AL IBTIDA: JURNAL PENDIDIKAN GURU MI (2020) Vol 7 (1) : 1-18
DOI: http://dx.doi.org/ 10.24235/al.ibtida.snj.v7i1.6088

Al Ibtida: Jurnal Pendidikan Guru MI
ISSN: 2442-5133, e-ISSN: 2527-7227
Journal homepage: http://syekhnurjati.ac.id/jurnal/index.php/ibtida
Journal email: alibtida@syekhnurjati.ac.id

Elementary School Teachers' Perceptions of Digital Technology Based Learning in the 21st Century: Promoting Digital Technology as the Proponent Learning Tools

Miftahul Jannah*
*Department of Basic Education, Postgraduate Program,
Universitas Negeri Yogyakarta, Indonesia
Email: miftahuljannah.2018@student.uny.ac.id

Lantip Diat Prasojo**
**Department of Education Management, Postgraduate Program,
Universitas Negeri Yogyakarta, Indonesia
Email: lantip@uny.ac.id

Mohammad Adam Jerusalem***
***Department of Basic Education, Postgraduate Program,
Universitas Negeri Yogyakarta, Indonesia
Email: adam_jerusalem@uny.ac.id

Received: February 21th, 2020. Accepted: April 01th, 2020. Published: June 07th, 2020.

Abstract

This study aims to identify elementary school teachers' perceptions of digital based learning in the 21st century. Data of this phenomenological qualitative study were collected through interviews with ten teachers in the Special Region of Yogyakarta, and the validity was tested using source triangulation techniques. The data analysis used descriptive data analysis techniques, including data condensation, data display, and drawing conclusion. The results show that teachers consider digital integration in elementary schools to bring positive changes, both in the process and student learning outcomes. It is proven by student responses in the form of increased motivation, activity, enthusiasm, and critical thinking skills. The findings confirm two things. First, the main factor for the success of digital based learning does not depend on the availability of digital equipments, rather in the competence of the teachers (digital skills, creative thinking, and communication skills). Second, teachers in schools with digital technology infrastructure have better performance in implementing digital based learning than those without the infrastructure. This study has implications for the development trends of the competencies of elementary school teachers. Apparently, digital literacy needs special attention in the development of four teacher competencies. Therefore, teachers can keep up with the era and the tendencies of student characteristics.

Keywords: *teachers' perception, digital technology, 21st century learning*.

Abstrak

Penelitian ini bertujuan untuk mengidentifikasi persepsi guru sekolah dasar (SD) tentang pembelajaran berbasis digital abad 21. Data dalam penelitian kualitatif jenis fenomenologi ini dikumpulkan melalui wawancara kepada 10 guru di Daerah Istimewa Yogykarta (DIY) dan diuji keabsahannya melalui teknik triangulasi sumber. Analisis data menggunakan teknik analisis data deskriptif, yang meliputi kondensasi data, penampilan data, dan penarikan kesimpulan. Hasil analisis data menunjukkan bahwa guru menganggap integrasi digital di sekolah dasar membawa perubahan positif, baik dalam proses maupun hasil belajar siswa. Ini dibuktikan oleh respon siswa, berupa peningkatan motivasi, aktivitas, antusiasme, dan keterampilan berpikir kritis. Temuan penelitian ini menegaskan dua hal. Pertama, faktor kunci keberhasilan pembelajaran berbasis digital bukan terletak pada ketersediaan peralatan digital, melainkan pada kompetensi guru (keterampilan digital, pemikiran kreatif, dan keterampilan komunikasi). Kedua, guru di sekolah dengan infrastruktur teknologi digital mempunyai kinerja yang lebih baik dalam melaksanakan pembelajaran berbasis digital daripada guru sekolah tanpa infrastruktur teknologi digital. Penelitian ini berimplikasi terhadap tren pengembangan kompetensi guru SD. Literasi digital pada akhirnya perlu mendapatkan perhatian khusus dalam pengembangan empat kompetensi guru, agar guru mampu mengimbangi perkembangan zaman maupun kecenderungan karakteristik siswa.

Kata kunci: *persepsi guru, teknologi digital, pembelajaran abad 21*.

INTRODUCTION

Digital technology and information advances nowadays have implications for learning patterns in schools. The emergence of digital based learning innovations, such as e-learning, virtual classes, game-based learning, interactive multimedia, computer-based learning, and so on fosters student's independent learning. Learning is not only limited by classroom partitions and time, but can browse information online through computers and smartphones, so that the 21st century demands innovation in the learning process (Wahyudi, 2019). There are many things unexplored by the global community related to the position of digital technology in the eyes of educators and education stakeholders. Some elementary school level studies in Indonesia notes that learning has been equipped with digital based facilities, including computers and the internet, but not all levels integrate digital based learning because some teachers only use it as an administrative function (Mundy, Kupczynski, & Kee, 2012).

