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The Digital Leap in March 2020 – Teachers Assessing Their Digital Competence After the Distance Learning Period

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Abstract

The Covid-19 pandemic and the emergency remote teaching (ERT) it necessitated in spring 2020, forced educators and educational institutions worldwide to quickly adapt to the technology needed for teaching and learning. This was situation in Finland as well. Three years after the pandemic, with extensive school closings and emergency remote teaching behind us, we wanted to find out how teachers assess their digital competence post-ERT compared to the period before it. Based on a self-assessment questionnaire, teachers' competence and confidence in their own skills have increased, but moderately. When examining competence assessments by age, confidence and competence seem to decrease with age, with teachers under 30 being the most competent. During the review period, competence has grown the most among individuals aged 30 to 60. Although teachers' activity in using information and communication technology (ICT) in most lessons has somewhat increased, no significant change can be seen in students' use of ICT in most of their lessons. Teachers remain the most active users of technology in learning.

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Keywords: digitalization, teachers' competence, self-assessment, Covid-19, school

Introduction

Although school digitalization has been underway for a long time, a sudden and compelling period of distance learning starting in March 2020 during the Covid-19 pandemic brought about a significant leap in the utilization of digital resources in teaching. The situation forced educators and educational institutions worldwide to quickly adapt to the technology needed for teaching and learning. Teachers had to rapidly acquire new skills and adapt to new pedagogical concepts and ways of working for which they may not have been trained (Schleicher, 2020). Employers, in turn, had to find enough equipment to organize distance education. This situation arose unexpectedly and on an extremely fast schedule, which can be described with the term emergency remote teaching (ERT) (Hodges, Moore, Lockee, Trust, & Bond, 2020; Nilsberth et al., 2021).

When schools were closed and teaching still had to continue, teachers, school leaders, and support staff did their best despite the difficult circumstances. Numerous studies have been conducted worldwide on how teachers and students coped with the distance learning period caused by the pandemic, i.e., ERT. For example, in the Nordic countries (Nilsberth et al., 2021), Canada (Hargreaves, 2021) and in a review article by Tang (2023) concerning several countries in Europe as well as Australia and Indonesia, the impact of Covid-19 on education has been studied. These studies have emphasized the skills gap that has arisen (Tang 2023), the inequality of learning opportunities (Tang 2023), and the coping skills and well-being of teachers and students (Tang, 2023; Nilsberth et al., 2021; Hargreaves, 2021). As Nilsberth et al. (2021) aptly state: "The teachers did not just sit and wait for instructions on what to do but took initiatives and managed the situation as best as they could drawing on their professional competence." This was the situation in Finland too.

Theoretical framework

In this article we use the concepts emergency remote teaching (ERT), teachers' digital competence, and teachers' self-efficacy. In this section, these concepts are briefly clarified.

Emergency remote teaching (ERT)

Emergency remote teaching (ERT) refers to the sudden shift of instructional delivery to an online or remote format due to crisis circumstances, such as natural disasters or pandemics (Hodges et al., 2020; Bonde et al, 2021). The primary objective in these crisis circumstances is to provide temporary access to instruction and instructional supports in a manner that is quick to set up and reliably available during an emergency or crisis (Hodges et al., 2020). ERT should be conceptually separated from high-quality online or distance teaching as well as blended learning (Hodges et al., 2020; Portillo, Garay, Tejada, & Bilbao, 2020; Nilsberth et al., 2021).

Teachers' digital competence

Teachers' digital competence refers to their ability to effectively use digital technologies, tools, and resources to enhance teaching and learning in the classroom. Digital competence

encompasses a range of skills, knowledge, and attitudes necessary for integrating technology into educational practices (Sillat, Tammets & Laanpere, 2021; Falloon, 2020). It includes skills needed to operate effectively in a knowledge-intensive society in the future (Sillat, Tammets & Laanpere, 2021). There are numerous frameworks available for assessing teachers' digital competence such as DigCompEdu (Punie & Redecker, 2017), TPACK (Mishra & Koehler, 2006), UNESCO ICT Competency Framework for Teachers (UNESCO, 2022) and ISTE Standards (ISTE Standards, 2024).

