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Information and Communication Technology in a Global World: Teachers' Perceptions of Continuing Professional Development

Christer Ohlin *
Kristianstad University
christer.ohlin@telia.com

*Corresponding Author: *christer.ohlin@telia.com*
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Abstract

This study takes its departure from ongoing debate about teachers' (collective) "continuing professional development" (CPD). The overall aim is to highlight active teachers' perceptions on developing a self-understanding of their complex role in daily practice by using digital tools. The following research questions guided the study: How can teachers make schools more relevant and engaging? How can students' achievement increase? In what way can teachers provide high-quality education for all students? Three perspectives will be guiding the study: Information and Communication Technology (ICT), learning, and special education. The participants in the study are 21 staff members in preschool, primary school, and a recreation center with whom we conducted structured individual interviews and focus group discussions. Field notes were also taken during the interview and discussion sessions. The findings reveal the importance of the teachers' deeper understanding of students' creativity, critical thinking, communication, and collaboration. Furthermore, the most powerful thing teachers can do is to design engaging, meaningful, and authentic work and technology-enhanced learning experiences. In order to improve learning in a digital world, the teachers must be engaged and supported by professional learning opportunities to continually improve and strengthen their digital competencies and teaching practices. The theoretical standpoint is the norm model as an analytical tool to understand the teachers' perceptions. The concept of "norm" is a collective term for the factors and structures that are regarded as a normal balance between the aspects of value/will, system conditions/possibilities, and cognition/knowledge.

Keywords: Continuing professional development (CPD), Digital tools, Information and Communication Technology (ICT), the norm model

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Introduction

Information and Communication Technology (ICT) is one of the potential and powerful tools for extending educational opportunities; hence, teaching and learning processes in different forms and levels of education will be enhanced (UNESCO, 2003). However, successful integration of ICT in the teaching-learning process is dependent on the preparation of teachers and teachers' Continuing Professional Development (CPD). This study takes its departure from ongoing debate about teachers' (collective) "continuing professional development," and is defined as natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school, which enhance the quality of education in the classroom (Day, 1999).

There has been a considerable emphasis placed on CPD for teachers and trainers to support them in using technology (Heinrich, 2012; Henderson & Yeow, 2012). The project "Information and Communication Technology (ICT) in a Global World" highlights teachers' perceptions of using digital tools to learn, create, and solve problems in their daily practices.

Education is a fundamental element of change, and teachers play a crucial role in implementing the necessary knowledge and values into the learners, making them participants in the development process. CPD is widely acknowledged to be of great importance in the life of schools, contributing to professional and personal development for staff and to improvement in teaching and learning. International studies (European Commission, 2008; Eurydice, 2009; OECD, 2005) on teachers and their continuing professional development show that the form, content, and context conditions of CPD is focusing on fostering educational performance and effectiveness but are relatively loosely linked with school practices in the area of instruction, evaluation and feedback, and school leadership. According to Desimone (2009), professional development involves activities such as regular in-service training, workshops, local and national conferences, and college courses. What is important for today's policymakers, principals, and educators is to realize the transformation of schools with regards to using digital tools and the role of technology in making schools more effective and engaging. Digital tools will serve as a means, not as an end.

Significance of the study

Conducting a study of this nature is very important, and the findings may contribute knowledge regarding the continuing professional development (CPD) needs of teachers in moving toward new roles and tasks associated with digital tools in schools. Furthermore, the study will illuminate the nature of the obstacles and possibilities for teachers' CPD. Finally, this study contributes toward the understanding of support in educational change.

Aim

The overall aim is to highlight the active teachers' perceptions on developing self-understanding of the complex role in daily practice by using digital tools. Three perspectives guide the study: Information and Communication Technology (ICT), learning, and special education.

Research questions

How can teachers make schools more relevant and engaging?
How can students' achievement increase?
In what way can teachers provide high-quality education for all students?

Related theories

ICT is an important area within the school and is connected to the mission of teaching: to train/educate for a future society. All involved in creating good learning environments for all students are responsible for attaining the mission. With digitalization and ICT, a greater desire, motivation, and willingness to learn can be created (Alberta, 2011), and this will contribute to the students' overall development.

