

# Same but different? An examination of Swedish upper secondary school teachers' and students' views and use of ICT in education

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## Abstract

**Purpose** – The purpose of this paper is to examine Swedish upper secondary school teachers' and students' views and use of ICT in education.

**Design/methodology/approach** – In total, 25 individual teachers and 39 students in small focus groups were interviewed. A qualitative content analysis was performed using NVivo11. The analysis was conducted in three steps: with each individual teacher, the student groups and the cohort of teachers and students. A comparative analysis was also conducted.

**Findings** – The teachers' views and use of ICT are diverse. Teachers and students identify similar challenges when using ICT in education, e.g. time and subject, the shortcomings of a school's learning management system (LMS) and teachers' digital competence. Students report an extensive out-of-school use of smartphones and an extensive in-school use of laptops and LMS.

**Research limitations/implications** – The relatively small number of teachers and students in three schools make generalisations difficult. The examination of teachers' and students' views and use in the same context reveals new knowledge.

**Practical implications** – The study may influence teachers' use of ICT in education, based on a better understanding of students' use.

**Social implications** – The study may lead to a better understanding of teachers' and students' different perspectives and a more enhanced and sustainable in-school use of ICT.

**Originality/value** – The originality is that teachers' and students' views and use of ICT in education are examined at the same time. The paper contributes new knowledge about how teachers and students conceptualise and use ICT in upper secondary school practices.

**Keywords** Teaching, Student, Teacher, Upper secondary school, Use of ICT

**Paper type** Research paper

## Introduction

This paper addresses the question of ICT in education from the perspectives of upper secondary school teachers and students. A lot is expected from ICT in education, although according to a large number of research studies and evaluations, ICT has yet to prove its potential to improve education (OECD, 2015; Pate, 2016; Pedro, 2009; Wastiau *et al.*, 2013). Several questions can therefore be posed. For instance, can the uptake and use of ICT in education ever meet policymakers' expectations? If so, how might the current situation be



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understood? Is it, as suggested by Schleicher in the foreword to the 2015 OECD report, a question of developing a way of thinking or a pedagogical design that makes the most of ICT, or is there an overestimation of teachers' and students' digital competences in an educational context? Or both? This paper attempts to provide some answers from the perspectives of teachers and students.

### *ICT in education – complicated expectations*

Expectations that ICT will reform education have been expressed for several decades (Cuban, 2001). As mentioned above, at a policy level the expectations often seem to be overrated (OECD, 2015) and are also repeatedly questioned by scholars in different parts of the world (e.g. Håkansson Lindqvist, 2015). In their review of research, Olofsson *et al.* (2015) maintain that the uptake and use of ICT in K-12 education, both in theory and in practice, can be understood from several different points of view and that there is a need for educational research to go beyond smaller case studies of what is described as successful implementation activities. In other words, research needs to move towards larger longitudinal studies that carefully consider the potential and the difficulties of using ICT in a complex educational context. Suggestions as to why ICT has not yet become an established pedagogical tool in K-12 settings have been made in research. For example, Sipilä (2014) argues that teachers' digital competence influences their use of ICT for teaching and learning. Male and Burden (2014) maintain that students' digital competence affects their possibilities of developing an understanding of how ICT can be used for learning in educational contexts. A third suggestion is that students' out-of-school use of ICT seems to influence their view of how ICT is used in school for learning purposes (Ben-David Kolikant, 2012). However, relatively few studies focus on teachers' and students' views and use of ICT and target the same contexts and conditions (Ingleby, 2013). Against this background, how teachers and students think about, talk about and use ICT as a tool to support and develop the process of teaching and learning in education is a meaningful avenue of exploration.

### *Teachers' use of ICT in education*

Recent research studies (Vrasidas, 2015; Ward and Parr, 2010; Wastiau *et al.*, 2013) highlight the difficulties that teachers face when using ICT in their daily educational practices. Many of these difficulties centre on the many and varying ways in which ICT can be used (Ward and Parr, 2010). Ward and Parr point out that teachers' need for ICT in education and their readiness to use ICT are factors that need to be considered. Research studies (Howard, 2013; Player-Koro, 2012, cf. Teo, 2013) also show that teachers with a positive attitude towards ICT are much more likely to use ICT in their teaching and for students' learning, presumably because they realise the pedagogical benefits of the tool. Further, Salleh (2016) finds that teachers' attitudes towards the usefulness of ICT in teaching and their feelings of control are more important for the implementation of ICT in teaching than the influence of social norms and expectations. Thus, understanding the everyday practices in which teachers try to manoeuvre between the expectations of others and their own beliefs, concerns, emotions and knowledge about the advantages and disadvantages of using ICT for teaching and learning would seem to be vital (Fransson, 2016). Here, acting in the best interests of the students and not taking risks would seem to be of primary importance (Howard, 2013; Kreijns *et al.*, 2013).