Teachers' self-efficacy

Self-efficacy refers to teachers' beliefs in their ability to successfully manage tasks, obligations, and challenges related to their professional role (Bandura 1997, in Bray-Clark & Bates, 2003). Teachers with high self-efficacy are more likely to transfer skills learned during in-service training to the classroom, explore alternative methods, and experiment with instructional materials. They are also better at handling stressful and challenging situations, taking risks, and using new techniques. (Bray-Clark & Bates, 2003.) According to Barton and Dexter (2020) teachers' self-efficacy, or their belief in their ability to effectively use technology, impacts their integration of technology in the classroom, which in turn is associated with improved student outcomes (Barton & Dexter, 2020).

Background

After the Covid-19 pandemic and the resulting ERT period, tutor teachers' experiences of transitioning to distance education in Finland were studied (Tanhua-Piiroinen, Honkonen, Vuorio & Viteli, 2021). Tutor teachers are trained to support their colleagues in digital learning, novel pedagogy, curriculum development and innovative classroom activities. In Finland, the first tutor teachers were educated with state funding starting in 2016, although there had been some individual projects before that.

At the time of writing the article (Tanhua-Piiroinen, Honkonen, Vuorio & Viteli, 2021) there were approximately 2,200 tutor teachers working in Finland. However, state funding for this activity and for tutor teachers' continuing education ended a couple of years ago and the activity has now continued with different local practices.

According to the study, after the ERT period in March 2020, school policies on how distance education would be conducted became clearer, teachers ICT skills improved dramatically, and basic technical problems were resolved (Tanhua-Piiroinen, Honkonen, Vuorio & Viteli, 2021). However, due to the pedagogical autonomy of teachers' work in Finland, which affects the learning materials and other resources used by teachers (see e.g., Kaarakainen & Saikkonen, 2021; Korhonen, Juurola, Salo & Airaksinen, 2021), it is possible that after the pandemic subsided, teachers may have returned to their previous teaching methods where digital resources and related competences related are not equally essential.

Earlier studies have observed that teachers' digital competences vary according to their age (see for example O'Bannon & Thomas, 2014; Scherer, Siddiq & Teo, 2015; Tanhua-Piiroinen, Kaarakainen, Kaarakainen & Viteli, 2020). Teachers' confidence in their own digital skills decreases with age, and an even stronger connection can be found between age and actual, tested competence (Tanhua-Piiroinen et al., 2020). O'Bannon and Thomas (2014) concluded in their study on teachers' perceptions of using mobile phones in the classroom that no significant differences appeared between teachers who were less than 32 years old and those who were 33–

49. However, both age groups differed significantly from those over 50 in mobile phone ownership and support for the use of mobile phones in the classroom, as well as in their perceptions regarding the useful mobile features for school-related work and instructional barriers. In their study, older teachers were less likely to own smartphones, less supportive on all items, less enthusiastic about the features, and found the barriers to be more problematic. (O'Bannon and Thomas, 2014.) Sherer, Siddiq and Teo (2015) explored teachers' perceived usefulness of ICT related to self-efficacy, the use of ICT for teaching and learning, and teachers' age. They found positive relations to teachers' self-efficacy and ICT use, but a negative relation between teachers' perceived usefulness of ICT and teachers' age: higher age was associated with higher levels of perceiving problems and obstacles of ICT use. (Sherer, Siddiq and Teo, 2015.)

Three years after the pandemic, with extensive school closings and emergency remote teaching behind us, we wanted to find out how do the teachers assess their digital competence post-ERT compared to the time before it, and how they view their own and their students' activity in using digital technology during lessons before and after the ERT. We have analyzed ordinary (non-tutoring) teachers' answers to an online self-assessment questionnaire on their digital competence, their confidence in their skills and their digital pedagogical activity.

The research questions were:

1. Are there differences in teachers' self-assessment before and after the Emergency Remote Teaching period?
2. Do teachers of different ages differ from each other in their answers?
3. Are there any noticeable changes in the digital activity of teachers and students during lessons before and after the Emergency Remote Teaching period?

