The effectiveness of the digital competency training program in improving the digital competence of elementary school teachers

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Abstract

The purpose of this study was to examine the design of a digital competency training program to improve the digital competence of teachers at the elementary school level. This study used a quasi-experimental method with a pretest and posttest design. The participants in this study were elementary school teachers from Yogyakarta. There were 800 teachers involved with the composition of 400 experimental class teachers and 400 control class teachers. This digital literacy program is carried out through several stages, namely the pre-test, intervention, and post-test stages. This digital literacy program lasts for one semester or 6 months with the main objective of improving the digital competence of teachers from three aspects, namely conceptual, procedural, and attitudes towards digital competence of teachers. The results showed that the intervention of this program was able to significantly improve the digital skills of teachers. The increase in digital skills of teachers in the experimental group is marked by increasing digital skills in three aspects, namely conceptual, procedural, and attitudinal digital competencies. The implication of this research is that digital competency training programs can be an alternative for stakeholders in order to improve teacher competencies while improving school quality.

Keywords: Digital competence of teachers, digital competence training program, Internet, digital literacy.

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1. Introduction

In the current era, information and communication technology (ICT) competencies are very important competencies both in carrying out work and becoming superior resources in order to compete. This is driven by environmental conditions that are all digital and use the Internet. The Internet is a major component of everyday life. Based on the results of the study, 95% more people use the Internet to support their activities, both students and teachers. The majority of Internet users in the world of education are used for communication purposes and to support the learning process (Baroud & Dharamshi, 2020; Chye et al., 2021). The rapid development of the Internet has created a fairly large gap between students and teachers so that teachers are required to adapt their digital competencies to the demands of current conditions. From the previous studies, students have digital competencies that are much better than teachers (Lindfors et al., 2021; McGarr & McDonagh, 2021; Xu et al., 2019). This is due to the introduction, and habits of use that are more intensively carried out by students compared to teachers.

In 2021, the measurement of Indonesia's digital literacy index shows a slight increase from 3.46 to 3.49. Although there was an increase, the sub-index that experienced improvement was still in the skills pillar (digital skills) and had not been followed by other sub-indexes (Hadianto et al., 2022; Kildan & Incikabi, 2015; Whong, 2013). The increase in skills can be understood as a result of the massive use of digital technology during the COVID-19 pandemic. This was not matched by an increase in the digital ethics and digital security sub-index which actually decreased. Digital safety (digital safety) gets the lowest score and of course this needs attention. This condition indicates that digital technology users in Indonesia are still unable to protect themselves in interacting with digital technology, for example, what often happens is low awareness of the dangers of uploading personal data (Casillas Martín et al., 2020; Hadianto et al., 2021b; König et al., 2020). This shows that the ability to interact with digital technology for the Indonesian population is only oriented towards technical use skills without being balanced with aspects of knowledge and values or attitudes. This is the basis for the importance of formulating digital competencies that are based on knowledge, skills and attitudes so that digital competencies become complete and comprehensive.

Currently, schools play a pivotal role in the digitisation process, including some schools that are starting to use a lot of technology in order to support the learning process to be of higher quality, such as virtual reality, digital whiteboards, computers, and so on. In addition, teachers are also required to be able to access and manage various information and knowledge via the Internet. This condition simultaneously encourages the digital skills of teachers to be qualified so that they are able to use the technology optimally (Amhag et al., 2019; Thompson et al., 2019). The condition of the ability to use digital media and devices for the majority of teachers in Indonesia currently tends to be grouped into the early majority group where in this group individuals are still experimenting with various existing technologies and their use requires a long period of consideration. The results of research regarding the ability to use digital media for teachers to be included in the early majority group are strengthened by the results of research which reveal that teachers who have not been able to master ICT due to the age factor which triggers a lack of ability to understand ICT, as a result, they are reluctant to use digital media. integrate ICT in teaching and learning activities (Pöntinen & Räty-Záborszky, 2022; Stewart et al., 2021). The age factor places teachers in Indonesia as a generational group that is included in the category of digital immigrants. In order to meet the demands of the digital competence of teachers, the government has implemented a teacher education program that includes digital competence education for teachers. However, the implementation of teacher professional education is also inseparable from shortcomings, namely the not-yet-optimal competencies taught in the educational process. In teacher professional education, teachers are not only prepared to be able to adapt their abilities to today's digital technology, but also must be able to bridge so that students are able to use technology appropriately and use it productively.

