The role of ICT and its pedagogical contributions in Finnish education: Advances in educational innovation for inclusion and technological literacy from the perspective of stakeholders

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Abstract

This chapter investigates the role of ICT (by which we refer to technologies such as software and hardware solution in general) as a pedagogical support tool in the Finnish education sphere. Qualitative research method based on interview was conducted with four (4) experts whose background varied from education to ICT. The result of the content analysis indicated that the use of ICT in Finnish education is widely spread and some of the respondents have cautious attitudes in adapting ICT as a part of their profession. Besides, this study identifies that the greatest barrier to implement ICT based solutions in schools are the funds. Based on the interviews and researches presented previously we conclude that digital literacy among the teachers in Finland is high as in many knowledge societies in general. Based on the interviews, also the use of ICT based innovations in schools in increasing in Finland.

Keyword: ICT, Finnish education, Inclusion.

Introduction

The use of ICT in Finnish education system is widely spread from elementary schools to the institutes of higher education (Niemi, Kynäslahti & Vahtivuori-Hänninen, 2013). Both hardware and software are extensively used to support learning, teaching, analysis and interventions. It is not unusual that elementary school students have iPads or Chrome books, which they use during the teaching and at home for completing the given homework (Kyllönen, 2014).. The teachers encourage students to harvest the power of ICT from early ages: the path that they will continue in adulthood as citizens of digitalized society. While this is the case in many schools and for many teachers, one should be aware that the attitudes of teachers regarding the use of ICT varies. Most enthusiastic teachers use novel innovations such as Virtual Reality (VR) and Augmented Reality (AR) as a part of teaching itself but there exist cases where teachers are not keen to adapt the ICT as a part of teaching.

The digital literacy of Finnish teachers is in general high (Zhao & Li, 2015; Tomczyk & Oyelere, 2019; Ellison, 2009). The teacher training in Finnish universities acknowledge the importance of the digital literacy and its impact on inclusion ((Lähdesmäki & Valli, 2017). Students with disabilities are yet facing another challenge: the adaptation of ICT based solutions is well spread to general education. However, the lack of proper materials, applications and hardware can cause exclusion among the disadvantaged (Haukipuro, Shabalina, & Ylianttila, 2015).

The rise of ICT use in the education in Finland has gained a boost due to the governmental acts when programming and computational thinking became a mandatory part of the curriculum (Bocconi, Chioccariello, Dettori, Ferrari, Engelhardt, Kampylis, & Punie, 2016). However, integrating ICT such as computational thinking and programming into the curriculum is done through teaching them as a minor subject of mathematics and such; not to teach them as standalone subjects. Such acts created a demand for proper hardware and software for the students and, of course, for the teachers. The teachers were demanded to know the basics of CT and programming and this further increased the digital literacy (Yadav, Gretter, Good, & McLean, 2017).

The government and the business sector provide funds, equipment and training for the teachers. The teachers can properly use the given software and devices as part of teaching activities. However, the funds are usually fixed and in general, only free software is being used. The teachers and the schools cannot demand the students to pay additional fees to participate in teaching. This is ruled in the constitution: the basic

education should be free and accessible for every student. Regardless of the students' background such as the financial status.

Study participants

We interviewed participants whose background varied from education to ICT. All of the subjects had experience in either working with children at some point of their professional careers. The interviews took place in March, 2020. All of the participants were living and working in a municipality of Joensuu, Finland. Joensuu is located in the Eastern Part of Finland near to Finnish Russian border.

In the following paragraphs, we introduce the participants we interviewed for the study. We introduce each participant based on the professional experience and their knowledge in education and the students. We refer the participants as S* in the following sections.

S1 was a history and social science teacher in the secondary school. S1 was native Finnish and she had been teaching social sciences and history for at least 10 years. She also taught 3D modeling and printing in the same school as she taught history and social sciences. She had a master's degree in pedagogy. In general, her attitude towards ICT as a tool to support teaching and learning was positive and she was keen to adapt innovations and novelties to support her activities in the classroom.