According to Livingstone (2012), technologies have transformed society from top to bottom, particularly in terms of education and what the public expects education systems to deliver. Technology has made it possible to view the world through a digital lens, and teachers can access this knowledge at will via interactive smartboards (touch boards) or students' laptops and touchpads/iPads. The research on iPad use and adoption overwhelmingly reports that tablet devices like these have a positive impact on students' engagement with learning. In a study by Karsenti and Fievez (2013), they highlight the benefits of using iPads: information access, portability, creativity, higher student motivation, and possibility to work in one's own space. Furthermore, the results from the study also show that the collaboration both among students and with the teacher increased, and the improvement of the quality of the presentations are remarkable.

Heinrich (2012) and Henderson and Yeow (2012) identify the importance of teacher training as a necessary support for effective integration of digital tools in classrooms, and different aspects are discussed such as technical, pedagogic, social, and economic. Furthermore, in getting teachers started using digital tools, some form of initial familiarization with the tools is essential (Heinrich, 2012) and can be described in different phases: a) initial familiarization with the tablet device (iPad) or smartboard; b) identifying, installing, and using appropriate and relevant applications that support teaching and learning; c) identifying applications that support personalized and/or collaborative learning, including those that can cater to learners with additional needs; and d) creating, uploading, and sharing teaching resources (for students and colleagues).

An increasing number of research studies indicates that teachers have not integrated ICT in the curriculum in a way that leads to significant changes in classroom practice (Baytak, Tarman, & Ayas, 2011; Burden, Hopkins, Male, Martin, & Trala, 2012; Kilinc et al., 2018; Valiendes & Tarman, 2011) despite increased access and improved technical artifacts. An overarching aspect for not implementing ICT is related to the teachers' personal attitudes toward ICT. Teachers who regard ICT as a learning tool have confidence in the technology, trust students to be capable of working independently, and have more inclination to use laptops.

Tallvid (2015) discusses teachers' reluctance to the pedagogical use of ICT in the classroom, and the main findings from this study are the teachers' lack of technical competence both concerning how to handle different types of digital teaching material and the lack of competence if technical problems should occur, insufficient teaching material, and insufficient time for planning. A successful school improvement with focus on ICT requires ongoing technical training and discussions about pedagogical issues and content (Tallvid, 2015) in order to integrate ICT in teachers' daily practices.

Furthermore, in promoting improvement in schools, the following strategies have been found to be effective (Hopkins, Ainscow, & West, 1994):
* concrete, teacher-specific and extended training
* classroom assistance from local staff
* teacher observation of similar projects in other classrooms, schools, and districts
* regular project meetings focusing on practical issues
* teacher participation in project decisions
* local development of project materials
* principals' participation in training

This highlights the key role of the relationship between policy implementation and school improvement programs in determining teacher quality and student achievement.

According to Stringfield, Winfield, Millsap, Puma, Gamse, and Randall (1994), there are different conditions that underpin the work of successful schools, such as many staff development opportunities for teachers to learn together, good leadership, the coordination of activities in order to keep people involved, etc. Communication within the school is an important aspect of coordination, together with the informal interactions between teachers, and finally the recognition of inquiry and reflection as important for school improvement.

Teachers' continuous professional development

The conceptualization of teacher learning and development is discussed by Shulman and Shulman (2004) and includes the key element of vision, motivation, understanding, practice, reflection, and community, where teacher learning/development is seen as a process of active individual construction.

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CPD is dynamic, ongoing, continuous, and set in teachers' daily lives, embedded in the classroom context, directly related to the work of teaching, can take form of co-teaching, reflecting on actual lessons or group discussions, and constructed through experience and practice (Webster-Wright, 2009). Another kind of professional development is involvement in a development or improvement process (Guskey, 2000). Researchers (Birman, Desimone, Porter, & Garet, 2000; Boyle, Lamprianou, & Boyle, 2005; Desimone, 2009) emphasize the importance of the collective participation of teachers, as participation from the same department, grade, or subject is more likely to be coherent with their experiences and affording opportunities for active learning and contributing to a shared professional culture. Hence, the development of a common understanding of instructional goals, methods, problems, and solutions are key factors that seem to inspire teachers to improve their classroom practices.