Current learning patterns illustrate that not all teachers apply digital based learning in the classroom. Some study results mention the integration of digital technology in learning has obstacles, in which teachers are not able to utilize digital technology in the classroom due to lack of knowledge, skills, training, self-confidence, and limited facilities (Amuko & Miheso-O'Connor, 2015; Hadriana, 2017; Mirzajani, Mahmud, Ayub, & Luan, 2015). Factors causing the low utilization of digital technology in learning are computer self-efficacy, computer and information technology support, teachers' teaching experience, pedagogical

skills and practices, and the development of teachers' professional abilities in integrating digital technology in learning (Gilakjani, 2013). A study shows that the utilization of digital technology by teachers is still low and teachers do not have good self-confidence in using digital technology, thus indicating the lack of teachers' experience about technology (Hassan & Sajid, 2013).

Digital based learning can provide an interesting and enjoyable learning atmosphere, so students are active and obtain meaningful messages. The main benefits of digital based learning is overcoming learning problems and facilitating learning activities (Beetham & Sharpe, 2013). Another benefit is to make learning easier and more practical, especially in the 21st century, in which learning orientation does not only develop academic abilities, but also independent learning abilities (Alwan, 2017; Tang & Chaw, 2016). More specifically, the utilization of technology provides greater opportunities for students in the process of building the knowledge and skills needed in the 21st century (Januarisman & Ghufron, 2016).

Digital based learning with various interactive visualizations and simulations has an impact on improving the quality of learning in terms of students' motivation and creativity (Gynther, 2016). Besides, the presence of digital devices must be collaborated with users, including teachers and students, who aim to improve the quality of learning, interaction, and students' participation (Asoodar, Vaezi, & Izanloo, 2016). Digital technology contributes to increase students' involvement in cognitive and intellectual understanding (Costley & Kevin, 2014). Based on the theory that students can respond positively to digital technology and build their motivation to learn, teachers must carry out activities that utilize technology and are aware of creating technology-based media (Granito & Chernobilsky, 2012).

Therefore, it is necessary to understand teachers' perceptions of digital technology-based learning as the basis for finding solutions to problems in the use of digital technology. Perception of digital technology has a very important role because it is a component of the formation of cognition related to human knowledge of technology (Al-Awidi & Aldhafeeri, 2017). Teachers' perception of digital technology is crucial as it is the main determinant of the successful integration of digital technology in the learning process because it can help wise and effective decision-making in integrating digital into learning (Qasem & Viswanathappa, 2016). To find out the motivation of teachers in implementing digital technology in the learning process, it is very important to explore and identify teachers' perceptions to determine policies to achieve educational goals.

The results of previous studies show that the positive teachers' perception of digital technology can influence the learning process and motivate teachers in creating digital based

learning resources (Dopo & Ismaniati, 2016). Thus, an understanding of technology and information is the initial foundation for integrating technology into learning (Ghavifekr et al., 2014). A world problem that occurs between developed and developing countries is that developed countries analyze artificial intelligence and how to implement it in the educational circumstances, while developing countries are still analyzing technological facilities, such as those found in classrooms (Skenderi & Skenderi, 2017).

The success of integrating digital technology in elementary schools largely depends on the role of the teacher. The teacher needs to apply it effectively in the classroom because it can provide many benefits. However, adopting digital technology is a big challenge for teachers in many countries (Kurt, 2010). A study conducted in Malaysia shows that all elementary school teachers are provided with basic training on the use of computers and the internet through courses and various training workshops (Hoque, Razak, & Zohora, 2012). Schools in Malaysia facilitate the development of information and the use of digital technology for students according to their professional level (Kim, Choi, Han, & So, 2012). Hence, a recent study reports that teachers in Malaysia generally have the readiness to integrate digital technology (Singh & Hussein, 2014). The use of technology can contribute to improving the quality of education (Bettaz, 2015). This indicates the high level of technology literacy in the ability and competence of teachers in Malaysian schools.

Other research findings of teachers' perceptions of digital based learning show that applying technology can motivate teachers to improve the quality of learning, professionalism, and creativity, such as creating presentation material that contains images, power points, animations, and videos (Fatimah, 2017). A study conducted by Quaicoe & Pata (2017) about the perspective of elementary school teachers on digital based teaching and learning in Ghana shows that the factors of digital culture and attitudes have an impact on the digital based activities done by teachers.

In Indonesia, the readiness of educators to utilize and integrate technology in the learning process is still a big problem today. The global gap requires an identification to find innovative solutions and new policies related to the use of digital technology in the learning process (Haryanto et al., 2018). This study is motivated by the limitations of previous studies. This study carries out further development by examining teachers' perceptions to find other factors that become major problems in the readiness of teachers to use digital technology as a source of new learning. This study seeks to contribute in the form of innovative ideas and policies to employ the development of digital technology in the 21st century. Although there are quite several studies that examine teachers' perceptions in the use of digital technology in

learning, the focus of the studies is in urban areas (Al-Munawwarah, 2014; Kristianto, 2017; Pramana, 2018).

This study fills the gap by expanding to one province, including cities and districts, both modern and peripheral schools in the Special Region of Yogyakarta. The objective of this study is to identify, explore, and describe issues related to the use of digital based technology in elementary schools in the Special Region of Yogyakarta. Through this study, it is expected to know the teachers' perceptions regarding digital based learning to answer the big problems that still occur in the educational environment in Indonesia. The purpose is that researchers get detailed information so that the results of this study contribute to improving the quality of education and creating effective learning innovations and discovering the results of the mindset of educators as people who design learning.