Methodology

Data acquisition and the participants

The data collected with the Opeka self-assessment questionnaire for teachers, between 1.1.2019 and 31.10.2022. Opeka is an online questionnaire for teachers and schools to measure and analyze their usage of information and communication technology in teaching. Opeka is used to evaluate how teachers use ICT and the characteristics of the ICT environment and culture in the school using the following perspectives: technological readiness, procedures, attitudes, pedagogical use, and ICT-skills. It provides teachers themselves as well as the school and municipality representatives information on how their ICT usage compares to other teachers and schools in national level (See https://opeka.fi/en). The four themes in Opeka are "Digital operating environments", "Organizational culture", "Pedagogical activities" and "Competences". All the current questions in Opeka can be viewed without registration at http://opeka.fi/en/presentation/kysymykset (More about Opeka, see Tanhua-Piiroinen & Viteli, 2017, Tanhua-Piiroinen & Viteli, 2021.)

For this study we did not make a special data collection using a before-hand specified sample. Instead, the municipalities, where the teachers work, were selected in accordance with the previous sample selections made by the National Education Evaluation Council in Finland for

"Comprehensive Schools in the Digital Age" (Tanhua-Piiroinen et al. 2019) and "Comprehensive Schools in the Digital Age II" (Tanhua-Piiroinen et al. 2020). In other words, we saved the entire data from Opeka and then selected the answers of the teachers from those municipalities which belonged to the above-mentioned sample. This data contained 6545 responses, of which 358 answers were from the same people in different years. We chose two sets of respondents as the data for the study, where the respondents were not the same before and after the distance learning period. These duplicates were removed from the data, as we did not do a follow-up study for specific people but wanted to look at the general picture before and after distance learning.

Since we specifically wanted to study *the teachers'* assessments of their competence, we removed from the material the answers of principals and school leaders who still answered the survey (N=77). We also removed the answers of tutor teachers for being able to analyze how so-called ordinary teachers have answered the questionnaire.

The final data consists of 6110 responses from 1.1.2019 to 31.10.2022, of which 3340 (55 %) have answered before and 2770 (45 %) have answered after the distance education period. No answers were given when the distance learning period took place (in Finland from 18.3.2020 to 13.5.2020). Eighty-one percent of the respondents who answered to the gender question, were women and 19 percent of them were men. As 109 respondents did not answer the gender question and 44 did not answer the age question, the age groups by gender have been counted according to this information (table 1). Ninety-seven percent of the respondents worked in comprehensive schools, and three percent of the answers were given by general upper secondary education teachers. In Finland, comprehensive school education (primary and lower secondary education) consists of school years 1 to 9 and is meant for all children aged between 7 and 17 (whole age group). After this compulsory education, students continue to the upper secondary level and choose between general education and vocational education and training. (Ministry of education and culture, 2024.)

Table 1.

Respondents by gender and age groups.

Gender		Age groups					
		Under 30	30–39	40–49	50–59	Over 60	Total
Female	N	517	1166	1603	1261	286	4833
	%	81,0 %	79,3 %	84,0 %	79,7 %	79,2 %	81,1 %
Male	N	121	305	306	321	75	1128
	%	19,0 %	20,7 %	16,0 %	20,3 %	20,8 %	18,9 %
Total	N	638	1471	1909	1582	361	5961
	%	100,0 %	100,0 %	100,0 %	100,0 %	100,0 %	100,0 %

Most of the respondents (76 percent) live in Southern Finland area, 6 percent of the respondents being from Northern Finland and Lapland and only 3 percent from South-western Finland. Since 43 percent of all Finnish residents live in Southern Finland, 12 percent live in Northern Finland and

Lapland and 13 percent in South-western Finland (Population of Finland 31.12.2022, Statistics Finland) (see Table 2), it is good to recognize that this data is somewhat skewed.

Table 2.

Respondents by their residential area in Finland

	Answers in the data	Finnish residents 31.12.2022
Southern Finland (N=4669)	76 %	43 %
South-western Finland (N=181)	3 %	13 %
Eastern Finland (N=278)	5 %	10 %
Western and Inner Finland (N=646)	11 %	22 %
Northern Finland (N=273)	5 %	9 %
Lapland (N=63)	1 %	3 %
All (N=6110)	100 %	100 %

Data analysis

In this preliminary study we are interested in 1) how the ordinary (non-tutoring) teachers assess their digital competence and their digital pedagogical activity after the distance learning period of March 2020 compared to the time before the crisis and 2) are there differences in the responses of teachers of different ages.

