5	39	14.10
	6-10	61	21.79
	11-15	53	19.23
	16-20	107	38.46
	20 and more	18	6.42
Education level	Master	257	92.30
	PhD	21	7.69
Level of computer knowledge	Poor	36	12.82
	Regular	178	64.10
	Fair	32	11.53
	Good	32	11.53
Hours of in service training related to using computing tools	None	278	100
	1-3	0	0
	4-6	0	0
	7-10	0	0
	11 and more	0	0

The questionnaire was completed by 278 supervisors, the large majority of the participating supervisors were male (76.91 per cent). The average number of years of experience in supervision functions was nearly 21 years (in the range from 1 to 25 years). The average number of supervisors with a PhD was only 7.69 per cent. Three out of four supervisors felt that their skills in the use of computers were poor (12.82 per cent) or regular (64.10 per cent). The hours of in-service training related to using computing tools was 0 for all the inspectors.

Procedure

A questionnaire was developed, which included four sections:

A. *General questions.* It included the supervisor's gender, number of years of experience, and supervisor's self-rating of skills in the use of ICT (Table 1).

B. *Characteristics of supervising of the digital learning environments.* A total of 26 items with regard to supervisor's views on the need for supervising ICT on learning environments were included. These Likert items consisted of scales ranging from "Never" to "All of the time" (Table 2), from "Not at all" to "Frequently" (Table 3), from "Not important" to "Essential" (Tables 4–5), and from "Not at all" to "Frequently" (Table 6).

C. *Use of ICT to develop supervisory functions on digital learning environments.* The 18 items referring to the characteristics of supervising the virtual learning environment addressed the use of different 2.0 tools for the development of supervisory functions and perception of supervisors about the need of ICT resources to develop their function on digital learning environments. The items consisted of four-point scales ranging from "Never" to "All of the time."

D. *Training, challenges, and difficulties in the development of supervisory functions on digital learning environments.* The eight items referred to training, challenges, and difficulties in the development of supervisory functions on digital learning environments. They addressed the difficulties and perception on the needs to perform supervisory functions in these digital contexts, as well as the challenges perceived by the supervisors. The items consisted of five-point scales ranging from "Strongly agree" to "Strongly disagree."

For the Likert items, α -scale construction was carried out by applying principal component analyses and by calculating Cronbach α -scores. Items that reduced the α -score were excluded from the scales. Subsequently, mean scores per scale were calculated. In order to assess the influence of background variables on the supervising of the virtual learning environment as well as on the use of ICT to supervision functions, Pearson correlation coefficients were calculated and multiple regression analyses were carried out (Tables 2-10).

FINDINGS

Dimension 1: Characteristics and needs of supervision of virtual learning environments.

Table 2 lists the items in relation to “Techniques for supervising digital learning environments.” It refers to the form of supervision employed in these digital contexts. Most supervisors ($n\ 192=69\%$) frequently used the same technique of supervising in normal contexts, and almost never used different 2.0 tools for the development of supervisory functions ($n\ 186=67\%$) and never or only sometimes made the observation of the digital learning environments ($n\ 214=77\%$).

Table 2: Techniques for supervising digital learning environments.

Items	Never	Sometimes	Often	All of the time
a) Face to face observation.	10%	21%	42%	27%
b) Digital learning environment observation.	45%	32%	8%	15%
c) Use of different 2.0 tools to supervise.	67%	12%	10%	11%

Cronbach $\alpha=0.89$; 3 items; four-point Likert scale (1–4); mean=3.41; standard deviation=0.38; N=278.

Table 3 shows the aspects that are less supervised in digital learning contexts, such as security systems ($n\ 3=1\%$), students' evaluation ($n\ 161=58\%$), and methodology ($n\ 178=64\%$). The two latter aspects that are crucial in supervising —evaluation and methodology— were not covered by supervisors in these digital contexts.

Table 3: Items supervised on virtual learning environments.