S2 was a social worker who worked with families and children with disadvantaged backgrounds. Mostly her clients involved children whose parents or guardians had been affected with conditions such as mental illnesses or alcoholism. She had a master's degree in social sciences and social work from Finland. However, she did not have pedagogical background and her knowledge in ICT was at intermediate level.

S3 was a social worker, who also worked with families and children who had challenges in upbringing and everyday activities. S2 and S3 worked both for a city of Joensuu, a municipality located in Eastern Finland near to Finnish Russian border. As S2, S3 did not have a degree in pedagogy but instead a degree in social sciences and social work. In Finland, a law enforces a social worker to hold a master's degree in social work in order to be qualified to work with children and families. Her knowledge in ICT was also at intermediate level.

S4 was a software engineer in Joensuu, Finland. He holds a master's degree in computer science from the University of Eastern Finland. During his studies, he taught robotics for children in informal settings after school days. He did his master's thesis in educational robotics and

had vast knowledge in educational technology. Although he lacked a degree in pedagogy, he had years of experience in educational robotics, which was also his PhD thesis' topic.

In general, all of the participants had experience in working with children with various backgrounds. Half of the participants were very familiar with technology and used ICT every day. The remaining half however did not use much ICT as a part of their professions (S2 and S3). Also, their attitudes towards ICT varied. S1 and S4 had positive attitudes towards ICT in education while S2 and S3 shunned ICT to some extent.

Ethical concerns

We interviewed in total 4 participants who had experience in working with children. The anonymity of children was not compromised under any circumstances: the participants of the research conducted did not describe or name any particular child or a student to the extent where the child or a student could be identified by the researchers or the readers. For those children who were counseled by a social workers, no any kind of description of any child was given. S1 described some students but did not provide names or age; only origin and gender.

Results

Implementation of ICT in schools and other educational institutes

The use of ICT in Finnish education is widely spread. S1 stated that all schools in Joensuu area provide hardware to at least secondary school students. Most of the schools provide iPads, which are owned by the school, but the students have an opportunity to purchase the devices after the graduation. The remaining schools provide Chrome books with the same option for the students to purchase the device after the graduation. The same applies for the teachers. All teachers in Joensuu area are provided some sort of device: a tablet computer or a laptop for instance. Most of the classrooms are equipped with Smart Boards or similar intelligent blackboards and Apple TVs. The teachers use extensively mobile devices and the support comes from the city of Joensuu, which receives funds from the government ultimately. The city also provides additional materials such as 3D printers and introductory courses for the devices that the teachers are provided. However, according to S1, the city does not provide education in hardware of software use for the students. The attitude is clear: the teachers are given education, which they are supposed to continue in the classrooms.

According to S1, she and many other teachers tend to experience with different software, which might be used to support the learning and teaching. The constraint is that the software must be free: the city does not provide licenses for software packages excluding the basic applications such as Office 365, which contains Word, Excel and PowerPoint for instance. Also, the teachers cannot demand the students to pay additional fees and this is forbidden by the law: in Finland, all public education must be free and inclusive. Paying for a software that is required to learn can be exclusive and selective in a favor of children who are more advantaged.

In Joensuu... mostly Chrome books or iPads: Joensuu provides these for all secondary school students for free. They are able to purchase the machine after they graduate so actually the school owns the machines during their studies. We also have licenses for Microsoft products such as Word and PowerPoint. iPads are really great, and the students know how to use them (S1)

S4 worked with primary school children in after school club where the children assembled and programmed educational robots from Lego Mindstorm series and Arduinos. The club was not free of charge, but all children received the same robotics kits. S4 stated that the origins of the club were more than 10 years from now and the philosophy had been the same ever since. According to S4, the educational robots are widely used as a part of curriculum nowadays in Finland to learn computational thinking and programming, but this was not the case 10 years ago.