METHODS

The method used in this study is qualitative research. The type of research used is phenomenology, which is identifying elementary school teachers' perceptions of digital technology-based learning in the 21st century. The research subjects were 10 elementary school teachers in Sleman, Bantul, and Yogyakarta. The sample selection was done by purposive sampling, which was choosing class teachers who teach at grade 1-6. The selection of respondents was not limited by age or length of work. The study was conducted at public and private schools located in cities and districts. Data collection techniques used interview guidelines with instruments adopted from ICT-enhanced Teacher Standards for Africa (ICTeTSA) (UNESCO, 2012). The variable items consist of 20 composite variables. The instrument consists of 4 aspects: (1) Instructional Design Process, (2) Creating and Managing Effective Learning Environments, (3) Facilitating and Inspiring Learning, Innovation, and Creativity, and (4) Learning Assessment and Communication. The interview technique was intended to make the research subjects describe personal information in more detail (Creswell, 2012).

The data analysis techniques used were data condensation, data display, and drawing conclusion. The validity test of the data used source triangulation (Miles, Huberman, & Saldana, 2014). The data condensation was carried out to classify the results of interviews into data tables to find answers from each respondent. The data display was done to present the results of identifying four aspects related to digital based learning. The conclusion was drawn to determine the final results of the research questions from the discussion related to the integration of digital technology in learning in elementary schools based on teachers' perceptions. The identification was done to find the teachers' perception whether digital based

learning has been implemented well or digital technology is actually needed by elementary school teachers. In this study, the teachers were allowed to express constructive views and claims in the form of opinions, facts, expectations, and targets to be achieved in their perceptions.

RESULTS AND DISCUSSION

Teachers' Perceptions Regarding the Instructional Design Process in Integrating Digital Technology in Learning

Teachers' perceptions of the ability to integrate digital technology and the learning material can be observed from their pedagogical knowledge. Pedagogical knowledge in the use of digital devices in planning and implementing learning is needed by the teacher. Based on the results of interviews, it obtained that 8 out of 10 teachers have known about digital technology, that is everything related to Information and Communication Technology (ICT) in the form of computer hardware, hand phones, electronic devices, internet networks, applications, and social media that provide the speed of information. Ten teachers said that the schools have digital based technology facilities such as computers, laptops, projectors, LCDs, mobile phones (if needed), multimedia, and internet networks.

Based on the various perceptions expressed by the teachers, the implementation of digital technology is very supportive for the teachers in designing the learning process, including the phase of preparing the material, presenting the material, and administering the results of the assessment. The following is an excerpt from the statement of 4 teachers: Teacher A said, "The development of the material also uses the PowerPoint Presentation and Learning CDs if time allows". Teacher B said, "There is also a positive impact from digital technology, for example, making me easier for my administration in making lesson plans and designing materials, sometimes the internet is also a relevant source for finding the material I need".

Related to its implementation, all teachers use computers or laptops in planning and learning in class ranging from grades 1-6. For internet access, almost all schools have been able to access the internet if the authority is given to teachers and not students. Teacher C also explained regarding the use of applications and learning videos, even using multimedia once a month, in which the students do moving class in the laboratory. However, Teacher D emphasized that the use of digital technology depends only on the subject matter because it is needed to be understood that not all material can be digitalized".

The other three teachers show different results because they continue to use digital technology almost every day and every week. Thus, it can be concluded that in the learning

process and design of digital based instruction, the teachers have implemented learning by involving technology even though it adapts to time, material, and situation. The teachers utilize technology in compiling teaching materials, learning administration, and learning practices.

Teachers' Perceptions Regarding Creating and Managing an Effective Learning Environment Based on Awareness of Mastering Digital Based Technology

Evidences that indicate teachers have mastered digital technology include: teachers use digital based devices for planning and teaching, such as creating digital lesson plans; evaluating the learning activities; making PowerPoint Presentation; collecting videos, images, and animations; creating mini-cinemas using LCD projectors to introduce far away and unreachable material by students; teaches singing, dancing, and storytelling skills; giving assignments via email and WhatsApp; using Paint-Tool to draw and color digitally. Two teachers revealed that the presence of digital technology can manipulate the conditions of teachers who are less skilled, for example, teachers who cannot sing or dance can display songs via digital video technology and LCD screens, how to sing well, and how to dance well. Hence, it can be an alternative for the limitation of teachers' ability. To foster awareness of mastery of digital technology, the teachers revealed that they had attended training related to digital technology, such as: *rumah juara, rumah belajar*, training on creating PowerPoint Presentation, workshops and seminars on technology, training in creating Google drive, workshop in developing learning media based on the articulate storyline. However, some teachers have never done any training related to digital technology.

Regarding growing awareness or technological literacy for students, all teachers have tried to increase awareness of students to use technology through explanation and in-depth understanding of the advanced aspects of digital technology as a learning tool, because technological advances may not be able to limit children in using it, but the use of gadgets must be limited wisely and used at certain hours. Several teachers gave assignments for students to work with parents using mobile phones, but still under adult supervision; there are teachers who increased awareness by doing courses. Only 1 teacher does not provide technology awareness to students because it is limited to learning and is still teacher-centered.