According to Cohen and Hill (2000), CPD should therefore be collaborative and over time, include time for practice, coaching, and follow-up, be grounded in students' curriculum, and be job-embedded and connected to several elements of instruction.

Desimone (2009, p. 185) has developed a model for studying the effects of professional development on teachers and students. In Figure 1 below, the model is illustrated.

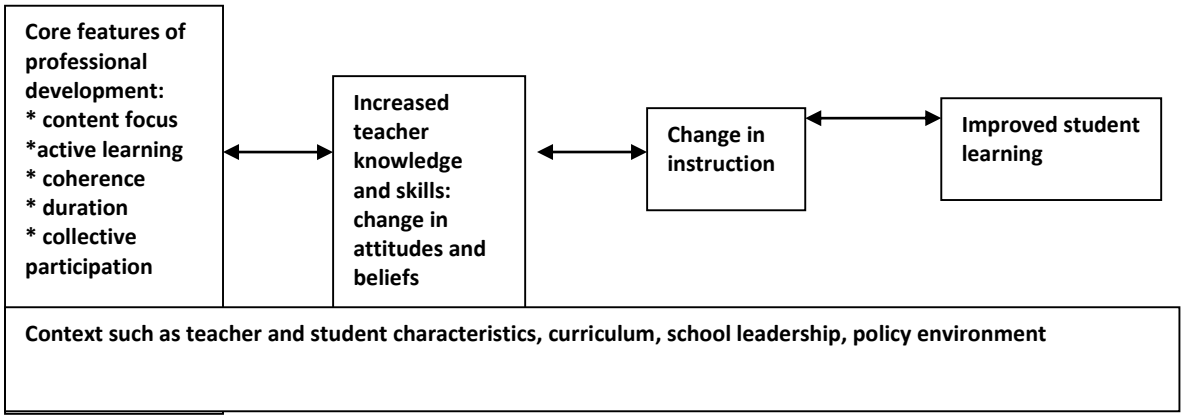

Figure 1. *The effects of professional development*

The model represents interactive relationships between the critical features of professional development, teacher knowledge and beliefs, classroom practice, and student outcomes. The contextual aspects are also important in describing the effects of CPD.

ICT and special education

ICTs offer a great potential to support lifelong learning for all groups of students, including students in need of special support (UNESCO, 2006). However, the educational needs of people with disabilities are vastly diverse. On one hand, they must, as their peers, get knowledge and skills required in the society in which they live; on the other hand, they have (by definition)

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additional demands (often referred to as special educational needs) caused by functional limitations which affect learners' ability to access standard educational methods of instruction and, therefore, prevent educational progress (UNESCO, 2006). In this context, ICT application is very important as it plays an essential role in providing quality education for students with disabilities. ICTs are extremely diverse and varied and may be grouped in the following categories, illustrated in Figure 2 below:

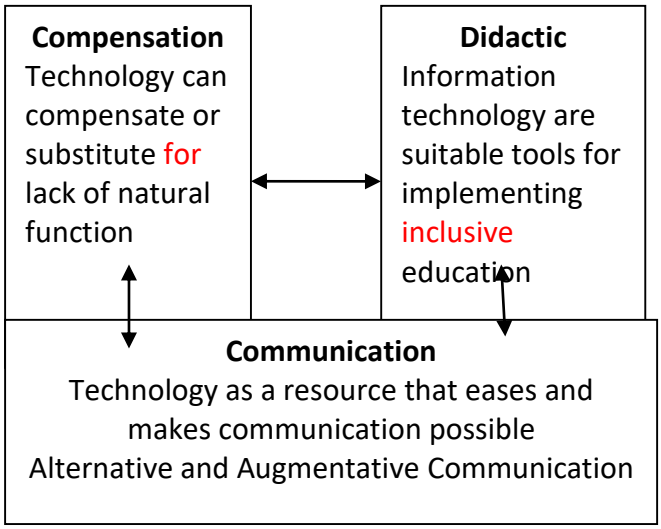

Figure 2. *The process of ICTs in special education*

ICTs allow students in need of special support to take active part in the process of interaction and communication and will become a valuable resource for inclusion (UNESCO, 2006).

