

Digital literacy curriculum management in kindergarten

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Abstract

Education needs to formulate a curriculum that suits the digital era, especially in terms of digital literacy and cyber wellness. This research was conducted to get an overview of digital literacy curriculum management in kindergarten. A total of 122 kindergartens were purposely selected to take part in a survey of this study. Of the 122 kindergartens, 27 kindergartens have integrated digital literacy education in schools, while 95 kindergartens have no integrated digital literacy education in schools. Then, the 27 kindergartens joined a focus group discussion and the results showed that there were six valid and reliable indicators to evaluate the implementation of digital literacy curriculum management in kindergarten, they are: 1)availability of digital infrastructure; 2) competence of managers and teachers in digital literacy; 3) curriculum objectives related to mastery of basic digital literacy competencies in children; 4) digital literacy implementation in school (children's learning experiences); 5) digital literacy teaching materials and strategies in schools and 6) parental involvement in curriculum development. In addition, there is a need for a technology integration development module in kindergarten classes that can become a guide for teachers and parents when using digital technology with children.

Keywords: Curriculum, management, digital, literacy, kindergarten.

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1. Introduction

The digital era is a period which is characterised by the changing of conventional industry to economy based upon information and communications technology (ICT) (Qian & Kennedy, 2020), whereas Cruz-Cunha et al. (2011) state that digital era is the phase where digital technology has significant part in establishing and controlling the behaviours, performances, standards, etc., of societies, communities, organisations, and individuals. The digital era cannot be separated from the rapid development of computer technology and the Internet. This era has changed the lifestyle of society where all activities can be carried out by mobile, only by using gadgets and Internet connection. The Internet can connect humanity as a whole where every aspect of daily life is connected to the Internet, even many children and toddlers are already using Internet-connected gadgets (Damayanti et al., 2020).

The use of gadgets in children is usually caused by the demands of the parents' jobs, who are very busy so that their attention to children is less and parents tend to provide children with gadgets to entertain them so that children are not fussy (Setiawan, 2014). However, when investigated further, the use of gadgets in children has a negative impact on their development (Wulandari & Hermiati, 2019). To counteract this negative impact, the Minister of Education and Culture, Muhadjir Effendy, stated that one indicator of achievement in the education and culture sector is the ability to build digital literacy, so it is necessary to encourage people together to be digital literate, namely having the ability to process various information, understand messages and communicate effectively with others so that the Internet can be a positive means for society (Kemdikbud, 2017).

Thus, digital literacy is a new challenge in the world of education, so it should be given high priority and needs to be explored more deeply in educational institutions. Digital literacy is the capability to apply information and communication technology to find, evaluate, utilise, create and communicate content with cognitive and technical skills (Anggun Paud, 2019). There are three digital literacy frameworks, namely protection, rights and empowerment. Parents or teachers must provide protection so that children are safe and comfortable on the Internet through a number of applications to control Internet access for children such as Kakatu, Qustodio and Net Nanny (ICT Watch, 2017).

Some students apply their knowledge in using digital tools when they come to school (Potter, 2012; Yamada-Rice, 2011). As a result, there have been many studies on various practices related to new technology and the need for school literacy to be more in tune with everyday life (Burnett, 2014; Burnett et al., 2017; Potter & McDougall, 2017). One of the studies on the need for school literacy provision is a survey of guidance and counselling teachers conducted by ICT Watch which showed that as many as 73% of the respondents stated that digital literacy/Internet material really needs to be given to students, while 26% said it was necessary and only 1% stated not yet necessary for students. Acquired from the survey results, it is clear that there is an important need to present digital literacy materials in schools for students. This is in line with the spirit of the World Summit on the Information Society in particular the Capacity Building action plan, which asked each country to 'develop domestic policies to ensure information and communication technology (ICT) that is completely combined into education and coaching, in which curriculum development, teacher training, institutional management and administration are included and also supports the ongoing study' (ICT Watch, 2015). The survey is the same with the study done by the authors in which the authors also studied the need for digital literacy in schools, but the authors studied at the kindergarten level.

According to Edwards (2013), technology is still not fully integrated with the perspective of game-based learning in early childhood education in many countries. In an international curriculum document that has not yet bridged the gap between pedagogical understanding of play as a foundation for studying and children's experiences with digital technology, involving children in

critical thinking skills through digital games should be done by teachers (Dooley et al., 2016). To achieve an understanding of literacy in the digital world, schools must discuss the integration of new forms of information resources in the educational environment and to protect children from negative Internet content, parents and teachers must act as gateways to filter information (Tyner, 2014).

Young children in particular need to be educated to surf the Internet healthily and protect themselves; developing countries do not yet have the resources needed to run healthy Internet education programmes for children, while cybersecurity curricula have been developed to empower teachers in elementary or junior high schools to educate students about cybersecurity (R. Solms & S. Solms, 2015).