Several previous studies investigating the digital competence of teachers are as follows. A previous study of 500 elementary teachers in Yogyakarta related to learning strategies while dealing

with COVID-19 emergency learning. The results of the study show that 98.6% of the learning strategies used by teachers are assignments and the rest are independent learning through programmed learning materials. The learning communication channel used by teachers to students is 87% via smartphones using the WhatsApp application, 5% via LMS using Google Classrooms and students using video conferencing (Google Meet) (Baroud & Dharamshi, 2020; Tusiime et al., 2020). The reason for choosing the communication channel, the majority of teachers answered because it adjusted to the skills possessed by teachers on digital technology. In addition, research on aspects of digital competence in teaching profession education found that digital competence is taught through programs with a partial approach, so the results of the study show that this approach is not effective for increasing digital competence because teaching is very narrow on isolated technical skills and without context (Chye et al., 2021; Erdreich, 2020; Eyo, 2016). Other research conducted on teachers who have good digital competence shows that teachers with good digital competence can provide quality learning processes and provide guidance to students in using the Internet compared to teachers who do not have digital competence. Therefore, in this study, researchers designed a digital literacy program design with the aim of improving the digital competence of teachers at the elementary school level targeting three aspects, namely, conceptual, procedural, and attitude skills in using technology. Based on the explanation of the background, the researcher formulated the research question of how the effectiveness of the digital competency training program on the digital competence of teachers in the conceptual, procedural, and attitude aspects of using technology?

2. Literature review

2.1. Digital competence

Based on the definition of digital competence formulated by experts, there is a lot of literature that describes a variety of different dimensions as a conceptual framework for digital competence. Various components of digital competence include Ala-Mutka (2011) who has identified the dimensions of skills, knowledge and attitudes in digital competence. In line with this, Calvani (2008) identified a digital competency framework into three main components, namely technology, cognition and ethics or attitudes. This is the same as stated by Ng (2012) who calls it a Tripartite Model which includes technical, cognitive and social-emotional aspects. The digital competency framework model as described above includes technical aspects (related to using digital technology), cognitive aspects (related to critical thinking skills) and social-emotional aspects (related to the ability to use the Internet responsibly including self-protection and protection of individual privacy and recognise threats and dangers in the digital environment). A digitally competent teacher if teacher has technical and operational skills in using ICT to support the learning process. For example, in interacting with digital technology, individuals must access, manage, and use information. In addition, teachers are also must use digital devices in the classroom, use communication tools and social media, update or change information, send and receive emails and know the main features of intensively used software programs.

The second competency component of digital competence is in the cognitive aspect, namely the ability to think critically in finding, evaluating and using digital information. The cognitive aspect means being able to evaluate and select the appropriate software program to study or perform a particular task. The digital competency dimension requires individuals to have knowledge of ethical, moral and legal issues related to digital offenses. Individuals must have an understanding of multiliteracy and be able to decode text-based information as well as information from images, podcasts, videos, maps and models. The relationship between the technical and cognitive dimensions is hyperlink and reproduction. This involves the ability to navigate through a hypermedia environment to build knowledge and to gain new understanding of using the device online and offline. The third competence is social-emotional competence which intersects between social-emotional and cognitive competence. This dimension is the ability to use the Internet responsibly to communicate, socialise and learn. The essence of the three dimensions of the digital competency

framework is digital critical literacy or understanding information and being able to critically evaluate what is important and not important to use.

2.2. Teacher digital competence

The very rapid development of digital technology in the era of the industrial brought a wave of change where some future jobs require digital skills (Williamson, 2019). This includes the teaching profession who plays an important role in the learning process. Teachers carry out their roles not only as content or knowledge transmitters and being the only source in learning, but are required to be able to integrate digital technology into the learning process properly and wisely to facilitate students' learning and develop the potential that exists within students. This condition results in the need for new competencies related to digital technology, including interacting with digital technology (Ruiz, 2019; Tafazoli, 2019) which Krumsvik (2008) calls digital competence. This competence is understood as a set of capacities, knowledge and skills possessed by teachers to solve educational problems by integrating ICT (Hatlevik, 2018). This is important for a teacher to master in carrying out his profession, considering that integrating digital technology in learning is a demand and a necessity in the era of the industry. The demand for digital competence for the teaching profession adds to the complexity of a series of competencies that must be mastered.