We chose three questions of the self-assessment survey that describe the respondents' perceptions of their own digital skills on a general level. The questions were:

1. Choose the level that best describes your competence in terms of ICT use. (five-step description)
2. My own ICT skills and competences are sufficient when compared with the objectives specified in the curriculum. (5-step Likert-scale)
3. I find good ways to utilize ICT in various learning situations. (5-step Likert-scale)

We also analyzed the answers to questions about who the main users of information and communication technology in the classroom are (questions 4 and 5):

1. I personally use information and communications technology in most of my classes. (5-step Likert-scale)
2. Students use ICT in most of my classes. (5-step Likert-scale)

The choices in Likers-scale questions were:

1= Strongly disagree

2= Disagree

3= Neither agree nor disagree

4= Agree

5= Strongly agree

The descriptions of the levels in question 1. were:

1. There are deficiencies in my ICT skills,

2. I have basic ICT skills,

3. I have advanced pedagogic ICT skills,

4. I'm an ICT expert and provide peer support for teachers and

5. I'm an ICT expert, share my knowledge for the community and develop the skills of the work community.

Questions 1-5 were analyzed comparing the answers before and after the distance learning period, exploring the question 1 by cross-tabulation and the chi-square testing, and the Likert-scale questions 2-5 using independent samples t-tests.

Results

After the distance learning period, 47.4 percent of respondents estimate that they have at least advanced pedagogical skills, and only 4.9 percent think there are deficiencies in their skills. The corresponding numbers from the time before the distance learning period were 40.8 percent and 6.8 percent. This positive change was statistically significant (Pearson Chi-Square = 28,027, df = 4, $p < 0.001$).

Statistically significant results, when considering the age groups of the respondents, are shown in figure 1. The most typical answer before ERT among all the respondents in groups over 30 years was level 2: *I have basic ICT-skills.* The competence for the level 3: *I have advanced pedagogic ICT skills* increased especially in the three oldest age groups where the responses increased five, six and nine percents (in order from the youngest group to the oldest one). The perceived deficiencies in own competence have decreased the most in the two oldest age groups: in group “50-59” from 13 % to 8 % and in group “over 60” from 18 % to 14 % after the distance learning period. In level 4. *I'm an ICT expert and provide peer support for teachers*, the biggest increase was in group “30-39”.

However, the changes were statistically significant only in groups “30-39”, “40-49” and “50-59”. The group of respondents under age 30 is still interesting, though the changes were not statistically significant. Before distance learning, their answers were slightly more evenly distributed to the three middle levels than those of other age groups’, and 25 percent of this youngest age group have estimated their competence to be in the level 4: *I'm an ICT expert and provide peer support for teachers*, both before and after the ERT, which is the highest frequency among all age groups in this level. The frequencies of all middle age groups’ responses have increased at this second highest level.

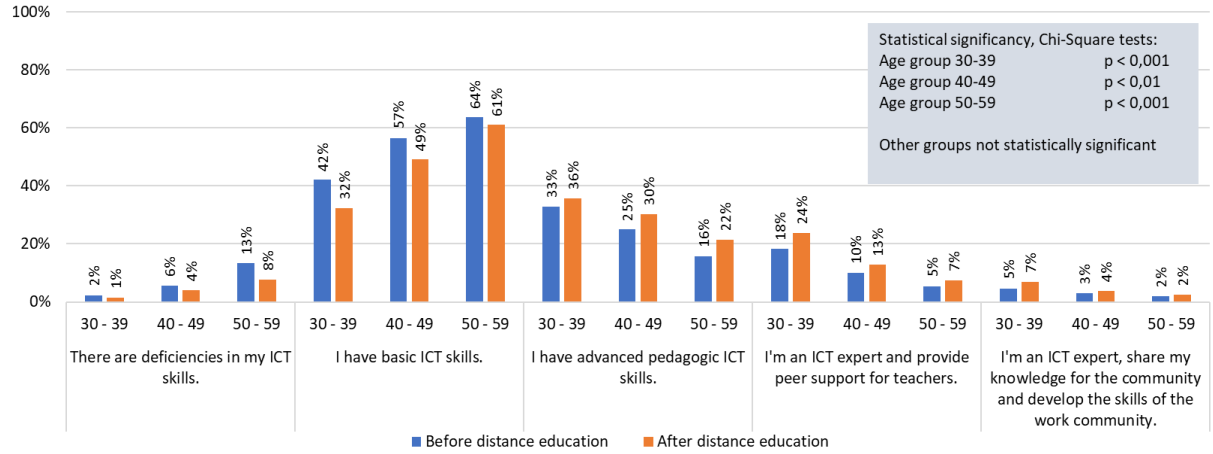


Figure 1.