Teachers' Perceptions Regarding Facilitating and Inspiring Learning, Innovation, and Creativity in Digital Based Learning Situations

The findings related to students' learning culture in digital based learning situations in schools can be a reference for teachers to improve the quality of digital use. Many positive impacts result from the use of digital technology. 10 teachers who teach in 10 different

schools, most of them revealed that by using digital technology in learning, it is fun and improves the quality of learning for students. The teachers said that the information obtained was faster and easier to be communicated with students' parents.

Table 1. Characteristics of Students' Learning Situations

The learning situations in using digital technology
Enthusiastic in learning
Excitement in taking lessons
Students finally study independently and in groups
Improving communication with other students
High students' curiosity
Fast response to digital stimuli
Students become active
Students are motivated to learn
More focused, increasing reading literacy
Culture to always observe, to ask questions, and analyze critically

Based on the results of data analysis obtained in the field, the learning situations in using digital technology shows several characteristics as shown in the table above, including: (1) Enthusiastic in learning; when digital technology was tried out in the learning process, then an assessment of processes was conducted, it turns out that the students showed high enthusiasm and they were happy when they were asked to find material on the internet even with the guidance of parents or teachers. The students were also more enthusiastic compared to when they did not use digital technology. (2) Excited in following the lessons; students looked very excited when the learning process presented videos or pictures and it showed the high desire of the students to learn. Illustrations on a computer have a positive impact on students by increasing their enthusiasm for interaction. (3) Students finally study independently and in groups; students independently searched for information by themselves through hand phone or computer technology, and what was presented on the screen was summarized by the students individually or in groups. So, the students who don't have technology can study together. (4) Improving communication with other students; one of the important factors in using web/e-learning was very beneficial, for example, the teachers or students could communicate with each other faster and easier. (5) High students' curiosity; by using the digital technology, the learning situations were more effective, the students had a curiosity in everything, for example, the teachers present an outline of the material, then the students wanted to understand deeper and find out more about the material. Moreover, the students' curiosity was also high.

The next point, (6) Fast response to digital stimuli; if something interesting was presented outside the students' expectations, then they would clap their hands and showed a good response, which was very different when they only learned from the books or other concrete media. (7) Students become active; there were interactive activities between digital based media with the students and they became active, enthusiastic, and the class atmosphere was lively. (8) Students are motivated to learn; because something interesting could bring up motivation and interest of the students so that it affected the learning outcomes, and they were motivated to improve their skills in producing works. (9) More focused and increasing reading literacy; by using the LCD, the students were more focused when reading together, but when they read the books individually, some read and some did not. (10) Culture to always observe, to ask questions, and analyze critically; the presentation of material using PowerPoint slides or animations and videos allowed the students to observe, analyze, ask questions, and communicate critically with other students. The application of high order thinking skills is also very supportive of the existence of digital technology for elementary school students.

The following is a summary of the results of interviews with several teachers. Teacher C has applied technology in all systems, including learning, administration, and evaluation. The teacher explained that he uses technology every day through lecture methods, gives group assignments, and they work together. Students are happy and enthusiastic. Teacher D said that students are more enthusiastic and happy when learning presenting videos or pictures, even though the schools do not explicitly implement digital based learning. Teacher E usually presents the material on the screen and students are asked for discussion, then evaluating at the end of the lesson. In another method, students are usually allowed to find material using hand phones during certain hours. Teacher F said that the material is presented on the LCD screen and supported collaborative and cooperative activities. Students' response shows that they are very happy and want to use digital continuously for learning. While teacher G gave the opinion that digital facilities become an obstacle so that it is not optimal in instilling understanding in students. The teacher uses the LCD if the higher grade does not use it, while the ability and resources of the teacher are very supportive in developing digital technology-based material. Teacher H said that he has managed it by displaying it on the screen, letting students search for information on the internet with the supervision and guidance of the teacher, presenting material not mastered by the teacher, such as how to sing well and how to dance properly. Similarly, teacher manages by displaying shows, and allows students to ask questions and comment. The form of practice undertaken by teacher J is to

provide assignments, such as creating learning video blog (vlogs), creating mind maps in digital form, and usually assigning group assignments to do digital game-based education. The use of e-learning is also done by moving class.

Table 2. Findings of Problems of the Study

Problems that arise in the use of digital technology
Less desire to read and write
Lack of socialization with others
Everything seems instant
Students become more individualistic
Excessive use affects emotions
Irregular time management
Laziness and no movement

The table 2 above illustrates other findings that there are some teachers' perceptions showing that the presence of digital technology in learning actually causes social and cultural problems in students. Once identified, the problem arises because of the lack of supervision and the lack of a wise attitude in using digital technology. Therefore, the teachers expect to improve the order of learning so that digital technology can be harmonized with students' lifestyle.

The teachers want to try to improve digital literacy while maintaining contextual norms and methods, so that the presence of digital technology in learning can be an alternative way to preparing students for the digital revolution 4.0. This finding can be a reference for educators in Indonesia to provide innovative ideas while considering heterogeneous student characteristics. The goal is that digital based learning is expected to accommodate various forms of students' characteristics and intelligence.