S2 and S3 were more cautious with the implementation of ICT to their profession: the disadvantaged children with whom they worked with did not used ICT during the counseling. If any, S2 and S3 had negative attitudes in adapting ICT as a part of their profession.

The greatest barrier to implement ICT based solutions in schools are the funds. The city and the government provide fixed amount of funds to schools. The schools are then obligated to purchase the hardware and the software for the students. Since the amount of funds is fixed, the schools cannot request more funds for the innovations and such. According to S1:

"The funds to support ICT in education is usually the first in line when the city or the government cuts something off from the schools. It is easy for them..."

S4 noted:

"I think it's always the money. And the fact that maybe not many teachers are keen to learn to ways to teach?"

Also, S1 suggests that negative attitudes towards ICT among some teachers is a barrier to adapt the ICT in more general level. S1 states that some teachers shun ICT and cannot see the additional value of hardware and software in learning and teaching. In Finland, it is up to the teacher how and what is done in the classrooms. The teachers must follow the study plan to some extent but how the learning takes place, is completely based on teacher's decisions. If a teacher wishes not to use ICT as a part of teaching, then the ICT will not be used in his or her classrooms.

According to S1, the freedom of the teacher in Finland is an advantage and disadvantage in this sense: the teachers are not forced to follow any specific path as long as the subject is based on the study plan provided by the government. It is clear that some teachers are not as confident as others in using ICT in education. If the additional value is not seen, then ICT is not used. This applies also for the funds provided by the city and the government. In order to remove these barriers, those who are responsible for the funds and the teaching should be informed about the extra value added by the ICT.

The innovations used in schools are usual in Finland. S1 stated that 3D printers, VR, and AR are used in certain learning settings and by some teachers. Again, the funds are the greatest challenge. S1 also noted that the use of AI in the future plays a crucial role in education.

S4 stated that he doubts the innovations are widely used in schools. However, in the informal settings, the innovations in Joensuu were used as a part of education. According to S4, the trend could be seen for a decade:

"When I dealt with educational robots, they were kind of innovative. Nowadays not so much maybe? Maybe schools use 3D printers? I doubt much of the innovations are used in schools" (S4).

Based on the opinions of the participants, it is clear that according to them, the barriers in to adapt the ICT in schools apply for the innovations: the schools and the teachers were more interested in trying different innovations such as AR and VR or even AI if the city and the government would provide funds to try and experience with different innovations. For instance, the teachers can only use software as a part of teaching, which is free of charge.

S1, S2 and S3 all stated that the business sector may provide some equipment for the schools, may give discounts and gives training for the teachers who wish to use some hardware and software. The use of the human potential according to subjects is clear: the education.

"I see many bright children who have a lot of potential. Educate them to trust themselves and give them the opportunity to be innovative. That would make a huge difference" (S2).

"I mean, people should not be afraid of technology. That is the most important thing. Teachers should be aware of the advantages of technology: basic skills. I don't want to teach the students some specific software. I want to teach the students how to use email in general. Or word. On the other hand, some applications are better for some tasks and some are better for other tasks. But really, we should show to all teachers that technology can be a great partner if you don't use it too much. In that way, teachers should not be afraid to fail" (S1).

Feedback and analytics – for groups requiring support

All of the subjects (S1, S2, S3 and S4) stressed the importance of education on how to support ICT related skills such as digital literacy of those who are responsible of education. S3:

"Educate them to use the technology. Give them the courage to fail and try again. There is a difference in educating children in need and supporting them when the situation is volatile. In the latter case I would not definitely think about ICT. In the previous case ICT can be used".

And S4:

"We should give training. So they can teach the students. Not every teacher knows how to use iPads not to mention how to do programming..."

Clearly, the education should take place even before the graduation: in Finland, all of the teachers are required to obtain at least Bachelor's degree in pedagogy. Most of the teaching positions require master's degree in education or related subjects. The digitalized society has a demand that its citizens should know how to use technology and that its citizens should not be afraid of technology. S2 stated that

"...If I speak based on my experience; I shun little bit using ICT with my clients..."