It is important to realize that ICTs alone cannot solve all problems. The teachers need to develop innovative teaching methods or change and adapt the existing approaches to accommodate new concepts of special education and modern technology. ICTs will thus contribute in creating good learning environments for all.

Theoretical standpoint

The norm model

The norm model may be used as an analytical tool to understand a particular taken action. The concept of "norm" is a collective term for the factors and structures that are normalizing and are therefore regarded as normal. The norm model (Hydén & Wickenberg, 2008) studies actions in order to find norms and what controls people's actions. Norm theory is based on systems theory, where the parts of a system are related to each other and influence each other while all the parts depend on the whole. A norm comprises factors and structures that jointly shape the patterns of behavior and thought; structures are normalized and consequently are seen as normal. A norm analysis examines the values, knowledge systems, and conditions that

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form patterns and work together as integrated action instructions. Hydén and Wickenberg (2008) assume that people's norms have three conditions that cannot exist without each other. The norm model is illustrated and the three conditions are described in Figure 3.

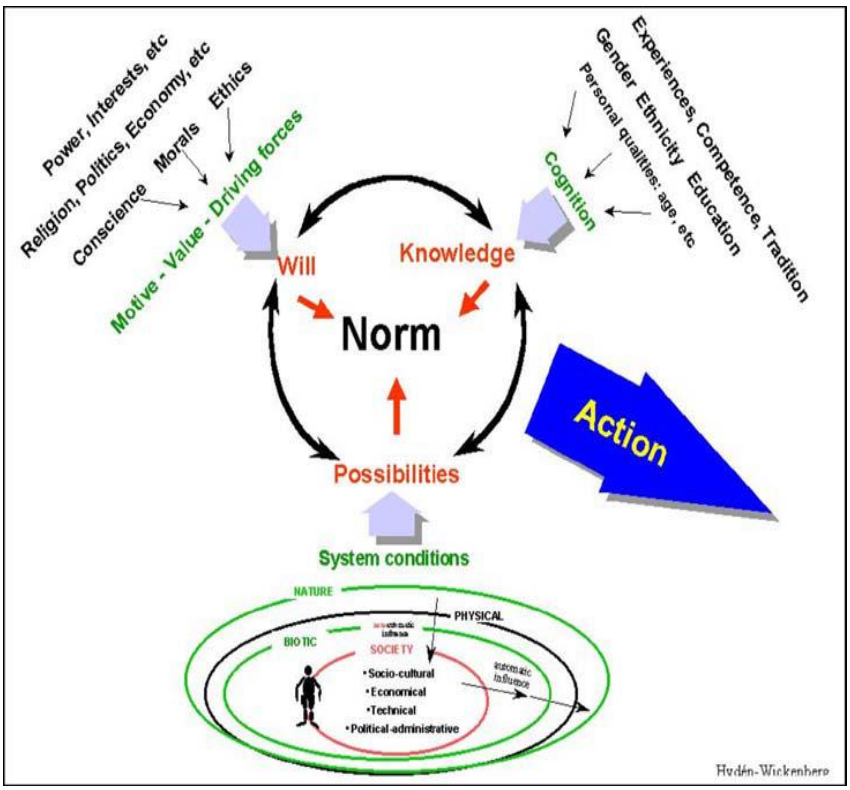

Figure 3. *The norm model*

Methods

Action research

This study is inspired by the concept of action research, a process in which teachers examine their own educational practices systematically and carefully using the techniques of research (Denscombe, 2010). Furthermore, action research allows teachers to try out different ways of doing things in their classrooms and to find something that works for themselves and their students.

Three main perspectives have guided the data collection: Information and Communication Technology (ICT), learning, and special education.