Teachers' Perceptions Regarding Learning Assessment and Communication in Integrating Digital Technology

On average, the answers of all teachers indicate that students can improve the process and learning outcomes when using digital based learning media. The results of teachers' perception can be seen from the table 3.

Table 3. Teachers' Perceptions of Digital Technology in Improving Learning Processes and Outcomes

No.	**Teacher's Name**	**Scoring Scale**		
		Cannot Improve	**Can Improve**	**Can Significantly Improve**
1	AN			√
2	SNR		√	
3	S		√	
4	N			√

5	DE	√
6	SK	√
7	TL	√
8	AM	√
9	JNS	√
10	NTW	√

Based on the table 3, it is clear that 80% of teachers assume that digital technology based learning can improve students' learning processes and outcomes. Even 20% conveyed that the improvement is significant, especially enthusiasm, motivation, and learning outcomes. Learning outcome increase because of children are happy and it is in line with their characteristics, even one teacher said that students do tutoring outside school hours using digital based technology, so that it affects students' test scores. Another finding shows a change in students due to the presence of digital based learning media. Besides, it can improve the skills in making product. Students have been able to think critically about a thing, since something interesting can foster motivation and interest of students in doing a task.

The various findings are summarized and discussed as follow, in which the implementation of digital based learning with various learning programs includes learning CDs, multimedia moving classes, material development via e-learning, PowerPoint Presentations, and digitizing material. According to the teachers, the whole program has proven influential in supporting the students' learning process and outcomes. Literature studies suggest that the use of technology in the classroom leads to an increase in students' achievement, closing the gap in students' achievement, and reducing the number of dropouts (Mundy et al., 2012).

The findings in this study are in line with the views examined in several previous studies in which the studies show the role and integrity of digital technology for students and teachers and the importance of integrating technology in learning (Asongu & Roux, 2017; Bornman, 2016; Tabira & Otieno, 2017). Porter & Graham (2016) in their study illustrate that the importance of using technology and information between teachers and students can develop ideas and notions available in digital form, can expand knowledge, and understand the language more sharply. The findings in this study are consistent with studies showing that the skills and abilities to use technology are necessary for the development of the 21st century (Koehler, Mishra, Kereluik, Chang, & Graham, 2014).

Competence of digital presence in learning, especially in elementary schools, is better to highlight the interests and put forward the uniqueness shown by students in the use of technology devices. In this case, a significant difference based on grade level becomes a comparison. It is clear that high-grade students outperform and master digital technology

better than low-grade students. While other studies found that girls outperform boys in the use of digital technology as a learning medium, especially in the form of stories (Del-Moral-Pérez, Villalustre-Martínez, & Neira-Piñeiro, 2019).

In general, some teachers believe that digital technology has contributed to the development of students' communicative skills. Also, it has the opportunity to use and develop their digital competencies as long as it has a positive impact. According to Thang, Lin, Mahmud, Ismail, & Zabidi (2014), in general, teachers recognize that digital technology provides benefits, both in its function as project support and as a complement in the classroom. However, teachers sometimes do not use technology in the classroom due to various factors.

A study by Munyengabe, Yiyi, Haiyan, & Hitimana (2017) recommends some elements to encourage positive attitudes towards digital technology, including: creating collaboration between teachers, recognizing teachers' competencies, involving teachers in planning school activities, and providing assistance in using digital technology pedagogically. After being implemented by other researchers, it shows that digital technology has encouraged collaboration activities between teachers in both low and high grades to work together. This has had a positive impact on the development of innovative culture with the integration of technology and elementary school communication (Del-Moral-Pérez, Villalustre-Martínez, & Neira-Piñeiro, 2016).

The results of the study state that many schools do not yet have the facilities and infrastructure to support the achievement of digital based learning. In addition, the presence of technology is important in learning, several findings in other studies indicate that the achievement of technology integration in learning and planning has requirements, such as: the need for adequate technological devices, adequate facilities and infrastructures, and human resources or teachers' skills who are qualified to integrate technology in the learning (Helm, 2015; Kumpel et al., 2015; Mbatha, 2016; Tarus, Gichoya, & Muumbo, 2015).

In resolving questions that are still a problem in education, the application of technology in learning should be integrated as a whole or adjusted to the conditions and availability of digital facilities and infrastructure. To be able to solve these problems, teachers with all innovative ideas can submit suggestions and requests to the government as the highest education stakeholders to be able to: (1) provide assistance in the form of technological and digital devices; (2) provide training for teachers to maximize the knowledge and skills needed in using digital technology; (3) increase socialization to improve the mindset of educators so that they are not only teaching for knowledge, but directing for

skills; and (4) prepare teachers relevant to 21st century skills by promoting cultural character and increasing digital literacy. The idea of innovation is supported by previous studies by Jaarsveldt & Wessels (2015); Muhametjanova & Çagiltay (2012); Shongwe (2015) that in improving the quality of teachers in developing countries, and preparing teachers relevant to developments in the information era, the government should rebuild the self-image of teachers and emphasize cultural order as a guideline to facing the information era.