Building technology skills and knowledge for teachers to support their profession as educators in interacting with new technologies that will appear in future classrooms has been continuously carried out. Even related to preparing teachers to be able to use digital technology effectively and productively in schools is a problem that has occurred for a long time (Guzman & Nussbaum, 2009; Sutton, 2011). Generally, this is only focused on improving teacher skills in using applications for education and various digital information or understanding an effective mix of pedagogics, content and knowledge (Falloon, 2020). So far, digital technology is seen as a supporting resource that is integrated into learning to improve learning outcomes. In teacher training and education programs for prospective teachers, these skills are presented separately as information that lacks context and only focuses on isolated technical skills in the hope of increasing teacher digital competence.

2.3. Teacher digital competency development model

Digital competence of teachers, as described above, has been described by many experts with various dimensions that support digital competence for the teaching profession. Departing from the digital competency framework which is then linked to the field of education, namely the profession as an educator or teacher, digital teacher competencies are born. Based on a search of various literature works, it is known that various frameworks are used to develop teacher digital competencies. The following will describe several concepts of the teacher digital competency framework that are used as the basis for development in this research.

2.3.1. Technological pedagogical content knowledge

Teachers in developing their professionals must master the nature of pedagogy along with the development of information technology which continues to grow rapidly. The development of professional competence in this case leads to 21st century pedagogic knowledge and skills. Teaching activities must be based on knowledge related to the material or content to be taught (content knowledge), knowledge of how to teach from the material or content known as pedagogic knowledge (pedagogy knowledge), and knowledge of various technologies used to support learning is called technological knowledge. The three components of knowledge are interrelated and interact so that they support one another. Traditional theory states that teaching requires knowledge of pedagogic content, while knowledge that only includes content knowledge is considered no longer relevant to be applied in the 21st century, where 21st century learning has faced various technological devices that are integrated in education, especially in teaching and learning activities. Teachers with students and between students themselves interact with various learning resources in a learning environment that is integrated with technology. Technology as a tool, process as well as a

learning resource that supports the learning process so that teachers are required to have digital competence. This competence is a framework used to analyse the ability of teachers to use technology in the learning process

2.3.2. Digital competence of educator

The digital competency framework known today is the Digital Competence of Educator (DigCompEdu) model. This digital model is widely used in Europe. This framework is also used as a reference for developing the digital competence of teachers in Indonesia. To better understand the digital competence of teachers, a digital competency framework for teachers for the European region was developed, known as DigCompEdu. This development aims to assist European countries in developing teacher digital competencies by creating innovations in education and contributing to the professional development of teachers.

3. Method and materials

3.1. Design

This study used a quasi-experimental research method with pre-test, post-test and follow-up designs. The sample in this study was divided into two groups, namely the experimental and control groups which were selected using a random sampling technique.

3.2. Participants

Participants in this study were teachers in elementary schools totaling 800 with a composition of 400 experimental class teachers and 400 control class teachers from 53 schools spread across the Yogyakarta area. The teachers involved are elementary school level teachers who are located in the Yogyakarta area, Indonesia and are under the coordination of the local Ministry of Education. The participating teachers come from elementary schools with various clusters and regions, ranging from rural and urban areas. The criteria for teachers who are allowed to participate are 1) have low digital competence, 2) teach at the elementary school level starting from grades 4 to 6, 3) are aged 25–60, 4) have a minimum education at the undergraduate level and 5) have experienced participate in the teaching profession training program. All teachers involved in this study met these criteria. This research was approved by the participating schools, participating teachers, and the local Department of Education.

The sociodemographic characteristics of the teachers who participated in this study are described in Table 1. The average age of the participating teachers was 35 years (SD = 0.7) with an age range of 25–60 years. The participants who participated were 10,500 with 45% male and 55% female. The research participants had homogeneous variable data and all participants had access to the use of the Internet at home and had basic knowledge of using computers and the Internet and there was no significant difference in ability. The majority of participants first got to know the Internet from their family members. In the variable of teacher characteristics, the control group knew the Internet earlier and had better Internet facilities than the experimental group.