Teachers' sense of control is related to their digital competence. Sipilä (2014) reports that teachers with high digital competence frequently use ICT in education, but that there are differences in relation to gender, different forms of ICT and the use of ICT in different school subjects. Vrasidas (2015) reports that challenges related to the use of ICT in Cyprus are lack of time, ICT and support, the school curriculum and the need to provide a flexible and professional teacher development. Based on the Survey of Schools: ICT in Education, commissioned by the EU, similar recommendations for professional development and ICT support are reported by Wastiau *et al.* (2013).

### *Students' use of ICT in education*

A large body of research on the ways in which students use ICT in education and at home has recently been published (Beavis *et al.*, 2015; Beckman *et al.*, 2014; Crook, 2012; Gronn *et al.*, 2014; Hinostroza *et al.*, 2015; Ben-David Kolikant, 2012; Plowman and McPake, 2013; Vekiri, 2010a, b). Vekiri (2010a) has studied how socioeconomic factors correlate with students' views of ICT for learning and confidence in their ICT skills and finds that although the students in the study have a positive view of ICT, those from low socioeconomic backgrounds tend to down rate their skills, partly due to a lack of access to the technology. In an increasingly marketised educational sector, Pate (2016) warns for what she calls a consumer mind-set and students' and parents' overuse of the accessibility to teachers that technology facilitates. Hinostroza *et al.* (2015) find similar student user profiles among different groups of secondary students in their out-of-school use of ICT. Vekiri (2010b) has also studied the relation between student efficacy and value beliefs regarding ICT and teacher expectations and finds that teachers' expectations matter, regardless of gender.

In a study of students' use of digital games in- and out-of-school, Beavis *et al.* (2015) report positive student responses towards the use of such games for learning. This research also highlights the importance of listening to students' experiences and meeting students where they are. This is also stressed by Beckman *et al.* (2014), who argue for the inclusion of student use in- and outside school in order to better understand their technological practices. Ben-David Kolikant (2012) finds that students are enthusiastic about using ICT outside school, but are much more ambivalent about it being integrated into their school curriculum. Crook (2012) identifies tensions between in-school and out-of-school cultures in the use of Web 2.0 in education. According to Crook, these tensions reflect students' different technological ambitions and expectations. Gronn *et al.* (2014), on the other hand, find that students use similar technologies at home and at school, suggesting that the digital divide or digital disconnect between home and school is a simplified explanation to a more complex dilemma. Similarly, Plowman and McPake (2013) scrutinise seven myths about children and technology and question assumptions about children's use of technology, including the idea of children as digital natives or technology hindering social interaction.

### **Purpose**

The purpose of this paper is to examine upper secondary school teachers' and students' views and use of ICT in education. What do they regard as the challenges and possibilities? Are they in agreement, or do they hold contrasting views that might restrict the use of ICT in education?

### **Methodology**

The study is part of a four-year national research project on the use of ICT in Swedish upper secondary schools, funded by the Swedish Research Council. The design of the project is multi-dimensional and longitudinal: multi-dimensional in terms of the inclusion of managers at the municipality level, school leaders, teachers and students, and longitudinal because it runs from 2015 to 2018. Three schools known nationally for their advanced use of ICT are included in the project. The schools have both theoretical and vocational programmes, and students in all three schools have their own laptops which they bring to each class.

The data consist of interviews with 25 teachers and 39 students. The teachers were interviewed individually and the students in 11 focus groups. The individual interviews with the teachers lasted between 38 and 110 minutes, with an average of 60 minutes. The group interviews with the students lasted between 16 and 40 minutes, with an average of 29 minutes. The number of students in each group interview varied from two to six. All 36 interviews took place in the schools and were recorded digitally. All the interviews were semi-structured. The interview guides that were used dealt with issues such as the

possibilities and challenges of ICT in education. Follow-up questions were used in both the teacher and student interviews to deepen their reflections and give extended examples of real situations using ICT. All the interviews were transcribed before being coded and qualitatively analysed with the aid of NVivo11 software. The analysis began with a content analysis (Krippendorff, 2004) of each teacher's and student group's views and use of ICT in education. This first phase of the analysis led to the identification of different themes. In the second phase, a comparative analysis was conducted involving all the teachers and all the student groups. In the third phase, the outcomes of the analyses were compared and discussed with the aim of identifying similarities and differences in themes, issues and emphases. The results of the analyses are presented in the next section.