Teachers' assessments of their own level of competence by age groups

Teachers' confidence in their own competence has increased between the periods under review, measured with two Likert items: "*My own ICT skills and competence are sufficient compared to the goals set in the curriculum*." (M_before = 3,31, StD = 1,049, M_after = 3,53, StD = 0,986, SE = 0,076, p < 0,001) and "*I find good ways to utilize ICT in various learning situations.*" (M_before = 3,49, StD = 0,897, M_after = 3,58, StD = 0,860, SE = 0,062, p < 0,001). These changes are illustrated in Figure 2.

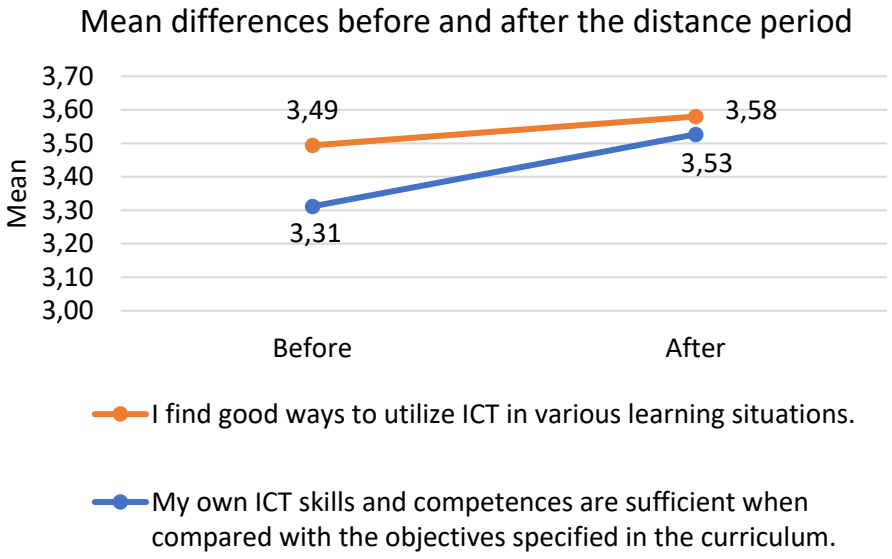
Figure 2.

Teachers' confidence in their own competence based on two variables.

We explored teachers' confidence in their own competence further, investigating what the changes look like between age groups. Tables 3 and 4 show the results by age group for questions 2 (My own ICT skills and competences are sufficient when compared with the objectives specified in the curriculum.) and 3 (I find good ways to utilize ICT in various learning situations.).

The distance learning period significantly impacted teachers' confidence in their ICT skills and competences across different age groups (Table 3). In the under 30 age group, no statistically significant change was observed (M_before = 3.84, M_after = 3.86, SE = 0.075, $p > 0.05$). However, in the 30-39 age group, the mean increased significantly (M_before = 3.57, M_after = 3.81, SE = 0.054, $p < 0.001$). Significant improvements were also observed in the 40-49 age group (M_before = 3.28, M_after = 3.50, SE = 0.049, $p < 0.001$), the 50-59 age group (M_before = 2.95, M_after = 3.28, SE = 0.052, $p < 0.001$), and the over 60 age group (M_before = 2.85, M_after = 3.15, SE = 0.109, $p < 0.01$).

In the group of teachers under 30 years of age, the results did not differ statistically significantly before and after the distance learning period. The mean of their answers was the highest of all age groups in both measurement points. The biggest positive change in teachers' confidence in their own skills occurred among the oldest age groups, and in all groups, except for the youth, the



confidence increased statistically significantly when compared before and after the distance learning period. (Table 3.)