As the teachers said in this study, the existence of digital technology can increase students' learning motivation and most students are active in learning. Therefore, UNESCO (2015) mention that technology can improve the quality of teaching and learning in schools, such as: (1) supporting basic skills; (2) increasing the active involvement of students and fostering motivation to learn; and (3) increasing teachers' resources and personal abilities, so that they can be directed to create student-centered learning methods. According to Gazi & Aksal (2017), technology and information devices in the form of computers, application software, multimedia, and learning videos that contain content of images, sounds and texts can be used to provide authentic challenges that can involve students in learning activities to increase learning motivation.

The results of the analysis explained above show that technology-based learning in the 21st century give benefits for students because they can develop knowledge and skills better. Therefore, the findings of this study confirm that the main factors for the success of digital based learning do not depend on the availability of digital devices, but on the competencies that must be achieved by the teachers, including: digital skills, creative thinking, and communication skills.

First, the teachers must be skilled in giving opportunities for the students to utilize technology and provide insight that digital devices are flexible media for certain situations. Sengül (2018) found that teachers are required to teach and train students with 21st century skills, and these skills are closely related to digital literacy competencies. According to him, students in the 21st century are very dependent on technology because they live together and learn a lot with technology. Thus, the teachers must have good digital skills competency as well as sufficient knowledge to train these skills for students. This is necessary so that the teaching process no longer depends on conventional lecture methods (Lemley, Schumacher, & Vesey, 2014).

Second, the teacher must have creative thinking. As it is known that teachers should be aware of the demands of the industrial revolution 4.0, teachers are expected to change their methods in teaching into ones that align students and technology to create innovations

(Hussin, 2018). Both competencies are in line with the results of the study conducted by Shafie, Majid, & Ismail (2019) that the professional development of educators through digital based technology training and literacy is very crucial to ensure that the quality of education of the students is improving. While communication skills are needed in order that digital based learning takes place collaboratively, so it creates interactions that support active communication (Carrió-Pastor & Skorczynska, 2015). This improvement in communication competency skills can be trained with the use of e-learning and multimedia. These have been vital media in improving students' communication skills with others, so students become more motivated. These competencies are required to be developed because the importance of technology-based learning is seen as a mediator among other factors in better teaching and learning (Vandeyar, 2015).

This study has implications for the establishment trends of elementary school teachers' competencies, including: digital skills, creative thinking, and communication skills. Digital literacy skills are apparently required to get special attention in developing four pedagogical teachers' competencies so that teachers can keep pace with the development of time and the tendency of students' characteristics. In this case, education stakeholders should show stability to schools to help develop the competencies that teachers must have in the 21st century. Contributions that could be made to realize the expectations of classroom teachers are underlining the importance of integrating digital technology in elementary schools learning. Thereby, the perfect collaboration between all educators, stakeholders, parents, and the parties of the education environment is needed. The main focuses is on innovations to improve teachers' competencies in Indonesia in encountering technological and information development (Del-Moral-Pérez et al., 2019).

CONCLUSION

The findings show that the major factor for the success of digital based learning does not depend on the availability of digital devices, but on the competencies that must be achieved by the teachers. Digital integration in elementary schools facilitates the teachers in planning and teaching. Technology devices have an impact on improving teacher performance in the implementation of digital based learning. This study recommends an idea of technological and pedagogical knowledge about digital based technology in learning. The results of this study have implications for the trend of developing competencies for elementary school teachers, in which teachers must have competence in terms of: 1) digital skills, 2) creative thinking, and 3) communication skills. Promoting those three competencies requires good cooperation to balance the four teachers' competencies pedagogically towards

the development of the 21st century and emphasizes the characteristics of students. It is expected that further studies can find digital based learning models following the skills needed, with the aim of introducing digital literacy in the world of education so that they can compete globally.

REFERENCES

Al-Awidi, H., & Aldhafeeri, F. (2017). Teachers' readiness to implement digital curriculum in Kuwaiti schools. *Journal of Information Technology Education*, *16*, 105–126.

Al-Munawwarah, S. F. (2014). Teachers' perceptions on the use of ICT in Indonesian EFL learning context. *English Review: Journal of English Education*, *3*(1), 70–80.

Alwan, M. (2017). Pengembangan model blended learning menggunakan aplikasi Edmodo untuk mata pelajaran geografi SMA. *Jurnal Inovasi Teknologi Pendidikan*, *4*(1), 65–76.

Amuko, S., & Miheso-O'Connor, M. (2015). Opportunities and challenges: Integration of ICT in teaching and learning Mathematics in secondary schools, Nairobi, Kenya. *Journal of Education and Practice*, *6*(24), 1–7.

Asongu, S. A., & Roux, S. L. (2017). nhancing ICT for inclusive human development in Sub-Saharan Africa. *Technological Forecasting and Social Change*, *118*, 44–54.

Asoodar, M., Vaezi, S., & Izanloo, B. (2016). Framework to improve e-learner satisfaction and further strengthen e-learning implementation. *Computers in Human Behavior*, *63*, 704–716.

Beetham, H., & Sharpe, R. (2013). *Designing for 21st Century Learning*. New York: Routledge.

Bettaz, M. (2015). No title transfering e-learning quality management practices in to face-to-face pedagogy. *The International Journal of E-Learning and Educational Technologies in the Digital Media*, *1*, 1–15.

Bornman, E. (2016). Information society and digital divide in South Africa: Results of longitudinal surveys. *Information, Communication & Society*, *19*(2), 264–278.