Table 1
Sociodemographic Data of Participants

Component	Total participant program N = 800 N (%)	Treatment N = 400 N (%)	Control N = 400 N (%)	χ^2	p
Age	35.0 (0.7%)	35.6 (0.7%)	38.2 (0.7%)	0.87	0.613
Sex					
Male	300 (40.0%)	150 (40.0%)	150 (45.0%)	0.92	0.456
Female	500 (60.0%)	250 (60.0%)	250 (55.0%)		
School					
Village	350 (43.75%)	180 (45.0%)	190 (47.5%)	0.01	0.892

City	450 (56.25%)	220 (55.0%)	210 (52.5%)		
Availability of computer at home	792 (99.0%)	395 (98.75%)	392 (98.0%)	0.06	0.945
Access to Internet at home	800 (100.0%)	400 (100.0%)	400 (100.0%)	0.06	0.945
Place they used Internet for the first time					
Home	720 (90.0%)	260 (65.0%)	300 (75.0%)	9.8**	0.025
Relatives' or friends' house	40 (5.0%)	20 (5.0%)	40 (10.0%)		
School or library	40 (5.0%)	120 (30.0%)	60 (15.0%)		
Person who showed them how to use the Internet					
Relative	550 (68.75%)	300 (75.0%)	305 (76.25%)	10.5*	0.030
Friends	100 (12.5%)	55 (13.75%)	50 (12.5%)		
Instructor	130 (16.25%)	20 (5.0%)	20 (5.0%)		
Other	20 (2.5%)	25 (6.25%)	25 (6.25%)		

From the total number of teaching participants, five people did not take the assessment in the posttest phase (two people from the experimental class and three people from the control), three people did not take the follow-up test (two people from the experimental group and one person from the control group). So, there were only a few participants who did not take part in this session, almost 100% of the participants participated in all stages. It can be said that this assessment meets the criteria for interpretation and conclusions.

3.3. Research instruments

The research instrument used in this study was a questionnaire to obtain qualitative information about the characteristics of participants, Internet use and Internet access. Furthermore, closed and open questions to obtain information about the level of digital competence in the knowledge or conceptual aspects (20 items), procedural (20 items) and attitude aspects (20 items). Conversion scores on each aspect are conceptual aspects (0–10), procedural aspects (0–10) and attitude aspects (0–10). The validity of the instrument was tested through empirical tests which were tested on other participants by producing an internal consistency value of 0.80. The level of instrument reliability was tested through expert judgment with doctoral qualification experts in the field of digital literacy. The results of the validity and reliability test showed that the instrument met the criteria. The correlation value between the instruments of the three assessed aspects shows 0.10–0.30 so that the three aspects are independent variables. Therefore, it can be concluded that the instrument made meets the criteria for use. Implementation of the program lasts for one semester or 6 months. The assessment was carried out in the pretest, posttest and follow-up phases.

3.4. Digital competency training program intervention

The training program lasts for 6 months with four sessions each month. Each session lasts for 2 hours with the main objective of increasing the digital competence of teachers in terms of knowledge or conceptual, procedural, and attitude. This training program in addition to improving the digital competence of teachers can prevent negative behavior in using the Internet as well. During these four sessions, the program focuses on developing digital skills and competencies in accessing the Internet. The program is filled with various activities and techniques such as the provision of materials, discussions, videos, simulations, and others. Each session in the program pays attention to aspects of a) the presentation of thematic material to achieve general and specific objectives, b) special activities are aimed at obtaining specific competencies in each session and c) each session ends with a discussion. The first session focused on increasing awareness of using the Internet, its characteristics, advantages and disadvantages, in the second session, the program focused on providing basic and applicable digital competencies, forming personal digital identities on the

Internet, and several concepts related to digital identity. In the third session, the program focuses on cyberbullying on the Internet. In the fourth session, a review of all the material presented in sessions 1–3 was carried out. The purpose of this training program is to increase the awareness of teachers in preventing cyberbullying both against themselves and their students, which includes how to prevent it, the consequences, and how to deal with it. The components of the teacher digital competency training intervention program are listed in Table 2.