## Results

In this section, the results of the study are presented. The results are based on the major themes that emerged from the analyses. The teachers' views are presented first.

### *Teachers' views of the use of ICT in education*

The analyses show that the teachers' views of ICT in education and students' abilities to use ICT for learning purposes are somewhat uniform. ICT is considered to be a valuable teaching tool, and the students appear to have the digital competence that is necessary to use ICT at the upper secondary school level. These views mainly seem to be based on how the teachers perceive the students' out-of-school use of ICT.

According to the analyses, the teachers use ICT for different purposes, e.g. for teaching in different kinds of digital software (e.g. Geogebra) and for administrative purposes, such as providing information through the school's learning management system (LMS) and communicating with other teachers and students by e-mail. According to the teachers, ICT is also used for recording attendance and communicating with parents about students' progress at school. As one teacher puts it:

[I] use our XX [software] a lot in the teaching. That's how I communicate with the students. Assignments, presentations and planning are placed in the different rooms. Feedback on and responses to what they have done are also in XX [software].

Some teachers provide links to websites through the LMS and also links to lectures and lecture notes uploaded on sites like YouTube – as well as other digital learning resources that are regarded as useful. Examples of these are web-based dictionaries, wikis, blogs and newspapers. Some teachers also use social media, such as Facebook, for their professional development and to search for relevant discussions and lesson-plans in their particular subjects. Other teachers use ICT for test and examination purposes.

At two of the three upper secondary schools, the main part of one of the programmes uses digital teaching materials for almost all the courses in the programme. Students work through the lessons using online course materials and assessments and are supported by the teachers in their work. This is considered by several teachers to be a convenient use of ICT. As one teacher says:

I think that XX [software] works well, but it needs to be use properly. If the students sit too long with it, they get tired. But I still think that they like it. You need to find a balance between the practical and XX [software]. They are also quite independent when working with XX.

The analysis of the data further reveals that the use of ICT in general in the three upper secondary schools seems to depend on which subjects are being taught. For example, teachers of English mostly use ICT as support for communication and writing practices, whereas maths teachers use ICT as a tool to visualise different mathematical relations. In the vocational programmes, for instance the electricians' programme, ICT is used by the

teachers to simulate practices that students might encounter in their future working life as electricians. Some of the teachers have started to experiment with clickers in order to determine students' knowledge in their particular subject.

Regardless of which of the schools the teachers work at, most of them seem to view ICT with some kind of ambivalence. For some purposes ICT is easy to use, whereas for others it appears to be unnecessary and difficult. The schools' LMS is one example. The LMS is by some teachers considered useful and easy for teachers to design and use in practice while others talk about it in terms of not being intuitive enough. The different rooms/spaces in the LMS that teachers are expected to design and maintain for their teaching require a certain level of digital competence and time, both of which are in short supply. This becomes apparent when teachers start to place their course material in the various digital rooms, which requires a different approach than the more traditional way of teaching. As one teacher says:

I've asked XX about the rooms [...] I have 25 years' worth of things to digitise. I also need to scan assignments and find examples. Then I have to scan this and that and then put them into the various rooms, but I'm not there yet.

Another example of teachers finding ICT difficult to use is smartboards. Using smartboards gives access to functionalities that teachers find difficult to handle. In this context, the technology is often referred to as unpredictable. Using ICT requires different strategies to be in place if the technology fails.

#### *Teachers' views of the possibilities of ICT in education*

Considering the possibilities with ICT, the analysis reveals that some teachers use simulations that are relevant in school settings. For example, simulations can support the visualisation of mathematical correlations. ICT is also used for flexibility in time and space and for giving students continuous online access to lectures and lecture notes. Documenting students' learning and assessment is also easier and less time consuming with ICT. Asking students to make audio-visual recordings of their learning progress, rather than always relying on written texts, is also regarded by some teachers as a possibility. One teacher describes the use as:

I use this for filming and running sequences. We've also done this with the workstations. They [the students] can film, document and comment on and describe how it works. Can you film it and show me?