Population

The participants are 21 staff members in a preschool, primary school, and recreation center in the southern part of Sweden. The school was selected because of the professional competence, awareness, and willingness among the staff to create good learning environments for all. Furthermore, the motivation among the staff members to use assistive teaching tools as a complement to the ordinary teaching and learning strategies was one important aspect in the selection of participants.

Research methods

Interviews

Data was collected through a semi-structured group interview process, audio-recorded and moderated by two researchers.

The interview questions were open-ended and covered the following areas: implementation and general experiences, classroom situation (teachers' role, student learning), lesson planning/design, perception of knowledge, and opinions concerning the in-service training.

In the analysis of interview data, a pattern coding process was used (Bryman, 2012; Kvale & Brinkman, 2009). The recordings were transcribed and analyzed. The transcripts were studied in detail to identify joint patterns, and key words and sentences were marked and put together into categories. Three research questions were raised and the analysis was based on these research questions, and the data presentation is organized according to the specific questions.

The example comments indicate teachers' reflections on their own professional development, the role of digital tools, and the impact on their teaching.

Research Question One: How can teachers make schools more relevant and engaging?
Research Question Two: How can students' achievement increase?
Research Question Three: In what ways can teachers provide high-quality education for all students?

The study context

The school is a primary school in a village in the southern part of Sweden. There are 150 students ages 6-12 years, divided into 7 classes. Each class has a classroom teacher, and in addition there is one special education teacher and a few subject teachers—21 staff members in all.

The final conference/workshop of the three-year project was held in 2015 and all the results connected to the project were analyzed and documented in 2016 and 2017. The project was funded by grants from a non-governmental foundation, and this made it possible for the

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principal to come up with a clear vision of the teachers' continuing professional development (CPD), which included activities such as:

- Lectures on how to create good learning environments, special education, ICT
- Specific courses in how to use the new tools
- Follow-up meetings for reflections
- Study circles on how to use the tools
- Workshops with experts in digital tools
- Field visits to relevant schools/institutions using digital tools
- Team development
- Individual classroom work, interaction between students and teachers

Furthermore, the following assistive teaching tools were purchased:

- An individual iPad for each staff member
- iPads for the students (working in pairs)
- Interactive boards in each classroom

The above activities were carried out in cooperation with staff from two universities and different agencies in ICT. All activities were discussed and resolved by a steering committee under the leadership of the principal.

Ethics

Throughout the study, the research ethical rules (Swedish Research Council, 2002) were considered:

Information: The participants were informed about the aim of the research, the role they would play in the project, and the conditions for their participation, which was voluntary and could be discontinued at any time.
Consent: Participants in the study had the right to decide whether or not to take part.
Confidentiality: Details about everyone taking part in the study were treated with the greatest confidentiality possible; personal data was stored safely.
Using the Data: Information gathered about individuals was used only for research purposes.

Findings

Teachers' perceptions on developing a self-understanding of their complex role in daily practice by using digital tools.

All the teachers expressed satisfaction in discovering their professional development since the project started. However, the participants had different views of what kind of knowledge their participation in project would lead to. Some stated that they saw the project as a possibility for deepening their knowledge in a subject area, regarded as a means for further professional

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training, while others stressed the positive influence of the project in general and specifically on the possibilities of reflection together with colleagues, which was enhanced by appropriate use of interactive technologies.

The teachers agreed that motivation increased and they felt greater confidence in working collectively with digital tools, acquiring pedagogical tools, and producing their own knowledge and learning in an everyday context.

Research Question One: How can teachers make schools more relevant and engaging?

All teachers had experience of working with digital tools and gave many examples of how they can be used in order to make schools more engaging. With the tools available, the possibilities to develop the skills are striking.