Table 2

Summary of Intervention Programs

Session	Purposes	Materials
1 Awareness in using the Internet, characteristics, advantages and disadvantages of using the Internet.	Development of teacher awareness in using ICT in supporting the learning process	Awareness of teachers in using ICT appropriately and not, as well as the benefits and consequences is increasing.
	Understand the benefits of using ICT well and the consequences of its misuse	
2 The concept of digital identity and enhancing the reputation and privacy of teachers in the digital world	Increase awareness of personal identity formation through ICT	Personal digital identity concept
	Understand how to create a good digital personal identity	Concepts of visibility, reputation and privacy in the digital world
	Know the advantages of using ICT in the learning process	Tools and procedures to avoid digital risks
3 Understand the concept of bullying and cyberbullying, the correct criteria for using the Internet	Can understand the concept of bullying and cyberbullying, how to avoid it and the consequences when doing it	Basic concepts of bullying and cyberbullying
	Can encourage students to participate in discussions on the appropriate use of ICT	Cyberbullying behavior criteria concept
	Can analyse the risks of using ICT when it is used to carry out cyberbullying	Strategies in responding or responding to cyberbullying
	Develop respect, empathy and prosocial behavior among other teachers	
	Improve the ability of teachers to understand, control, and manage themselves and students in the context of digital interactions	

3.5. Procedure

This study begins with collecting sociodemographic data on teaching participants in elementary schools from various regions in the Yogyakarta area. After the demographic data were obtained, then a pretest was carried out to determine the teacher's initial digital abilities by paying attention to three aspects, namely knowledge, procedural, and attitudes. After the initial ability data is known, the competency training intervention program is carried out in the experimental group. The control group did not receive the intervention, but continued to take the next test. After the intervention in the experimental group, the researchers conducted a posttest to study the effectiveness of the digital competency training program. This research involved educational psychologists and experts in the field of digital literacy. After the posttest, a few weeks later a follow-up test was conducted to measure whether there was a change after receiving the intervention. Follow-up tests are carried out to maintain the validity of the teacher's digital ability improvement.

3.6. Data analysis

Data analysis was carried out using the Statistical Package for the Social Sciences program. Data analysis performed included descriptive analysis, comparative analysis, *t*-test, analysis of variance (ANOVA) and effect size of program interventions. Descriptive analysis was conducted to investigate the characteristics of the participants involved. This analysis includes mean, percentage and standard deviation. Group comparison analysis was performed through the chi-square test on each variable category. *T*-test was conducted to see the level of effectiveness. ANOVA was conducted to assess changes in the improvement of each group's ability in three aspects of the assessment, namely knowledge or conceptual, procedural and attitude. Effect size analysis was conducted to determine the effect size of the program in each phase (pretest, posttest and follow-up).

4. Results

4.1. Effect of digital competency training program on digital competence conceptual and procedural aspects

Based on the results of the intervention, there was a significant difference between the digital ability scores in the experimental and control groups. In the conceptual and procedural aspects of the digital competency training program, the focus is on increasing awareness of using the Internet, its characteristics, advantages and disadvantages, providing basic and applicable digital competencies, forming a personal digital identity on the Internet, and several concepts related to digital identity. After the intervention, the average ability of the teachers in the experimental group showed a significant increase compared to the control group in all variables studied, both at the end of the intervention session and in the follow-up phase. The literacy level of digital competence in conceptual and procedural aspects is listed in Table 3.

Table 3

Digital Competency Level (Conceptual and Procedural)

Conceptual digital literacy knowledge level	Experimental $N = 400$ N (%)	Control $N = 400$ N (%)	χ^2	p
Digital media				
Pre	240 (60.0%)	220 (55.0%)	0.15	0.532
Post	385 (96.0%)	310 (77.5%)	8.2	0.012
Follow-up	390 (97.5%)	200 (50.0%)	5.4	0.040
Digital media profile				
Pre	152 (38.0%)	124 (31.0%)	0.8	0.514
Post	280 (70.0%)	267 (66.8%)	5.7	0.048
Follow-up	295 (73.0%)	280 (70.0%)	5.8	0.045

Cyberbullying concept				
Pre	80 (20.0%)	45 (11.3%)	0.08	0.978
Post	260 (65.0%)	159 (39.7%)	95.6	0.005
Follow-up	180 (45.0%)	200 (50.0%)	20.9	0.008
Identity of digital				
Pre	35 (8.7%)	12 (3.0%)	15.8	0.007
Post	130 (33.7%)	80 (20.0%)	72.3	0.003
Follow-up	150 (37.5%)	130 (32.5%)	56.7	0.004
Internet visibility				
Pre	10 (–)	15 (1.2%)	3.4	0.240
Post	50 (8.3%)	30 (3.6%)	4.6	0.071
Follow-up	60 (25.5%)	50 (4.6%)	32.5	0.005
Internet privacy				
Pre	120 (30.0%)	70 (17.5%)	3.9	0.654
Post	278 (70.5%)	90 (22.5%)	54.7	0.008
Follow-up	200 (50.0%)	170 (42.5%)	8.9	0.040
Identity false on the Internet				
Pre	251 (62.8%)	220 (55.0%)	0.7	0.865
Post	378 (94.5%)	280 (70.0%)	46.5	0.008
Follow-up	280 (70.0%)	258 (64.5%)	7.10	0.056