Items	Not At all	Occasionally	Frequently
a) Methodology on virtual environments.	64%	15%	21%
b) Use of 2.0 tools.	43%	47%	10%
c) Student's evaluation on digital environments.	58%	31%	11%
d) E-Materials.	35%	43%	22%
e) Security systems.	78%	21%	1%

Cronbach $\alpha=0.91$; 5 items; four-point Likert scale (1–3); mean=3.61; standard deviation=0.46; N=278.

Table 3 shows that supervisors do not perform effective oversight of aspects such as methodology and evaluation in digital learning environments, and Table 4 shows supervisors' perception of the need to monitor different aspects of teaching-learning digital process. It highlights the importance of supervising evaluation as very important or essential ($n\ 228=82\%$), methodology ($n\ 183=66\%$), information to families ($n\ 197=71\%$), network security systems ($n\ 242=87\%$), and knowledge of classrooms' purposes and provisions as well as the guidance and support for teachers experiencing problems in the ICT classrooms ($n\ 242=87\%$).

Table 4: Perception on the needs of Supervision on digital learning environments.

Items	Not Important	Somewhat Important	Very Important	Essential
a) Need of Supervision of Teacher's methodology.	11%	23%	56%	10%
b) Need of Supervision of 2.0 tools.	12%	21%	58%	9%
c) Need of Supervision of evaluation.	4%	14%	67%	15%
d) Need of Supervision of information to families.	8%	21%	51%	20%
e) Need of Supervision of time of use of ICT.	12%	23%	49%	16%
f) Need of Supervision of Security systems.	9%	35%	37%	19%
g) Need of Supervision of Teacher's e-portfolio.	2%	7%	49%	52%

h) Knowledge of ICT classrooms purposes and provisions.	8%	21%	43%	28%
i) Knowledge in guidance and support for teachers experiencing problems in the ICT classrooms.	1%	12%	53%	34%

Cronbach $\alpha=0.89$; 9 items; four-point Likert scale (1–4); mean=3.39; standard deviation=0.42; N=278.

Table 5 indicates the percentage of supervising the use of 2.0 digital tools in the digital learning environments. LMS ($n\ 236=85\%$), electronic data base ($n\ 228=82\%$), forums ($n\ 225=81\%$), and social networks ($n\ 250=90\%$) were almost not supervised.

Table 5: 2.0 Tools supervised.

Items	Not At all	Occasionally	Frequently
a) E-mail.	50%	38%	12%
b) Blogs.	65%	28%	7%
c) Wikis.	51%	38%	11%
d) Social networking	90%	9%	1%
e) Electronic portfolios.	12%	78%	10%
f) Chat.	78%	11%	11%
g) Forums.	81%	9%	10%
h) Electronic data base (Google.docs or similar).	82%	11%	7%
i) LMS.	85%	9%	6%

Cronbach $\alpha=0.86$; 9 items; four-point Likert scale (1–3); mean=3.23; standard deviation=0.42; N=278.

The results observed in this first dimension show key aspects of the way in which supervisors carry out their functions in these digital environments. It can be observed that there is a need to rethink the way to monitor and supervise these environments in both techniques and resources used. Aspects such as the methodology and evaluation are not sufficiently supervised, and supervisors perceive a great need for monitoring tools used in these environments and assessment processes, methodology, and network security.

Dimension 2: Use of ICT to develop supervisory functions in digital learning environments.

Table 6 shows the 2.0 tools that have been used by supervisors in the performance of their functions. It can be seen that they almost never use blogs ($n\ 253=91\%$), wikis ($n\ 275=99\%$), social networking ($n\ 270=97\%$), forums ($n\ 270=97\%$), and chats ($n\ 242=87\%$).

Table 6: 2.0 tools used in supervisory functions.

Items	Never	Sometimes	Often	All of the time
a) E-mail.	1%	3%	67%	29%
b) Blogs.	91%	4%	4%	0%
c) Wikis.	99%	1%	0%	0%
d) Social networking	97%	2%	1%	0%
e) Electronic portfolios.	5%	4%	67%	24%
f) Chat.	87%	11%	2%	0%
g) Forums.	97%	3%	0%	0%
h) Electronic data base (Google.docs or similar).	15%	25%	37%	23%

Cronbach $\alpha=0.87$; 8 items; four-point Likert scale (1–4); mean=3.23; standard deviation=0.39; N=278.