According to S1, schools in Joensuu use extensively open educational resources (OERs):

"We use a lot of those. For people with poor sight, there should be more audio books for instance. For inclusion I mean. I have one student who speaks Persian language, and he communicates with me in English, but the teaching is in Finnish. So potentially more diverse collection of different languages... Most that we use are in Finnish and not even in audio. Although I should stress that in Finland, we have these special classes who are taught by teachers with a special degree. So, I don't teach that much classes for students with severe disabilities. Some, but the conditions are not severe".

S1 also stated that OERs can be used to support students with disabilities. However, in Finland, students with severe disabilities are being taught in special education classes. Teachers teaching in such classes are required to possess a master's degree in special education. Some parts of the degree overlap with a regular teacher training degree but mostly the education is more focused on different kind of learning strategies and disabilities and how to support students.

Other subjects (S2, S3, and S4) did not have experience in OERs.

All of the subjects agreed that the governmental agencies should provide more funds for ICT to support inclusion:

"Money. Government gives money. Joensuu gives money. And training for hardware and applications. But of course, if we are tight on money, then technology is the first thing that suffers" (S1).

"The funds they provide. The public schools and institutions depend on such funds. Without the funds, they would not be ICT in schools. The same applied for the inclusion: our salary comes from the city of Joensuu. The city of Joensuu raises its funds from the governmental sector and so on" (S3).

"They give money. Maybe even training? I don't know. Though they don't give as much money as needed" (S4).

Conclusions

The digital literacy among the teachers in Joensuu is high. The use of the ICT based innovations in schools is also high and increasing in Joensuu. However, the attitudes towards ICT based solutions to support

teaching, learning, analysis and interventions varies greatly between the teachers. Based on the law, Finnish (and Joensuu) schools cannot demand pupils to invest their own funds for software and hardware; the basic education in public level has to be free and inclusive for every student regardless the background of the student.

The Finnish schooling sector provides great freedom to the teacher. If the teacher wishes, ICT based solutions can be used during the classroom activities. On the other hand, if the teachers choose not to use any ICT based solution, then the students will not use any ICT. Of course, the decision is based on the teachers' own attitude and the level of digital literacy. Ottesad (Ottestad, 2010) noted in His research that Finnish teachers tend to be more conservative in the use of ICT than teachers in other Nordic countries. The attitude against ICT may be caused by one's own experiences and digital literacy. Hence, as the digitalized society evolves and its citizens use more and more different type of ICT every day, the attitudes of teachers may also evolve in favor of ICT based solutions in education; the situation when the freedom the teachers is an opportunity.

The funds are fixed but every school tends to offer their students some sort of ICT device. Whether the device is an iPad or a laptop, it will be used for the learning to some extent. Most schools in Joensuu provide the students an opportunity to purchase the device after the graduation. But this alternative is optional.

For those teachers who wished to use more software and hardware during their teaching, the fixed funds are not optimal solution. The teachers are forced to use only free software and playing with innovations such as 3D printing, AI, AR or VR tends to be difficult due the lack of such devices or software artifacts. Ellison (Ellison, 2009), however, pointed that Finnish education system is quite prone to use of innovations in general (educational innovations, for instance) due the flexibility of the system.

Informal sides of education also use ICT based solutions in Joensuu. The ICT based solutions are used for inclusion. For instance, audio books are available for the students with disabilities with hearing. For immigrants, OERs provide an option to study with their own native language.

Altogether, the schooling in Finland is inclusive and the ICT based solutions tend to increase the inclusion. The rise of novelties and innovations - if handled correctly - increase this inclusion even further.

For those who work with the severe students with severe disadvantages such as social workers, the use of ICT is not yet well spread - at least in Joensuu - but the schools, the cities and the government have woken up for the digitalization of the society.

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