Table 4
Total Score of Conceptual Digital Competence

	Experiment N = 400 X (SD)	Control N = 400 X (SD)	t	p
Total score				
Pre	3.5 (2.6)	3.1 (2.1)	0.8	0.869
Post	7.9 (5.6)	3.6 (2.6)	10.9	0.005
Follow-up	6.8 (4.3)	4.5 (2.7)	6.8	0.005

Table 5
Digital Procedural Competency Level

Knowledge level of procedural digital competence	Experiment N = 400 N (%)	Control N = 400 N (%)	χ^2	p
Impose privacy restrictions				
Pre	120 (30.5%)	98 (24.5%)	0.5	0.986
Post	210 (52.5%)	125 (31.3%)	50.6	0.005
Follow-up	115 (28.8%)	140 (35.0%)	7.6	0.060
Response got a negative message				
Pre	210 (52.5%)	280 (70.0%)	0.6	0.856
Post	385 (96.4%)	220 (57.5%)	30.8	0.005
Follow-up	360 (90.0%)	270 (67.5%)	0.6	0.786
Reject evil messages				
Pre	130 (32.0%)	115 (28.7%)	0.6	0.784
Post	260 (65.0%)	235 (58.7%)	40.6	0.000
Follow-up	180 (45.0%)	225 (56.2%)	3.8	0.297
Can set privacy on social media				
Pre	194 (48.5%)	120 (30.0%)	0.5	0.978
Post	289 (72.3%)	115 (28.8%)	55.8	0.005
Follow-up	265 (66.3%)	231 (57.8%)	8.4	0.035

Table 6

Total Score of Procedural Digital Competence

	Experimental group N = 400 X (SD)	Control group N = 400 X (SD)	t	p
Total score				
Pre	2.9 (2.8)	3.8 (2.8)	0.8	0.976
Post	7.9 (3.6)	3.7 (2.6)	8.9	0.000
Follow-up	6.8 (3.8)	6.9 (2.9)	6.5	0.078

4.2. The influence of the digital competency training program on the attitude aspect of digital competence

The increase in digital competence in the aspect of attitude can be seen in Table 6. The experimental and control groups had homogeneous characteristics on all variables prior to the implementation of treatment through a digital competency training program. Improvements were seen in the posttest and follow-up phases after the teacher joined the intervention program. This increase in digital competence in the aspect of attitude can be seen from the significant difference between the two groups before and after the intervention program was implemented. The experimental group showed a significant increase in the digital competence of the attitude aspect compared to the control group. To find out more about the effect of the intervention program, ANOVA and effect sizes were conducted. From the test results, it was found that every aspect of digital competence, both conceptual, procedural, and attitude showed a significant increase, especially in the conceptual and procedural aspects. The effect size of the program intervention results for one semester (6 months) has a significant impact on increasing digital competence. The largest effect size was obtained by the conceptual and procedural aspects in the pretest to posttest and pretest to follow-up phases. This proves that the digital competency training program is effective in improving the digital competence of teachers in every conceptual, procedural, and attitudinal aspect.

Table 7

Level of Attitude Digital Competence

Variables	Experiment N = 400 N (%)	Control N = 400 N (%)	χ^2	p
The dangers of the Internet				
Pre	360 (90.0%)	347 (86.0%)	0.8	0.985
Post	380 (95.0%)	356 (88.0%)	0	0.887
Follow-up	370 (92.5%)	325 (81.3%)	6.8	0.036
Dependence on the Internet				
Pre	358 (89.5%)	348 (88.0%)	0.6	0.989
Post	396 (99.0%)	368 (92.0%)	21.5	0.005
Follow-up	378 (94.5%)	360 (90.0%)	0.6	0.786
Internet bullying response				
Pre	230 (57.5%)	190 (47.5%)	4.8	0.478
Post	278 (70.0%)	235 (58.8%)	9.6	0.010
Follow-up	345 (86.3%)	276 (69.0%)	0.8	0.839
Permission to access and post information on the Internet				
Pre	312 (78.0%)	325 (81.3%)	0.9	0.657