In the analysis there are also accounts of what could be called a non-advanced use of ICT with effective learning potential. For example, the views of some teachers of ICT as a tool for drills and rote learning are also mentioned. Other examples of non-advanced use are online search engines to gain access to new and relevant information and assist with English spellings.

#### *Teachers' views of the challenges of ICT in education*

The challenges that the teachers experience or imagine mainly appear to relate to aspects of time, curriculum and subject. For some teachers, the time that is allocated to a subject is too restricted to allow for the use or support of ICT. Put differently, it is not time spent well enough. Time is also an issue for the teachers when it comes to designing and preparing lessons with the support of ICT. It often takes a lot of time to find relevant and stimulating digital teaching and learning resources in their subjects. One example given by the teachers is finding YouTube links for certain course content. As one teacher puts it:

There must be lots of possibilities. The problem is finding the time to sit down and find good software and good websites to use.

In the interviews, the teachers also talk about challenges related to local policies that restrict certain ICT usage. Several of the teachers also experience challenges in relation to their own digital competence. They feel that their technological and pedagogical knowledge is lacking, and they sometimes have difficulty identifying how ICT could be used in a meaningful and pedagogical way in their subjects. For several of the teachers this is a difficult area for continuous professional development (CPD), in that it is hard to keep pace with technological developments, the demands of teaching and the students' requirements. The challenge of technological infrastructure is also mentioned by the teachers in the three schools. Some teachers say that they would like the technology to be more transparent and consistent. In the words of one teacher:

No, that's the [...] next [...] problem if I want to, for example if I go in, if I'm in the attendance register and go into these rooms to collaborate as it's called, I shouldn't need to click there and lose contact with [...] wherever I am. But I should be able put the mouse there and click straight away.

For the teachers who plan to use ICT in their teaching, the current limits in broadband and Wi-Fi are real challenges. This is especially the case when teachers want to provide teaching situations that simulate a real-life setting that students might encounter in their future workplaces. Yet another challenge is the problem of students focussing on the task in hand. Easy access to the internet leads to distractions and is something that teachers have to consider when planning the use of ICT for learning. There are also challenges related to the trustworthiness of different sources on the internet. A final major challenge according to the analysis is the efficient use of the school's LMS.

#### *Students' views of the use of ICT in education*

It would seem that students view their teachers' use of ICT in education in a similar way to how teachers view their students' use of technology. The students view some teachers' use of ICT as more advanced than others. A main difference with the students' own use of ICT both in- and out-of-school is their use of smartphones.

According to the analysis, the students in all three schools use ICT in education on an everyday basis. The students also report that in some of their school subjects they find it difficult to use ICT for learning purposes. Some claim that ICT is not necessary in their learning activities. For example, when talking about using ICT in mathematics, one student explains:

It feels somewhat unnecessary to spend time on it [ICT] when we've just started to work with advanced mathematics. Well, it's not all that advanced, but it is time consuming and difficult.

It should also be mentioned that in some subjects the students find it impossible to follow the lesson without using their laptops. Throughout the interviews the students' at all the three schools have a generally positive view of the use of ICT in education and are aware of the potential distractions of the internet and the different apps they install on their smartphones. When talking about the potential of smartphones as a learning tool, one student says:

No, I don't think it's good. As you [the interviewer] noticed in the lessons, many [students] find it difficult to concentrate [...] some look at streams or play some kind of game [on the smartphone]. They don't concentrate and just do their own thing and don't understand what's happening etc.

Students also report differences in use depending on the teachers' preferred style of teaching. Students described that teachers provide digital lectures and lecture notes through the local LMS, but that they also use YouTube, for example, to search for resources on their own. Only a few students explicitly provide examples of using ordinary computer-based games for learning. Students in all the groups use the local LMS on a regular basis, but at

the same time they find it unnecessarily difficult and time consuming to handle. In the schools, students' use of smartphones is restricted, unless the teacher specifically allows it.