Table 3.

Comparison of the answers before and after the ERT by age groups in question 2. "My own skills and competences are sufficient when compared with the objectives specified in the curriculum."

I find good ways to utilize ICT in various learning situations.						
Age group	**N**	**Mean before distance learning period**	**Mean after distance learning period**	**Mean difference**	**Std. Error Difference**	**Statistical Significance**
under 30	593	3,81	3,83	-0,016	0,062	no significance
30 - 39	**1374**	**3,66**	**3,78**	**-0,117**	**0,045**	**p < 0,01**
40 - 49	**1768**	**3,49**	**3,56**	**-0,07**	**0,042**	**p < 0,05**
50 - 59	**1451**	**3,27**	**3,42**	**-0,149**	**0,048**	**p < 0,01**
Over 60	314	3,09	3,25	-0,164	0,102	no significance
My own ICT skills and competences are sufficient when compared with the objectives specified in the curriculum.						
Age group	**N**	**Mean before distance learning period**	**Mean after distance learning period**	**Mean difference**	**Std. Error Difference**	**Statistical Significance**
under 30	589	3,84	3,86	-0,014	0,075	no significance
30 - 39	**1368**	**3,57**	**3,81**	**-0,239**	**0,054**	p < 0,001
40 - 49	**1758**	**3,28**	**3,50**	**-0,224**	**0,049**	p < 0,001
50 - 59	**1445**	**2,95**	**3,28**	**-0,327**	**0,052**	p < 0,001
Over 60	**314**	**2,85**	**3,15**	**-0,299**	**0,109**	p < 0,01

The distance learning period had varying impacts on teachers' ability to find good ways to utilize ICT in various learning situations across different age groups. When looking at the answers to question 3 (Table 4) we notice that the change between before and after the distance learning period is in the same direction as in the previous question, but smaller for all age groups. Among the youngest and the oldest age groups the change is not statistically significant, but in the other age groups it is.

In the under 30 age group, no statistically significant change was observed (M_before = 3.81, M_after = 3.83, SE = 0.062, $p > 0.05$). However, in the 30-39 age group, the mean increased significantly (M_before = 3.66, M_after = 3.78, SE = 0.045, $p < 0.01$). Significant improvements were also observed in the 40-49 age group (M_before = 3.49, M_after = 3.56, SE = 0.042, $p < 0.05$), and in the 50-59 age group (M_before = 3.27, M_after = 3.42, SE = 0.048, $p < 0.01$), while in the over 60 age group, no statistically significant change was observed (M_before = 3.09, M_after = 3.25, SE = 0.102, $p > 0.05$). (Table 4.)

Table 4.

Comparison of the answers before and after the ERT by age groups in question 3. "I find good ways to utilize ICT in various learning situations."

Teachers' own use of ICT in most of their lessons has remained roughly the same during the period at hand, with about four out of five of the respondents somewhat or completely agreeing with the

item. After the distance education period the amount changed from 81.4 to 84.9 percent. The difference in the mean values of the answers before and after the distance learning period was 0,130 and p < 0,001 (M_before = 4,04, StD = 0,998, p < 0,001 ans M_after = 4,17, StD = 0,948, p < 0,001). However, the students' use of ICT in most of the lessons has not changed after the distance education period. Just under a third of the teachers responded to agree somewhat or completely with this item after the distance learning period. The difference in the mean values of the answers before and after the distance learning period was 0,058 which was not statistically significant.

I personally use information and communications technology in most of my classes.						
Age group	**N**	**Mean before distance learning period**	**Mean after distance learning period**	**Mean difference**	**Std. Error Difference**	**Statistical Significance**
Under 30	622	4,25	4,36	-0,111	0,072	no significance
30 - 39	**1447**	**4,17**	**4,35**	**-0,184**	**0,048**	**< 0,001**
40 - 49	**1859**	**4,04**	**4,14**	**-0,096**	**0,046**	**< 0,05**
50 - 59	**1507**	**3,87**	**4,03**	**-0,163**	**0,053**	**< 0,01**
Over 60	339	3,8	3,96	-0,159	0,105	no significance

The results when age groups are considered are shown in next tables (Tables 5 and 6). Based on the teachers' answers, it seems that before the ERT period both teachers' and students' activity of using ICT in lessons decreases from the youngest respondent group to the oldest, although the differences are not large. After the ERT period the situation was the same regarding the teachers' own use of the ICT. When comparing teachers own ICT use in most of their classes, the means where higher after the ERT in all the age groups, but statistically significant only among the three of the middle age groups. (Table 5.) When teachers assessed students' activity of using ICT in their lessons after the distance learning period, the mean of the responses of age group “under 30” decreased slightly, while the means of the other age groups increased. This result is interesting, although the increase was not statistically significant in all age groups. (Table 6.)