The possibility for the teachers to participate in the project meant a lot for their professional development, and their attitudes toward the meaning of good teaching have changed. All the teachers are aware of the importance of designing engaging, meaningful, and authentic work and technology-enhanced learning experiences. Thanks to improved learning in the digital world, the teachers demonstrate a deeper understanding of the importance of being able to create sustainable teaching practices. Furthermore, the teachers are aware of the many benefits, for both students and teachers, of learning in relevant and engaging contexts and using technology in appropriate and innovative ways. According to the teachers, the benefits of using iPads include enhanced learning, collaboration, visualization, motivation, and communication. In summary, the teachers felt very positively about the value of the digital tools and articulated many of the benefits, not only for learning but for themselves:

It has made me think differently about how I deliver my lessons.
The children are more focused.
I think it excites them more so they are more engaged.
Students engage in the material more and can work independently more effectively.

All the teachers highlighted the role of the principal and the administrative support:

Good leadership is a necessary condition for creating schools more relevant and engaging.

Research Question Two: How can students' achievement increase?

The teachers were aware that more time is needed in order to be able to confirm that quality has improved due to the digital tools, and this is because of insufficient assessment data available. However, the majority of the teachers believed that technology has a role to play in education insofar as it can make a meaningful contribution to provide instruction, socialize, and

provide qualification, and thus the teachers firmly stressed that iPads have enormous educational potential.

There was a clear consensus among the teachers that collaborative learning entails more than just working next to each other or even helping one other. The digital tools have created many possibilities in truly collaborative work, which enhances student learning by modeling authentic work and increasing students' achievement.

The teachers appeared to recognize the value of different apps in their teaching, and due to the fact that the device is always available, it becomes present and can be used at will. Nevertheless, the teachers expressed a need for ongoing professional development and sharing of best practices. The iPad has impacted the way the teachers now teach in order to increase students' achievement, and some of them consider more student-centered approaches, more group work activities, and more student activities. Another possible way of increased achievement is expressed in this way:

The instant access to new information means that students can gain information from a variety of resources, not just a textbook or worksheet.
I just use another tool. My teaching approach has not changed but clearly using the iPads is new.

Research Question Three: In what ways can teachers provide high-quality education for all students?

The teachers were aware of the complexity of providing high-quality education for all students, and many basic components were mentioned: learners, environments, content, processes, and outcomes. One appropriate way to meet a variety of individual learners' needs can be via iPad and smartboard. This will lead to the possibilities of enhancing the need for more relevant education for all.

According to the teachers, digital tools can contribute to improving learning environments: usability, accessibility, and flexibility. However, integration of the aforementioned tools must be carefully elaborated: content, methods of content delivery and methods for teaching and learning, and methods for students' progress assessment. Furthermore, the teachers stressed the importance of considering what the application of digital tools requires, and mentioned continual upgrading of their own competence as well as the possibility of access to more expert knowledge, guidance, and professional advice to provide individual education.

In order to be able to include all students in an active part in the learning process, most of the teachers agreed about the compensatory role of digital tools, which allow for compensation of mental, sensory, and physical activity limitations. The tools will help students to overcome the barriers to learning and thus help students to develop effective learning strategies.

The teachers were aware of the conditions of quality education and discussed different processes of economic, scientific, technological, and cultural development where digital tools play only a partial role:

Electronic textbooks can be tailored to the individual student so that iPads open the doors to an individualized curriculum.
iPads allow more independent learning from students.
Enabling students to immediately see the results of learning.

A quotation from one of the teachers summarized the overall consideration of providing high-quality education for all by using digital tools:

The ideas are there, and while some of us are still at the stage of doing traditional things more easily, many of us are potentially agents of change.

The main complaints about using digital tools are related to occasional poor network connectivity and to blocking of internet sites. This is an obstacle to creating good learning environments for all students.

Discussion

The overall aim of the study was to highlight the active teachers' perceptions on developing a self-understanding of their complex role in daily practice by using digital tools.

The project made it possible for the teachers' continuing professional development (CPD), and the conditions for improving their classroom practices were offered, such as in-service training, time for meetings and coaching and follow up, and collective participation of teachers. This is emphasized by Birman et al. (2000) and Boyle et al. (2005), who highlight the importance of the development of a common understanding of instructional goals, methods, problems, and solutions.