Carrió-Pastor, M. L., & Skorczynska, H. (2015). Collaborative learning and communication technologies in teaching business English. *Procedia - Social and Behavioral Sciences*, *178*, 32–37.

Costley, & Kevin. C. (2014). The positive effects of technology on teaching and student learning. In *Associate Professor of Curriculum & Instruction*. Arkansas Tech University.

Creswell, J. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitatif Research (Fourth Edition)*. Boston: Pearson.

Del-Moral-Pérez, M. E., Villalustre-Martínez, L., & Neira-Piñeiro, M. del R. (2016). Habilidades sociales y creativas promovidas con el dise~nocolaborativo de digital storytelling en el aula (Social and creative skills promoted with the collaborative design of digital storytelling in the classroom). *Digital Education Review*, *30*, 30–52.

Del-Moral-Pérez, M. E., Villalustre-Martínez, L., & Neira-Piñeiro, M. del R. (2019). Teachers' perception about the contribution of collaborative creation of digital storytelling to the communicative and digital competence in primary education

schoolchildren. *Computer Assisted Language Learning*, *32*(4), 342–365.

Delport, P. M. ., Solms, R. Von, & Gerber, M. (2016). Towards corporate governance of ICT in local government. *In IST-Africa Week Conference*, 1–9.

Dopo, F. B., & Ismaniati, C. (2016). Persepsi guru tentang digital natives, sumber belajar digital dan motivasi memanfaatkan sumber belajar digital. *Jurnal Inovasi Teknologi Pendidikan*, *3*(1), (13-24.

Fatimah, A. S. (2017). Teaching in 21st century: students-teachers' perceptions of technology use in the classroom. *Journal Of Linguistic And English Teaching*, *2*(2), 125.

Gazi, Z. A., & Aksal, F. A. (2017). Technology as mediation tool for improving teaching profession in higher education practices. *EURASIA Journal of Mathematics, Science & Technology*, *13*(3), 803–813.

Ghavifekr, S., Razak, A. Z. A., Ghani, M. F. A., Ran, N. Y., Meixi, Y., & Tengyue, Z. (2014). ICT integration in education: Incorporation for teaching & learning improvement. *The Malaysian Online Journal of Educational Technology*, *2*(2), 24–54.

Gilakjani, A. P. (2013). Factors contributing to teachers' use of computer technology in the classroom. *Universal Journal of Educational Research*, *1*(3), 262–267.

Granito, M., & Chernobilsky, E. (2012). The effect of technology on a student's motivation and knowledge retention. *NERA Conference Proceedings*, *17*.

Gynther, K. (2016). Design framework for an adaptive MOOC enhanced by blended learning: Supplementary training and personalized learning for teacher professional development. *The Electronic Journal of E-Learning*, *14*(1), 15–30.

Hadriana. (2017). *Analisis pemanfaatan teknologi informasi dan komunikasi (TIK) oleh guru-guru bahasa inggris SMAN pekanbaru*. Pekanbaru: Universitas Riau.

Haryanto, Suwarjo, Safruddin, C., Sujarwo, Wahyono, S. B., Dardiri, A., Maryatun, I. B. (2018). *Ilmu Pendidikan: Landasan Filosofis, Rujukan Teoretik, dan Terapannya*. Yogyakarta: UNY Press.

Hassan, T. ul, & Sajid, A. R. (2013). ICTs in learning: Problems faced by Pakistan. *Journal of Research and Reflections in Education*, *7*(1), 52–64.

Helm, F. (2015). The Practices and Challenges of Telecollaboration in Higher Education in Europe. *Language, Learning and Technology*, *19*(192), 197–217.

Hoque, K. E., Razak, A. Z. A., & Zohora, M. F. (2012). ICT utilization among teachers and principals in Malaysia. *International Journal of Academic Research in Progressive Education and Development*, *1*(4), 26–42.

Hussin, A. A. (2018). Education 4.0 Made Simple: Ideas For Teaching. *International Journal of Education and Literacy Studies*, *6*(3), 92–98.

Jaarsveldt, L. c Van, & Wessels, J. S. (2015). Information technology competence in undergraduate public administration curricula at South African universities. *International Review of Administrative Sciences*, *81*(2), 412–429.

Januarisman, E., & Ghufron, A. (2016). Pengembangan media pembelajaran berbasis web mata pelajaran ilmu pengetahuan alam untuk siswa kelas VII. *Jurnal Inovasi Teknologi Pendidikan*, *3*(2), 166–182.

Kim, H., Choi, H., Han, J., & So, H.-J. (2012). Enhancing teachers ICT capacity for the 21st century learning environment: Three cases of teacher education in Korea. *Australian Journal of Educational Technology*, *28*(6), 965–982.

Koehler, M., Mishra, P., Kereluik, K., Chang, T. S., & Graham, C. R. (2014). *Handbook of Research on Educational Communications and Technology*. New York: Springer Science & Business Media.

Kristianto, B. (2017). Factors affecting social network use by students in Indonesia. *Journal of Information Technology Education:Research*, *16*(1), 69–103.