The distance learning period had varying impacts on teachers’ personal use of ICT in most classes across different age groups. In the under 30 age group, no statistically significant change was observed (M_before = 4.25, M_after = 4.36, SE = 0.072, p > 0.05). However, in the 30-39 age group, the mean increased significantly (M_before = 4.17, M_after = 4.35, SE = 0.048, p < 0.001). Significant improvements were also observed in the 40-49 age group (M_before = 4.04, M_after = 4.14, SE = 0.046, p < 0.05) and the 50-59 age group (M_before = 3.87, M_after = 4.03, SE = 0.053, p < 0.01). In the over 60 age group, no statistically significant change was observed (M_before = 3.80, M_after = 3.96, SE = 0.105, p > 0.05). (See table 5.)

Table 5.

Comparison of teachers’ use of information and communication technology during lessons before and after the ERT by age groups.

In the under 30 age group, no statistically significant change was observed in students' activity of using ICT in lessons after the distance learning period (M_before = 2.76, M_after = 2.61, SE = 0.096, p > 0.05). However, in the 30-39 age group, the mean increased significantly (M_before = 2.69, M_after = 2.81, SE = 0.065, p < 0.05). No significant change was observed in the 40-49 age group (M_before = 2.63, M_after = 2.65, SE = 0.056, p > 0.05). Significant improvements were observed in the 50-59 age group (M_before = 2.51, M_after = 2.62, SE = 0.060, p < 0.05), while in the over 60 age group, no statistically significant change was observed (M_before = 2.51, M_after = 2.67, SE = 0.125, p > 0.05). (See table 6).

Table 6.

Comparison of students' use of information and communication technology during lessons before and after the ERT by age groups.

Students use ICT in most of my classes.						
Age group	**N**	**Mean before distance learning period**	**Mean after distance learning period**	**Mean difference**	**Std. Error Difference**	**Statistical Significance**
Under 30	619	2,76	2,61	0,154	0,096	no significance
30 - 39	**1438**	**2,69**	**2,81**	**-0,120**	**0,065**	**< 0,05**
40 - 49	1855	2,63	2,65	-0,026	0,056	no significance
50 - 59	**1506**	**2,51**	**2,62**	**-0,111**	**0,06**	**< 0,05**
Over 60	335	2,51	2,67	-0,155	0,125	no significance

Discussion

According to the tutor teachers the period with the pandemic and the sudden distance learning situation (the ERT) from March to May 2020 influenced positively teachers' ICT-skills (Tanhua-Piiroinen, Honkonen, Vuorio & Viteli 2021). In this study we compared answers from ordinary (non-tutoring) teachers before and after this emergency remote teaching, ERT.

After the distance learning period, 47.4 percent of respondents estimated that they have at least advanced pedagogical skills, and only 4.9 percent think there are deficiencies in their skills. The corresponding numbers from the time before the distance learning period were 40.8 percent and 6.8 percent. When considering the age groups of the respondents, the middle age groups from 30 to 59 changed their assessments the most.

Teachers' confidence in their own skills related to the objectives specified in the curriculum increased within all other groups than the youngest ones, though the mean values of the answers of the youngest teachers were already the highest in both before and after situations. In the other question, about teachers' ability to find good ways to utilize ICT in various learning situations, the results were quite similar, but in this question the mean differences between before and after were not statistically significant in the age groups of not only the youngest but also the oldest teachers.

These results mentioned above are in line with earlier studies where higher age was associated with higher levels of perceiving the problems and obstacles of ICT use (Sherer, Siddiq and Teo 2015), teachers' confidence in their own digital skills decreases with age (Tanhua-Piiroinen, Kaarakainen, Kaarakainen and Viteli 2020) and the older teachers were less likely to own

smartphones, and found the barriers having the phones in use at school to be more problematic (O'Bannon and Thomas 2014).