According to the analysis, students' out-of-school use of ICT is to a large extent divided into computer-based games and the use of smartphones. Online computer gaming dominates in some of the student groups. Regarding smartphone use, it seems that most students use them for social media purposes and for watching films and video clips. When students use ICT at home for school purposes, it seems to be a mix of laptop use and smartphone use, depending on the digital educational software being used whether apps are available to support their school work. During the group interviews, students describe how they would like to use ICT for student collaboration when doing school assignments at home. One student, though, went beyond seeking support among classmates and instead consulted her father, who lives in a different geographical location. She says that they:

[...] mostly use the phone or Facetime. Sometimes text messages. I send him a mathematical problem and he solves it himself. He sends the answer to me and then rings me up and tells me what he's done and how he arrived at the solution.

#### *Students' views of the possibilities of ICT in education*

Some of the possibilities that students see with ICT in education are related to its future use and purpose, such as using ICT for simulations and programing. Students view ICT as a way of visualising complex relations and providing structure in their everyday school work. Referring to Google Docs, during one of the group interviews a student says:

Yes, because it's a good collection point. I can create folders and be sure that everything is stored there. I'm not sure about the computer, things can end up anywhere. I could use it [Google Docs] and I could write my tests on the computer.

The students regard the use of a local LMS as helpful for administrative purposes, collaborating on shared documents and communicating with teachers and other students. In all three schools, the LMS serves as a collection point for the submission of assignments. One of the students says:

We submit all our school work via Fronter [the LMS]. I think you can count the number of written assignments provided [by the teachers] on one hand.

Other possibilities can be summarised in terms of the laptop being a good tool for writing and communicating, searching for information, using different forms of software for educational purposes and student collaboration.

#### *Students' views of the challenges of ICT in education*

The challenges that the students identify for ICT in education are related to teachers' digital competences. According to the students, teachers teach different age ranges and have different reasons and ambitions for integrating ICT in education. One of the students reflects on this issue in terms of:

Many teachers don't know how it [the LMS] works or why it works. It seems as though this needs be covered at the teacher training stage so that people know how and why it works and can use the platform properly.

Another student talks about teachers' digital skills like this:

My English teacher hates technology in general. He complains every lesson about the smartboard and that it doesn't always work. He says he needs to re-start it, or that it's locked itself if it's been on all night. People [e.g. the teachers] don't really know. Instead of learning how things work and solving the problem, they just see the difficulties and hope for the best. One of the daftest

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arguments is that they just want the technology to work. Technology is not some kind of magic that just works, it's a program, a machine that does something because it has been told to do it. If you know how it works, you know what the problem is and can solve it.

According to the analysis, the students at all the three schools also give examples of teachers who they experience as being much more digitally competent than others. They also have views about the challenges related to digital software and the development of an efficient LMS. In the three schools, and regardless of any extended out-of-school use, the possibility to use smartphones in their learning is seldom requested by the students. One exception is their wish to access the school's LMS via their smartphone, mainly for administrative purposes. As mentioned above, the analysis also captures the students' views in all three schools that smartphones are often a distraction during class, rather than a useful digital learning tool.

## Discussion

In general, the possibilities and challenges raised by the teachers and their use of ICT in education mirror to a large extent earlier research (Sipilä, 2014; Vrasidas, 2015; Ward and Parr, 2010; Wastiau *et al.*, 2013). It can be noted that the teachers in this study are somewhat ambivalent about using ICT in educational contexts, perhaps due to their own personal levels of digital competence or by restrictions of time and subject, which also reflect the results of previous research. How the students' view their in- and out-of-school use of ICT also seems to reflect the reports in the research literature (Beavis *et al.*, 2015; Beckman *et al.*, 2014; Crook, 2012; Gronn *et al.*, 2014; Hinostroza *et al.*, 2015; Ben-David Kolikant, 2012; Plowman and McPake, 2013; Vekiri, 2010a, b). When comparing the results from both the teachers and students, it would appear that they identify similar challenges in the use of ICT in education. Three of the major challenges and three of the major possibilities identified by both the teachers and the students are outlined in the next section.

### *Challenges*

The first major challenge to be identified relates to time and subject. More specifically, the time allocated to subjects in the timetable is considered by the teachers as very restricted, which more or less rules out the use of ICT. In other words, although many of the teachers can see the potential of ICT for their subjects, not enough time is available for its use. The students came to the conclusion that they would rather spend time learning the subject, than learning how to use an ICT tool that might support them in their learning process. At the same time, it should be noted that other students gave examples of how mathematics lectures uploaded onto YouTube could be as supportive learning resources.