Kumpel, E., Peletz, R., Bonham, M., Fay, A., Cock-Esteb, A., & Khush, R. (2015). When are mobile phones useful for water quality data collection? An analysis of data flows and ICT applications among regulated monitoring institutions in Sub-Saharan Africa. *International Journal of Environmental Research and Public HHalth*, *12*(9), 10846–10860.

Kurt, S. (2010). Technology use in elementary education in Turkey: A case study. *New Horizons in Education*, *58*(1), 65–76.

Lemley, J. B., Schumacher, G., & Vesey, W. (2014). What Learning Environments Best Address 21st-Century Students' Perceived Needs at the Secondary Level of Instruction. *NASSP Bulletin*, *98*, 101–125.

Mbatha, B. (2016). Pushing the agenda of the information society: ICT diffusion in selected multipurpose community telecentres in South Africa. *Information Development*, *32*(4), 937–952.

Miles, M., Huberman, M., & Saldana, J. (2014). Qualitative Data Analysis. In *European Journal of Science Education* (Vol. 1).

Mirzajani, H., Mahmud, R., Ayub, A. F. M., & Luan, W. S. (2015). A review of research literature on obstacles that prevent use of ICT in pre-service teachers' educational courses. *International Journal of Education an Literacy Studies*, *3*(2), 25–31.

Muhametjanova, G., & Çagiltay, K. (2012). Students' and instructors' perceptions on use of information and communication technologies during instruction in a Kyrgyzstan university. *In Advanced Learning Technologies (ICALT), 2012 IEEE 12th International Conference*, 500–502.

Mundy, M.-A., Kupczynski, L., & Kee, R. (2012). Teacher's perceptions of technology use in schools. *SAGE Open*, *2*(1), 1–15.

Munyengabe, S., Yiyi, Z., Haiyan, H., & Hitimana, S. (2017). Primary teachers' perceptions on ICT integration for enhancing teaching and learning through the implementation of one laptop per child irogram in primary schools of Rwanda. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(11), 7193–7204.

Porter, W. W., & Graham, C. R. (2016). Institutional drivers and barriers to faculty adoption of blended learning in higher education. *British Journal of Educational Technology*, *47*(4), 748–762.

Pramana, E. (2018). Determinants of the adoption of mobile learning systems among university students in Indonesia. *Journal of Information Technology Education: Research*, *17*, 365–398.

Qasem, A. A. A., & Viswanathappa, G. (2016). Teacher perceptions towards ICT integration: Professional development through blended learning. *Journal of Information Technology Education: Research*, *15*, 561–575.

Quaicoe, J. S., & Pata, K. (2017). Basic school teachers' perspective to digital teaching and learning in Ghana. *Education and Information Technologies*, *23*(3).

Sengül S, A. (2018). Teachers ' Perceptions about the Relationship between 21st Century

Skills and Managing Constructivist Learning Environments. *International Journal of Instruction*, *11*(4), 825–840.

Shafie, H., Majid, F. A., & Ismail, I. S. (2019). Technological Pedagogical Content Knowledge (TPACK) in Teaching 21st Century Skills in the 21st Century Classroom. *Asian Journal of University Education (AJUE)*, *15*(3).

Shongwe, M. M. (2015). The information technology influence on LIS job descriptions in South Africa. *Information Technology for Development*, *21*(2), 196–204.

Singh, T. kaur R., & Hussein, N. (2014). Teachers' readiness to utilize frog VLE: A case study of Malaysian secondary school. *British Journal of Education, Society and Behavioral Sciences*, *5*, 20–29.

Skenderi, L., & Skenderi, F. (2017). Teachers' perceptions of technology use in the classroom. *Conference: 14th International Conference "The Power of Knowledge", At Thessaloniki, Greece*.

Tabira, Y., & Otieno, F. X. (2017). Integration and implementation of sustainable ICT-based education in developing countries: Low-cost, en masse methodology in Kenya. *Sustainability Science*, *12*(2), 221–234.

Tang, C. M., & Chaw, L. Y. (2016). Digital literacy: A prerequisite for effective learning in a blended learning environment? *The Electronic Journal of E-Learning*, *14*(1), 54–65.

Tarus, J. K., Gichoya, D., & Muumbo, A. M. (2015). Challenges of implementing e-learning in Kenya: A case of Kenyan public universities. *International Review of Research in Open and Distance Learning*, *16*(1), 1–10.

Thang, S. M., Lin, L. K., Mahmud, N., Ismail, K., & Zabidi, N. A. (2014). Technology integration in the form of digital storytelling: mapping the concerns of four Malaysian ESL instructors. *Computer Assisted Language Learning*, *27*(4), 311–329.

UNESCO. (2012). *ICT-enhanced Teacher Standards for Africa (ICTeTSA)*. Africa: UNESCO International Institute for Capacity Building in Africa (IICBA).

UNESCO. (2015). *ICT in education in Sub-Saharan Africa, A comparative analysis of basic e - readiness in schools*. Canada: UNESCO Institute for Statistics.

Vandeyar, T. (2015). Policy intermediaries and the reform of e-education in South Africa. *British Journal of Educational Technology*, *46*(2), 344–359.

Wahyudi, N. G. (2019). Desain pesan pembelajaran di era digital. *EVALUASI*, *3*(1).