Cyber wellness (CW) refers to the health/well-being of Internet users and involves understanding online behaviour as well as awareness of how to protect oneself in cyberspace. There are three main principles that will guide children in making decisions when interacting in cyberspace, namely (1) respect for themselves and others, (2) safe and responsible use and (3) positive peer influence. Through the cyber wellness curriculum, children will be taught to (1) feel, namely identify possible risks online and protect themselves; (2) think, namely analyse, evaluate and reflect on situations based on the principles of CW; (3) acting, namely taking actions to stay safe and have a positive impact online (Ministry of Education Singapore, 2020). Meanwhile in Indonesia, since 2017, the Telkomsel Company has officially held the #internetBAIK (responsible, safe, inspirational and creative) campaign related to cyber wellness education (Indonesian digital citizenship education) for grades 4–6 elementary and junior high school students as entry-level Internet users, as well as teachers and parents who act as assistants and supervisors so that an understanding of the use of the Internet in a responsible, safe, inspirational and creative manner is expected to be realised and not to forget the values of the nation's personality (PT Telkomsel, 2017).

Indonesia's digital literacy framework, includes (1) protection, how to protect personal data, online security and individual privacy; (2) rights, such as freedom of expression, intellectual property and social activism and (3) empowerment, including citizen journalism, entrepreneurship and information ethics (Syaripudin et al., 2017).

Parents also have an important role in the success of cyber wellness programmes. As stated by Daipi (2012), 'Parents have a big part in creating children manner in cyberspace. They have effect on instilling strong values in their children to better manage their children's internet activities. Through the joint efforts of parents and school, it can be ensured that students have the right values and attitudes when using technology'. The role of parents in educating children aged 4–7 years in the digital era, includes (1) making collective agreements, monitoring, consistently implementing the consequences of violations and giving appreciation for children's success in undergoing agreements; (2) making use of educational programmes/applications related to school readiness; (3) discussing the similarities and differences of favourite characters seen through the media, with the aim of improving the skills to distinguish between good and bad things; (4) avoiding broadcast programmes that contain violence and sexuality; (5) making use of programmes/applications that teach friendship and respect the differences and diversity that exist and (6) guiding children to know which one is a fact and which one is a fantasy (Kemdikbud, 2018).

In order to involve parents in digital literacy education, practitioners need to recognise situations such as manners, practices, values and skills so that schools and parents have good connection; to create activities for practitioners to act effectively with parents to assist the learning process and to make parents realize the important role of digital media. (Kendall, 2015, as cited in McDougall et al., 2018).

Thus, the world of education needs to formulate a curriculum that is in accordance with the development of the digital era, especially in terms of digital literacy and cyber wellness, so that the

goals, contents and processes of education are in line with the needs, conditions, characteristics and developments in society (Shofiyah, 2018) . Therefore, a cyber wellness education programme that functions to empower students to make the right choices is an important part of education, besides that in the relationship between school and parents, the best way to apply cyber wellness education programmes is by using holistic approaches; from a school perspective, the infrastructure of the cyber wellness programme must be available when a media literacy programme is running (Lim et al., 2016).

1.1. Conceptual framework

1.1.1. Curriculum management

Early recognition of cybersecurity through the well-designed curriculum and a series of activities will help reduce the negative effects of cyberspace. According to Jiang et al. (2018), curriculum is a programme that provides knowledge and skills for students. Meanwhile, Picton and Teravainen (2017) state that the curriculum has to support students for the skills needed in a digital world and critical digital literacy.

According to the Indonesian National Education System Law Number 20 of 2003 (2003) curriculum is a set of plans and arrangements regarding the objectives, content and learning materials as well as the methods used as guidelines for implementing learning activities to achieve educational goals. The curriculum serves as a guide for teachers so that children's behaviour changes. The curriculum should be age-appropriate, holistic and child-centred and include active learning through purposeful play. The central principle of the preschool curriculum should be able to develop competencies for the 21st century at the preschool level, 'learning by playing' so that the curriculum can support students in their social lives, help them manage their emotional, physical and cognitive (Sim, 2015).

In the 21st century in which the learning process cannot be separated from the Internet, 'learning by playing' activities can be carried out through cyber security-based games/game applications developed to teach users, mostly children, such as, a 'cyber security lab' created to train basic cyber security skills; 'The Internet Safety', a web-based game about safety on the Internet; and 'children's games – FBI (Federal Bureau of Investigation)' about online security management. Most studies show positive results and impacts on users, especially children, in using games and applications as a means of education about cybersecurity (Quayyum, 2020).

Based on the above opinions, it can be concluded that children must be supported by the curriculum for the skills needed in the digital world and critical digital literacy. In addition, children must also be equipped with cyber security skills, one of which is through games and applications based on cyber security so that the concept of 'learning by playing' can still be implemented.