The results from this study show that investment in quality professional learning opportunities to support teachers in designing meaningful, highly engaging learning experiences for students pays off. When analyzing the results using the norm model (Hydén & Wickenberg, 2008), it became obvious that the teachers are motivated and have gained new knowledge using interactive tools. Furthermore, they are aware of the new possibilities in improving their teaching. The contextual conditions are also essential in studying the effects of professional development (Desimone, 2009), and according to the teachers, strong leadership is one of the most important factors in successfully continuing professional development. Together with the staff members, the principal at the school developed a clear vision for ICT and CPD focused on pedagogy and teacher development. It is the principal's role to create a culture of norms that

stimulates and inspires teachers to a higher level of engagement and willingness to develop their skills and their profession.

The overall objectives and a coherent strategy were thus in place. This is essential in order to be able to avoid operational problems of time and funding. Therefore, leadership, like clear goals and objectives, is crucial to the success or failure of CPD. The impact of CPD programs ought to be evaluated within the conceptual framework, opportunity to learn features, etc., in accordance with the presented research (Desimone, 2009). Another important factor in the success of the project was the teachers' ongoing training development, and this is something that Tallvid (2015) emphasized in his study.

Research Question One was formulated to find out how the teachers, with the new knowledge, could make the school more relevant and engaging. All the teachers expressed an awareness of the importance of designing engaging, meaningful, and authentic work and technology-enhanced learning experiences. The teachers also realized the benefits of using iPads and the way they contribute to enhancing learning, collaboration, visualization, motivation, and communication. This is in accordance with results reported in different research projects (Alberta, 2012; Karsenti & Fievez, 2013) where benefits such as information access, creativity, higher student motivation, and collaboration are highlighted. Collaboration is promoted by digital tools since they stimulate face-to-face social interaction between children; in the project, the students often worked in groups of two, and this was a contributing factor in creating collaboration. However, the iPads were either used individually or in groups depending on what was being taught and the expected learning outcomes. Use of iPads often resulted in students spending more time and effort on their work, which will contribute to a higher level of engagement.

The outcomes of Research Question Two, *How can students' achievement increase?,* revealed that even if it is too early to say whether iPads are a contributing factor in enhanced student achievement, the teachers expressed that technology has a role to play in education insofar as it can make a meaningful contribution to better results in general. With the teachers' increased knowledge and skills and their changing attitudes and beliefs, this changed their instructions, which has led to improved learning. This is what Desimone (2009) discusses as the effects of professional development. Obviously, digital tools alone cannot contribute to the students' achievement of the goals; the teachers must develop innovative teaching methods and accommodate modern technology.

The third research question dealt with ways in which teachers can provide quality education for all. This study has shown that digital tools have the potential to motivate both students and teachers and are beneficial to both learning and teaching. However, the tools have to be carefully elaborated: content, methods of content delivery and methods for teaching and learning, and methods for students' progress assessment. Furthermore, the teachers agreed to the fact that digital tools have a compensatory role, which will help students to overcome

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the barriers to learning, and thus help students to develop effective learning strategies. These aspects are also highlighted by UNESCO (2006), where the process of ICTs in special education are discussed including compensation, didactic, and communication. ICTs allow students in need of special support to take active part in the interaction and communication and will become a valuable resource for inclusion (UNESCO, 2006).

Conclusion

The project proved to be extremely successful. While technology was an integral part of the success, a key factor was the principal's capability to create a culture of norms that stimulates a higher level of engagement and willingness to develop their skills and their profession. The quality of the ongoing management is striking, and the principles of sound management of school improvement and development have been applied.

The teachers interviewed found that digital tools have features and a design to make them useful for education. The size and portability of the iPad allow it to be easily moved around the classroom. The tools can be used to support engagement and collaboration.

There has been a significant and very positive impact on learning and teaching, and Information Communication Technology (ICT) has proven to be influential in everyday activities which, in time, should be reflected in achievement, thanks to both pedagogical changes and new ways of learning due to access to information and learning tools. The adoption of using ICT tools in education enhances teaching and learning processes in different forms and levels of education.

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