The second major challenge is related to the use of the LMS. For the teachers and students at all the three schools, the LMS is an important hub in the educational practices. The LMS is considered by both as a resource for the distribution and submission of assignments, the dissemination of information or leaving a message through the LMS system. What does differ between the teachers and students is that the latter are critical about the functionality of the LMS system. In particular, this critique concerns the LMS system being outdated or not user-friendly enough, and that smartphone apps for using the LMS are missing. Further, they consider the LMS more as a collection point for information than an online platform for education and the learning process.

A third major challenge relates to teachers' digital competence and their CPD. Even though some teachers have advanced ICT skills, many teachers talk in the interviews about the difficulty they often experience in keeping pace with the rapid development of technology, the demands of teaching and those of the students. They also think that the time allowed for CPD in the area of ICT in education is limited and that even if there was enough

time, transferring the knowledge learned into their specific subjects could be problematic. The students' views about teachers' digital skills mirror those of the teachers. The students think that several teachers at their schools seem to be in need of basic digital training so that they can use the technology that is available.

### *Possibilities*

The first major possibility to be expressed by both the students and the teachers is the number of options for teaching and learning that ICT provides. The possibilities include ICT as facilitating learning, giving flexibility in time and space, enabling simulation and the use of updated online (course) materials. The students especially indicate a strong belief in the possibilities for the future development of education using ICT, for instance in cases such as visualisation and programming.

A second possibility is that both students and teachers regard students as having the necessary digital competence to use ICT for learning at the upper secondary school level. Students seem to have a wide use of ICT both in- and out-of-school, which can provide rich opportunities for the further development of the use of ICT for teaching and learning. The students' digital competence is not just about using technology, but also how ICT influences their lives and self-understanding. For instance, students seem to be aware of the distractions when using ICT, which could be regarded as a healthy sign for future in-school use.

The third major possibility relates to students' use of smartphones. In the results, the discrepancy in students' in- and out-of-school use of smartphones is striking. It seems to be the case that teachers use the ICT infrastructure that is provided to the best of their abilities, at least according to the analysis, but that the infrastructure is based on ICT hardware such as laptops and LMS that is a generation older than that used by the students. In all three schools, it seems that students access their education using smartphones in combination with their laptops, while teachers mainly seem to plan for the students to use their laptops under teacher surveillance. According to the students, they sometimes surprise teachers by Googling relevant information on their smartphones and finding useful resources that the teachers are unaware of. However, if upper secondary schools require students to use their smartphones in education there could be legal implications, for instance if a privately owned smartphone breaks during this particular use. In the interviews it became apparent that this had happened at one of the schools and had resulted in the school compensating the student in question. Jurisdiction like this could thus impede the teachers' integration of new technologies that are not provided by the schools.

### **Conclusion**

The main conclusion to be drawn from this study is that the teachers and students at all the three schools are largely in agreement about how they view ICT in education and how it could be used for teaching and learning. The main difference that stands out in the analysis is the educational potential of smartphones. If teachers planned lessons and made educational choices together with their students, many of who are aware of the pitfalls of using ICT in education, such as distracting social media and computer games, a more elaborate use of ICT in education could be designed and planned.

### **References**

- Beavis, C., Muspratt, S. and Thompson, R. (2015), "Computer games can get your brain working: student experience and perceptions of digital games in the classroom", *Learning, Media and Technology*, Vol. 40 No. 1, pp. 21-42.
- Beckman, K., Bennett, S. and Lockyer, L. (2014), "Understanding students' use and value of technology for learning", *Learning, Media and Technology*, Vol. 39 No. 3, pp. 346-367.