1.1.2. Digital literacy

Digital literacy can be seen as a general term that includes a continuum of meaning that extends across the ability to use digital devices or software, consume and produce digital content, to participate significantly in the digital community (Alexander et al., 2016). Meanwhile, Techataweewan and Prasertsin (2018) stated that digital literacy, according to the American Library Association's digital literacy task force, is the ability to use information and communication technology to find, evaluate, create and communicate information, which requires cognitive and technical skills. More simply, Hiller Spiers, a professor of literacy and technology at North Carolina State University, views digital literacy as having three elements: 1) discovering and using digital content; 2) making digital content and 3) communicating or sharing it (Heitin, 2016).

The key components of digital literacy that are very important to be mastered by students include: 1) social networking, 2) transliteracy, 3) maintaining privacy, 4) managing identity, 5) creating content, 6) organising and sharing content, 7) reusing or repurposing content, 8) filtering

and selecting content and 9) self-broadcasting (Wheeler, 2012). Therefore, the process of preparing students (all ages) for the 21st-century digital adventure is through the following stages: 1) find and gather, 2) filter, 3) process and shape, 4) create and 5) share (Gibson & Smith, 2018).

Tham et al. (2021) define digital literacy as the cultivation of awareness, attitude and ability to use digital tools and facilities to appropriately identify, access, manage, integrate, evaluate, analyse and synthesise digital resources, build new knowledge, make media expressions, as well as communicate with others, in the context of [these] specific life situations, to enable constructive social action and reflect on this process. Donohue (2014) also states that it is necessary to be wise when using technology to ensure children's involvement when interacting with screen media that supports learning in the early childhood and overall child development. Since technology is in children's hands, however, they need skills, competence and enthusiasm to function and thrive in the world where they grow up (Plowman et al., 2012). Practicing digital literacy, such as basic computer skills, online security, coding, keyboards or other active and productive skills should be included in the curriculum (Langub & Vega, 2017). The International Society for Technology in Education recommends fundamental skills in technology operations and designs at the age of 5; therefore, early childhood education institutions can provide opportunities to explore technology for children from low income as well as wealthier families and educators should also consider creative learning through high-quality interactive media to children (NAEYC & The Fred Rogers Center, 2012).

1.1.3. Role of kindergarten in digital literacy curriculum management

The steps to integrate technology into the educational environment should involve the following factors: national and local policies, bandwidth and technology infrastructure, educational context, cyber safety practices and cyber wellness practices, as well as privacy accountability. In addition, many members and key stakeholders are involved in the digital life of students, from families and educators to law enforcement authorities, telecommunications organisations, as well as local, provincial and national leaders (Searson et al., 2015). There are four factors that contribute effectively to the teacher professional development for technology integration in teaching, namely (a) time to analyse and arrange literacy instruction by integrating technology; (b) access to equipment during and after professional development; (c) access to high-level knowledge and relevant background knowledge and (d) continuous support and actionable effect for enhancing teacher professional development and student learning (Hutchison, 2012).

To teach children in the digital era, teachers must consider two sides of interactivity, namely 1) interactivity inherent in technology and 2) interactivity among students, teachers and technology (Barron et al., 2011). Kindergarten teachers need to be trained and given positive examples of how technology is selected, used, integrated and evaluated in kindergarten classrooms. Teachers need to access online resources and links, videos and communities that provide examples and applications of technology and digital media to be demonstrated, shared and discussed. There are six standards needed for teachers to be excellent in the digital era, namely 1) encouraging children's development and learning: teachers need to choose, use, integrate and evaluate technology; 2) building a family and community partnerships, in terms of digital literacy skills because technology affects children's development; 3) observing, documenting and assessing children's development by using technology: various digital devices or applications invite teachers to explore, exchange ideas and apply learning by doing; 4) using an effective developmental approach: technology unites children through social interaction rather than isolating children for a long time; 5) building a meaningful curriculum: teachers should provide learning resources for students to explore, be creative, practice digital media in the context of academic content and information available for learning in early childhood classes and 6) becoming a professional teacher by mastering technology and digital literacy, such as accessing learning materials online, sharing information and communicating with colleagues through social media in a safe environment (NAEYC & The Fred Rogers Center, 2012).

Based on some of the opinions above, it can be concluded that to integrate technology into the educational environment, kindergarten institutions must involve educators and parents into the digital lives of students, discuss the integration of new forms of information resources in the educational environment and pay attention to the standards required by teachers so that teachers can be excellent in this digital era, especially in terms of digital literacy.

The purpose of this study is to evaluate the implementation of digital literacy curriculum management in kindergarten related to indicators such as 1) availability of digital infrastructure; 2) competence of managers and teachers in digital literacy; 3) curriculum objectives related to mastery of basic digital literacy competencies in children; 4) digital literacy implementation in school (children's learning experiences); 5) digital literacy teaching materials and strategies in schools and 6) parental involvement in curriculum development.