Table 7 shows the perception of the benefit of using different 2.0 tools for the development of supervision tasks in digital learning environments. The most-valued tools are electronic portfolios ($n\ 270=97\%$), electronic database ($n\ 145=52\%$), e-mail ($n\ 228=82\%$), electronic portfolios ($n\ 270=97\%$), and social networks ($n\ 97=35\%$).

Table 7: Rate of 2.0 tools to develop supervisory functions.

Items	Not Important	Somewhat Important	Very Important	Essential
a) E-mail.	10%	8%	67%	15%
b) Blogs.	21%	42%	23%	14%
c) Wikis.	78%	19%	2%	1%

d) Social networking	31%	34%	30%	5%
e) Electronic portfolios.	1%	2%	78%	19%
f) Chat.	78%	14%	8%	0%
g) Forums.	61%	29%	10%	0%
h) Electronic data base (Google.docs or similar)	13%	25%	23%	39%

Cronbach $\alpha=0.88$; 8 items; four-point Likert scale (1–4); mean=3.33; standard deviation=0.42; N=278.

Dimension 3: Training, challenges, and difficulties in developing supervisory functions in digital learning environments.

Table 8 summarizes the major difficulties faced by supervisors in relation to the performance of their functions in digital learning environments. It can be noted that the results are very similar among the five items presented. Supervisors agree or strongly agree that more training is needed on the use and safety of these digital learning environments ($n\ 256=92\%$), the use of virtual tools, and the need for modernization of the techniques and tools using ICT for developing the functions of supervision ($n\ 242=87\%$).

Table 8: Difficulties for Virtual Supervision.

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a) Lack of training.	1%	2%	22%	0%	75%
b) Need of specific regulations.	0%	0%	7%	12%	81%
c) Need of modernization with ICT of supervisory techniques and instruments.	0%	0%	3%	10%	87%
d) Need of training on ICT Skills.	2%	0%	3%	5%	92%
e) Need of training in Security regulations on ICT .	10%	0%	3%	6%	81%

Cronbach $\alpha=0.81$; 5 items; four-point Likert scale (1–4); mean=4.41; standard deviation=0.46; N=278

The challenges that supervisors face on these new digital learning environments are primarily focused on the need to implement virtual visits to schools ($n\ 181=65\%$) and develop virtual environments and internal social networks ($n\ 178=64\%$) to share and work collaboratively on the development of administrative and advisory processes in each inspection service, to standardize processes and supervisory techniques.

Table 9: Challenges.

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a) Develop virtual visits.	10%	2%	18%	5%	65%
b) Develop Supervisory Virtual Environments.	8%	3%	11%	0%	78%
c) Develop supervisory networking.	12%	4%	11%	9%	64%

Cronbach $\alpha=0.93$; 3 items; four-point Likert scale (1–5); mean=4.01; standard deviation=0.38; N=278

Implications of Virtual Supervision

It is important to remind that effective supervision necessitates knowledge of Information and Communication Society and various types of on-line supervisory approaches that can be used when working with teachers and principals in virtual spaces so as to positively impact students indirectly. Selecting the most effective on-line intervention will always be critical to effective supervision, with specific attention paid to collaborative and non-directive supervisory behaviors. Attaining the ultimate goal of virtual supervision (i.e., unification of organizational goals and teachers' needs to achieve effective student learning in this ICT society) means that the task areas of supervision must be restructured to be adapted to new ways of teaching mediated by ICT. Provision of on-line assistance to teachers develops in a better way the group development, professional development, curriculum development, and action research activities which are essential to the realization of pedagogical effectiveness.

Variables that influence the development of Virtual Supervision

Multiple regression analyses were carried out to assess the influence of background variables on the supervision of digital learning environments and in-service use (see Table 1). Table 10 shows the seven independent variables that were processed.