There can be many reasons for the age-related differences in perceived, and self-assessed competence of teachers. In the question, where teachers were asked to estimate the level of their digital competence using a five-step level description, the youngest respondents' assessments of their own level of competence where high and did not change statistically significantly after the distance learning period. Newly graduated teachers may have the skills acquired through their studies, which they perceive to be sufficient being thus more confident than older teachers. But when the pandemic and the ERT started, the experience and the maybe better self-efficacy among the middle age groups of teachers may have helped them to cope with the new situation better than the youngest ones, and their results increased. As one explanatory factor, it might thus be good to measure teachers' self-efficacy too (see Hatlevik 2017) and compare the results with their evaluations related to competence.

Although teachers' activity in the use of information and communication technology in most of the lessons has somewhat increased, no remarkable change can be seen in students' use of ICT in most of their lessons. Teachers are still the most active part in the use of technology in learning. Thus, the increase in teachers' digital competence does not yet seem to have much effect on students' digital activities. Perhaps there is no reason to talk too strongly about the digital leap in schools. Teachers' digital competence and their activity in the use of technology during lessons and its connection to students' activity in using technology during lessons is one of the important future research themes, which needs attention. It is important to take this into account in both strategic and practical work at school as well. Students should have sufficient possibilities to use digital devices and resources themselves, not only being passive bystanders.

In this study we use concept of emergency remote teaching when describing the distance learning that occurred in spring 2020. As the situation in this kind of ERT is not similar than in beforehand well planned distance learning or blended learning (Hodges et al. 2020; Portillo, Garay, Tejada & Bilbao 2020; Nilsberth et al. 2021), it would be interesting to compare these two different situations of distance learning, and find out if there are differences for example in students' activity in using digital resources in learning or in teachers' confidence and self-efficacy related to digital pedagogy. Other important questions to investigate more, are the digitalization and the changes it may cause in school cultures, now when the worldwide pandemic has shown the importance of being able to quickly step on to remote teaching mode. Big questions as well, linked to this are the well-being of teachers and students and its' connection to digitalization, and the general weakening of learning results (OECD 2023a) and the factors related to this. The last mentioned has caused concern and wonder in Finland as well, which has long been considered a model country for learning based on, among other things, the PISA results. Still in 2023 (OECD 2023b) students in Finland scored higher than the OECD average in mathematics, reading and science, but the direction is steeply downward. Digitalization has progressed a long way, but have its opportunities and on the other hand its weaknesses been fully understood correctly, as far as learning and teaching are concerned?

Study limitations and recommendations for further research

This article describes a preliminary study concerning teachers' digital competence before and after the pandemic 2020, where teachers' competence was discussed using only a few general variables. A more detailed and accurate understanding of the subject could be obtained by studying different areas of teachers' expertise, such as e.g., media education, different learning resources and the frequency of their pedagogical use, or utilization of artificial intelligence, augmented reality, and other advanced technologies in teaching. As we know that the situation with devices provided by the employer to the teachers has improved after the ERT period (Tanhua-Piiroinen, Honkonen, Vuorio & Viteli 2021), it could have been explored whether this has an effect to the self-assessed competence by teachers. This could be one of the future research subjects too.

We decided to choose two independent sets of respondents as the data for the study. We could have done it differently and looked at the answers of the same respondents before and after the ERT period. Since this was not planned and considered in the data collection, there were problems regarding which year the duplicates were from. Only a few of the answers from the same respondents were given both before and after the ERT period. Instead, the person may have answered twice but both answers before or both after the ERT period, though in different years.

Although the municipalities have been selected for this sample as evenly as possible, unfortunately we have not been able to influence the number of respondents in the selected municipalities. The answers were strongly focused on southern Finland, with Lapland and Southwestern Finland being more passive. Therefore, one must be careful when interpreting and generalizing the results in relation to different parts of the country. However, the material is quantitatively comprehensive as a whole and the results can be considered reliable to describe Finnish teachers' self-evaluation of their overall competence before and after the ERT period of spring 2020.

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