Post	367 (92.7%)	376 (94.0%)	7.8	0.040
Follow-up	187 (46.7%)	258 (65.0%)	4.8	0.097
Make sure friends on the Internet are friends in the real world				
Pre	207 (51.7%)	211 (60.0%)	0.8	0.675
Post	160 (40.0%)	221 (53.0%)	9.5	0.045
Follow-up	187 (46.7%)	190 (47.5%)	8.6	0.056
Reporting if you have problems in the digital world				
Pre	145 (36.6%)	110 (27.5%)	7.8	0.564
Post	198 (49.5%)	98 (24.5%)	21.5	0.005
Follow-up	200 (50.0%)	125 (32.0%)	11.6	0.005
How to build your own reputation through the Internet				
Pre	70 (17.5%)	45 (12.0%)	0.10	0.687
Post	168 (42.0%)	80 (20.0%)	11.8	0.005
Follow-up	153 (38.3%)	67 (16.5%)	15.7	0.000
The risk of posting wrong or unauthorised information on the Internet				
Pre	210 (52.5%)	280 (70.0%)	0.6	0.856
Post	385 (96.4%)	220 (57.5%)	30.8	0.005
Follow-up	360 (90.0%)	270 (67.5%)	0.6	0.786
Etiquette of sending messages on the Internet				
Pre	251 (62.8%)	220 (55.0%)	0.7	0.865
Post	378 (94.5%)	280 (70.0%)	46.5	0.008
Follow-up	280 (70.0%)	258 (64.5%)	7.10	0.056

Table 8
Total Score of Attitude Digital Competence

	Experiment N = 400 X (SD)	Control N = 400 X (SD)	t	p
Total score				
Pre	5.8 (2.6)	5.7 (2.6)	2.4	0.354
Post	6.8 (2.8)	5.6 (2.8)	7.5	0.002
Follow-up	6.9 (3.5)	6.8 (2.5)	2.4	0.487

Table 9
ANOVA Test Results and Effect Size

Aspect of digital competence	ANOVA F	p	Post-hoc	p	Effect size (d) Pre-Post	Pre-Follow-up	Post-Follow-up
Conceptual	125.7	0.000	Pre < Post	0.000	2.56	2.23	0.06
Experimental	14.43	0.000	Pre < Foll.	0.000	0.23	0.53	0.40
Control			Pre < Foll.	0.000			
			Post < Foll.	0.001			
Procedural	70.5	0.000	Pre < Post	0.000	0.89	0.70	0.21
Experimental	35.7	0.000	Pre < Foll.	0.000	0.08	0.50	0.50
Control			Pre < Foll.	0.000			
			Post < Foll.	0.000			
Attitudinal	20.6	0.000	Pre < Post	0.000	0.31	0.45	0.34
Experimental	8.4	0.003	Pre < Foll.	0.006	0.10	0.40	0.40
Control			Pre < Foll.	0.004			

Post < Foll.	0.023

5. Discussion

This research reveals that the program's digital competence can be improved through the design of a digital competency training program in three aspects, namely conceptual, procedural, and attitude. This program is carried out for one semester with a duration of 6 months which each month consists of four sessions. Homogeneous participants are involved in participating in this program so that the results of the intervention can be seen objectively (Hadianto et al., 2021a; Undheim & Jernes, 2020; Xu et al., 2019). All participants have access to use the Internet and have computer equipment, both experimental and control groups. This homogeneity of ability and socio-demography is done so that there are no gaps. This digital competency training program is able to improve the ability of teachers to use computer devices and access the Internet to obtain information. Teachers' skills in using digital devices are seen from three aspects of mastery of knowledge or conceptual, procedural, and attitude. Knowledge and procedural aspects include basic knowledge of digital competencies such as the concept of Internet networks, Internet profiles, Internet crime, digital identity, digital privacy, the ability to access the Internet, the use of several application devices that support the learning process, and the formation of self-identity in the digital world (Gudmundsdottir & Hatlevik, 2018; Hatlevik, 2017; McGarr & McDonagh, 2021). Attitude aspects include knowledge of the advantages and disadvantages of digitisation, avoiding digitalisation dependence, avoiding digitalisation crimes, utilising digital in the learning process.