Table 10: Variables that influence Virtual Supervision; results from a multiple regression analysis.

	B	SE	β	p
Intercept.	0.737	0,343		
Supervisor's gender.	-0.252	0.071	-0.151	0.001
Supervisor's years of experience.	-0.297	0.003	-0.126	0.015
Supervisor's age.	-0.210	0.041	-0.103	0.013
Supervisor's skills in the use of ICT.	0.234	0.027	0.167	0.014
Supervisor's views on the need of supervising digital learning environments.	0.241	0.058	0.135	0.000
Supervisor's education level.	0.199	0.097	0.167	0.019
Hours of in service training related to using computing tools.	-0.201	0.025	-1001	0.001

The results from the regression analyses show that supervisors who were more confident about their skills in using ICT were more likely to use skill-based ICT applications in their supervision functions. In addition, skill-based use of ICT was favoured by supervisors who felt that ICT contributes to better performance of supervisory functions. The age of the supervisors and the years dedicated to supervisory work were found to influence their perception of the domain of ICT and its use in educational supervision work. Supervisors, who were young and with less years of experience, were more willing to use ICT in their work. Besides, female supervisors appeared to less favour the use of ICT applications, when compared with their male colleagues. These variables accounted for 62.1 per cent of the variance in the dependent variable. A significant, but not very strong, relationship was found between supervisor's education level and the supervision as well as use of digital learning environments (Pearson's $r = 0.16$; $p < 0.01$). In addition, a significant relationship was also found between the need of supervising the digital learning environments and the hours of in-service training (Pearson's $r = 0.40$; $p < 0.001$). To ensure supervision functions on virtual environments, a substantial shift should take place from the highly bureaucratic component of the inspection activities towards more dynamic monitoring techniques involving testing of the proceedings and online activities. The t-test was administered in order to determine whether or not the supervisors responses given to the questionnaire revealed any differences according to whether virtual supervision was necessary or not. According to t-test results, the responses of the supervisors differed in only one item according to whether computer training was received or not. T-test results revealed that supervisors who received computer training believe that virtual supervision was possible and essential for the future ($t(278)=3,754$, $p=0.000$). And also t-test results revealed that schools which received supervisors who used virtual tools on supervision believe that the school is better monitored ($t(278)=2,041$, $p=0.034$) than the schools that did not receive virtual supervision. This study exposes the fact that many of the school supervisors who are mandated to encourage, guide, and support the educational use of ICT in the classroom lack the training, depth of understanding and body of experience to be able to address these issues and to introduce these technologies in their usual functions. Very few of them have received any training in establishing and developing ICT based classrooms and the vast majority lack advanced knowledge and skills in uses of the technology in supervisory functions. The new virtual supervision requires constant track of the virtual processes in the following dimensions: didactics, network security, evaluation, development of skills, and information to families about curriculum development in virtual environments.

DISCUSSION AND CONCLUSIONS

This study shows how supervisors, who are responsible to carry out their functions in digital learning environments, are not adequately trained for monitoring and supervising these environments. They are not aware of virtual tools used by teachers in developing their classes. Older supervisors and with more years of service are more reluctant to use ICT in their work and supervising digital learning environments. Most of the supervisors are found to use computers to support their supervisory duties, observation of practice and provision, and research, but they are far less well-versed in educational applications of ICT. None of them have received any training in establishing and developing ICT-based classrooms.

The implementation of ICT programs is a challenge for both teachers and supervisors in the development of their duties. The role of supervisors is essential to promote change and adapt to these new digital

environments, and therefore, an internal adaptation of processes and supervisory techniques in virtual environments is needed. The supervisor in this virtual world should be a person who leads people to think about new and improved ways of doing things. Above all, the supervisor needs to possess a predisposition to change and must constantly promote improvement. Furthermore, he/she must be able to live with change and help teachers adapt to the changing needs of the society and of children and youth. To accomplish this mission, the supervisor should be able to work effectively in both one-to-one relationships and in groups, as well as profoundly use and understand the way in which new digital learning environments are developing new ways of learning and interaction in classrooms. As we can observe in the results, supervisors do not perform effective oversight of virtual learning environments and online teaching-learning processes. These virtual learning environments are unobservant, badly monitored, and targeted.