- Ben-David Kolikant, Y. (2012), "Using ICT for school purposes: is there a student-school disconnect?", *Computers and Education*, Vol. 59 No. 3, pp. 907-914.
- Crook, C. (2012), "The 'digital native' in context: tensions associated with importing Web 2.0 practices into the school setting", *Oxford Review of Education*, Vol. 38 No. 1, pp. 63-80.
- Cuban, L. (2001), *Oversold and Underused: Computers in the Classroom*, Harvard University Press, Cambridge, MA.
- Fransson, G. (2016), "Manoeuvring in a digital dilemmatic space: making sense of a digitised society", *Nordic Journal of Digital Literacy*, Vol. 10 No. 3, pp. 185-201.
- Gronn, D., Scott, A., Edwards, S. and Henderson, M. (2014), "'Technological me': young children's use of technology across their home and school contexts", *Technology, Pedagogy and Education*, Vol. 23 No. 4, pp. 439-454.
- Håkansson Lindqvist, M.J.P. (2015), "Gaining and sustaining TEL in a 1:1 laptop initiative: possibilities and challenges for teachers and students", *Computers in the Schools*, Vol. 32 No. 1, pp. 35-62.
- Hinostroza, J.E., Matamala, C., Labbé, C., Claro, M. and Cabello, T. (2015), "Factors (not) affecting what students do with computers and internet at home", *Learning, Media and Technology*, Vol. 40 No. 1, pp. 43-63.
- Howard, S.K. (2013), "Risk-aversion: understanding teachers' resistance to technology integration", *Technology, Pedagogy and Education*, Vol. 22 No. 3, pp. 357-372.
- Ingleby, E. (2013), "Selected student and tutor perceptions of ICTs in further and higher education in England", *Journal of Further and Higher Education*, Vol. 38 No. 3, pp. 287-304.
- Kreijns, K., Vermeulen, M., Kirschner, P.A., van Buuren, H. and Van Acker, F. (2013), "Adopting the integrative model of behaviour prediction to explain teachers' willingness to use ICT: a perspective for research on teachers' ICT usage in pedagogical practices", *Technology, Pedagogy and Education*, Vol. 22 No. 1, pp. 55-71.
- Krippendorff, K. (2004), *Content Analysis: An Introduction to its Methodology*, Sage, London.
- Male, T. and Burden, K. (2014), "Access denied? Twenty-first-century technology in schools", *Technology, Pedagogy and Education*, Vol. 23 No. 4, pp. 423-437.
- OECD (2015), *Students, Computers and Learning: Making the Connection*, PISA Series, OECD Publishing, Paris.
- Olofsson, A.D., Lindberg, O.J., Fransson, G. and Hauge, T.-E. (2015), "Uptake and use of digital technologies in primary and secondary schools-a thematic review of research", *Nordic Journal of Digital Literacy, Jubileumsnummer* (Special Issue) 2006-2016, pp. 103-121.
- Pate, L. (2016), "Technology implementation: impact on students' perception and mindset", *The International Journal of Information and Learning Technology*, Vol. 33 No. 2, pp. 91-98.
- Pedro, F. (2009), "New millennium learners in higher education: evidence and policy implications", *International Conference on 21st Century Competencies, OECD, Brussels, 21-23 September*.
- Player-Koro, C. (2012), "Factors influencing teachers' use of ICT in education", *Education Inquiry*, Vol. 3 No. 1, pp. 93-108.
- Plowman, L. and McPake, J. (2013), "Seven myths about young children and technology", *Childhood Education*, Vol. 89 No. 1, pp. 27-33.
- Salleh, S. (2016), "Examining the influence of teachers' beliefs towards technology integration in classroom", *The International Journal of Information and Learning Technology*, Vol. 33 No. 1, pp. 17-35, available at: <http://dx.doi.org/10.1108/IJILT-10-2015-0032>
- Sipilä, K. (2014), "Educational use of information and communications technology: teachers' perspective", *Technology, Pedagogy and Education*, Vol. 23 No. 2, pp. 225-241.
- Teo, T. (2013), "Influences of contextual variables on the intention to use technology in education: a latent variable modelling approach", *Campus-Wide Information Systems*, Vol. 30 No. 2, pp. 95-105.
- Vekiri, I. (2010a), "Socioeconomic differences in elementary students' ICT beliefs and out-of-school experiences", *Computers and Education*, Vol. 54 No. 4, pp. 941-950.

- Vekiri, I. (2010b), "Boys' and girls' ICT beliefs: do teachers matter?", *Computers and Education*, Vol. 55 No. 1, pp. 16-23.
- Vrasidas, C. (2015), "The rhetoric of reform and teachers' use of ICT", *British Journal of Educational Technology*, Vol. 46 No. 2, pp. 370-380.
- Ward, L. and Parr, J.M. (2010), "Revisiting and reframing use: implications for the integration of ICT", *Computers and Education*, Vol. 54 No. 1, pp. 113-122.
- Wastiau, P., Blamire, R., Kearney, C., Quittre, V., Van de Gaer, E. and Monseur, C. (2013), "The use of ICT in education: a survey of schools in Europe", *European Journal of Education*, Vol. 48 No. 1, pp. 11-27.

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