Technological advances in the current era encourage teachers to adapt to existing conditions. Most students in schools already have a fairly high level of digital literacy compared to their teachers. Based on observations, teachers who started their careers in the digital era have fairly good digital skills, but teachers who have started careers before the digital era do not yet have sufficient digital competence. This is the cause of the classical learning process (Castaño Muñoz et al., 2021; Del-Moral-Pérez et al., 2019). The learning process that does not optimise digitisation in the learning process makes the learning process hampered and less effective in facilitating students to achieve learning goals. This is in accordance with the theory that the learning process will be of higher quality if it is supported by learning tools and digital competence of teachers, especially in accessing and using information, and managing classes (Pozo-Sánchez et al., 2020; Tusiime et al., 2020). Based on these conditions, currently several schools are carrying out various efforts to improve the digital skills of teachers who are lacking. One of them is a digital competency training program designed by researchers that broadly targets digital competence in three aspects, namely knowledge (conceptual), procedural, and attitude.

Based on the results of the research, digital competence in conceptual and procedural aspects is the most significant competency that has increased from the results of the training program intervention. This is because these two aspects can be trained in a fairly short time compared to training attitudes. Knowledge and procedural aspects of digital competence can be trained through presentations, discussions, and simulations, while the attitude aspect takes longer to form habits. Teachers who have low digital competence tend to be most of them not knowing how to behave in using these digital devices. The knowledge and procedural aspects seem significant, especially in the competence of basic understanding of digitalisation and the competencies in using tools that can help the teacher to manage the class better (Hatlevik, 2017; Thompson et al., 2019). Digital competence in the aspect of knowledge and attitude strongly supports the role of teachers in improving the quality of the learning process, while digital competence in the aspect of attitude strongly supports the role of teachers outside of school, especially in dealing with various digital crimes, maintaining, and improving the digital reputation of teachers in the school environment and at the same time. in their community(Spiteri & Chang Rundgren, 2017; Yilmaz & Siğirtmaç, 2020).

Attitude aspects that experienced a significant increase were attitudes in dealing with digital threats and managing digital privacy. From the results of the intervention, the experimental group experienced a significant increase in this aspect of attitude. However, some teachers have quite good

abilities in the attitude aspect even though they do not participate in the intervention. This is related to the participants' habits in using digital devices. In addition, another attitude aspect that shows improvement is permission to access information or use it as material for the learning process. Some aspects of this attitude are obtained from the teaching profession training education from the government which was previously attended by some teachers (Hatlevik, 2017; Kildan & Incikabi, 2015; Palaiologou, 2016). In addition, teachers also show increased awareness in notifying others when there is an abuse of a teacher's digital identity. Overall, this digital competency training intervention program is very helpful for teachers in improving their digital competencies in order to improve self-quality which will have an impact on the quality of the learning process and the competence of students who learn.

6. Conclusion, limitation, and recommendation

Based on the results of the study, it can be concluded that this digital competency training program is effective in improving the digital competence of teachers in three aspects, namely knowledge or conceptual aspects, procedural, and digital aspects. This increase can be seen from the increase in knowledge of basic digital concepts, the ability to access information, use and operate several computer applications and devices for a smooth learning process, and attitudes in preventing digital violations and dealing with various digital crime situations. This study has several limitations including, the participants of the training program are not broad enough to reach from various regions in Indonesia, participants are only centered on teachers who are in one city, do not involve gender variables in research that might affect the level of mastery of digital competencies, especially in the aspect of attitude, the limited duration of the research which does not comprehensively look at the aspect of attitude, and an analysis that focuses on quantitative analysis which allows the data to be obtained to be less comprehensive. Based on the limitations of the study, the researcher recommends that further research pays attention to gender variables that may show different effects of the program, a wider sample involving teachers from various geographies in Indonesia, a longer duration of program intervention, longitudinal studies are needed to look at digital competence aspects. attitudes, especially on problematic behavior and its consequences, a deeper qualitative analysis is needed, not only quantitative analysis so that the data obtained is more comprehensive. Recommendations for stakeholders in improving the digital competence of teachers are that a training program should be held to improve digital competence on a regular basis for teachers at every school level and reach disadvantaged areas. In addition, the policy of the emergence of digital competency mastery qualifications for teachers can encourage teachers to improve their abilities in the field of digitalisation to support the learning process. Principals can equip schools with digital facilities that support the educational process.

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