Instructional supervision model must change substantially to monitor the virtual learning environments and incorporate new monitoring techniques with the support of ICT. This new model implies an internal working model of collaborative ICT tools based on networking and sharing of strategies and processes. For supervisors, this means knowledge of school effectiveness, instructional empowerment initiatives, and understanding the range of supervisory approaches best suited to realize these goals. In particular, supervisors need to appreciate the critical role of communication in group functioning, because tapping group potential is central to deployment of constructivist pedagogy and associated knowledge discovery. It is necessary for teachers not only to feel supported and advised in their teaching functions in virtual environments, but also controlled in compliance with regulatory provisions and standards of quality teaching and security. This allows the teachers to learn from the mistake and create a quality and virtualized environment that is safe, inspiring the collaborative and interactive work. Schools that virtualize a part of this teaching process could possibly develop a more creative learning environment and enable freedom of expression. It also allows a greater approach to the educational community, parents, and other institutions, and this situation also requires a significant change in the culture and organization of supervision of digital learning environments. The supervisors' role is critical for the success of these digital learning environments, and, for this purpose, they need more training in technological, organizational, and pedagogical approaches using ICT. However, it is not necessary for all these training programs to be face to face. The supervisors can be given timely and quality online training, information, and opportunity to interact with colleagues and schools, regardless of where they are stationed or their working circumstances. By using the same technologies and methodologies for students' learning — email, wikis, curriculum resource websites, etc.— the supervisors can gain invaluable insights that can be passed on to teachers.

Towards a new form of monitoring of virtual environments for training and the use of ICT tools in the supervisory functions, we propose the following strategies to improve the functions of supervisors to implement online educational supervision:

1. Designing a social network to support learning communities of schools. These social networks allow greater interaction and collaboration among all members, and provide an opportunity for more personalized attention to all the problems that may arise in supervising.
2. Designing a working network to support internal work of supervisors. This social network should be orientated to develop work in group and share the work with 2.0 tools.
3. Development of a corporate blog of the inspection focused on advisory work contextualized in the area of the inspected schools.
4. Creating a training and advice virtualized environment for teachers involved in training networks and processes of teaching and learning based on ICT.
5. Use of online electronic portfolios that can help to systematize the functions of teachers who develop educational processes based on ICT and guide interpretation of the supervisors in supervising the functions of teachers and academic achievements of students.

In a few years, it will be impossible to understand the work of educational supervision without the use of technological tools. This study contributes to approach the design of strategies and ICT resources for the supervising of online learning and the development of the functions of supervisors. The most recent U.S. educational technology plan, has set the goal for all levels of the educational system to redesign processes and structures to leverage “the power of technology to improve learning outcomes while making more efficient use of time, money, and staff” (U.S. Department of Education 2010, 63). The goal suggests that more vigorous efforts are needed to both design and build key constructs and measures that will support increasingly real-time, integrated learning analytics for students, teachers and administrators and develop

the technical and human infrastructure needed to plan and implement productivity analyses and use their results appropriately.

In the latest movements in Education, there is a consensus that what happens in a classroom can positively or negatively impact student performance. It is clear that it is time to extend classroom application of technology to another level by giving supervisors the tools that will enable them to perform their most important charge, which is the assessment of classroom performance. Virtual supervision provides a viable alternative for addressing issues that often compromise effective supervision. This proposal is just the beginning of a dialogue that deserves more attention from those involved in the education community.

LIMITATIONS

This research focused on 3 different supervision services corresponding to 3 different regions in Spain. Although the sample is sufficiently representative because it involves a large number of supervisors, future researches should be extended to different international contexts to generate different perspectives to the overall improvement of the supervision functions at schools.

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