2. Methodology

2.1. Participants

2.1.1. Choosing and contacting kindergarten

To become a sample, kindergartens must be located in the city of Semarang and have integrated digital literacy in learning. Based on these eligibility criteria, 122 kindergartens were purposely selected for inclusion in the study. Of the 122 kindergartens that participated in a closed question survey via Google Forms about digital literacy education in schools, 27 (22.7%) kindergartens were known to have integrated digital literacy education in schools, while 95 (77.3%) kindergartens were known to have no integrated digital literacy education in schools.

This research, which involved kindergartens, received a good response due to 1) contacting the organisation that oversees the school (Association of Indonesian Kindergarten Teachers, Semarang City area); 2) contacting the kindergarten principals who would eventually coordinate at schools and 3) the importance of planning face-to-face meetings with kindergarten principals and key teachers.

2.1.2. Selecting participants

Participants were selected using *purposive or convenience sampling* (Stewart & Shamdasani, 2014). In *purposive sampling*, researchers select individuals who meet the criteria according to the research objectives, participants need to have experience related to the research topic, namely related to digital literacy curriculum management in schools, in the appropriate age range, i.e., teachers who are less than 45 years old or have the similarity of psychosocial characters such as changes that occur in personality, emotions and social relationships in schools as a result of developments in information technology as it is today (Barbour, 2018; Krueger & Casey, 2009; Rabiee, 2004). In *convenience sampling*, people who are accessible and still in the same city as the researchers and have experience with the research topic are invited to participate in the research.

2.1.3. Contacting principals and key teachers at kindergartens

Principals and key teachers from 27 eligible kindergartens were approached and invited to join face-to-face meetings. Principals were contacted directly to delegate a committed teacher. Initial contact was made by telephone and letters were sent to the kindergartens 2 weeks prior to the face-to-face meeting in the form of a focus group discussion (FGD). When contacted by telephone, the principals and kindergarten teachers expressed their interest in joining the FGD. Of these 27 kindergartens, 24 kindergartens were ready to attend the FGD, while 3 other kindergartens could not attend it because there were other school agendas that could not be abandoned. In more detail, each of the 11 kindergartens was represented by 2 people, namely the principal and teacher, while the other 13 kindergartens were only represented by 1 person, namely the principal or teacher so that the total number of FGD participants was 35 people.

2.2. Preparation of FGD

When preparing for the FGD, several issues had to be addressed. First, selecting participants; second, determining the time (duration of the FGD) and place of the FGD, as well as the total number of research questions to be discussed; and third, preparing questioning strategy and interview guide (closed questionnaire). The research question points discussed in the FGD were developed by the researchers themselves with reference to the opinion of Wheeler (2012), Searson et al. (2015) and Gibson and Smith (2018).

2.3. Data analysis

The data analysis used to test the validity of the factual conditions of digital literacy curriculum management in kindergarten was a qualitative and quantitative descriptive analysis involving expert judgments from practitioners, namely principals and teachers. The quantitative descriptive analysis was revealed using a closed questionnaire. There were 37 questions in the closed questionnaire using three alternative answers, namely appropriate, less appropriate and inappropriate with scores moving from 3 for 'appropriate' answers to 1 for 'less appropriate' answers. Of the 37 question items, after the validity test was carried out using the product-moment validity test with SPSS in which the criteria are valid; if r count $>$ r table (r table = 0.202), then the questionnaire question items are declared valid, and it is known that there are 6 invalid items, so there are 31 valid question items. While the result of the reliability test is 0.960, with the criteria 'if Cronbach's alpha value is $>$ 0.60, the questionnaire is declared reliable or consistent'. Based on the test results, the overall questionnaire is declared reliable or consistent.

The category of validation level of expert judgment in the field of digital literacy curriculum management is as shown in Table 1.

Table 1: *Category of validation level of expert judgment kindergarten practitioners: principals and teachers*

Number	Score range	Criteria
1	40–51	Less appropriate
2	52–63	Quite appropriate
3	64–75	Appropriate

Qualitative descriptive analysis is revealed through an open questionnaire that supports the closed questionnaire. Besides the discussion that could be carried out on the 31 questions, the researchers also prepared five questions, such as (1) What kinds of the availability of digital infrastructure in schools? (2) What are the examples of the school principal compiles school programmes by browsing the internet? (3) What are the examples of the school programme compilation carried out by the principal by means of browsing the internet? (4) What are the examples of the internet content that has been accessed by children along with the teacher in learning at school and (5) What kinds of parental involvement in preparing school curriculum content (basic competencies) that characterises children's healthy internet skills?

3. Research result

According to the findings of the FGD in this study, the implementation of digital literacy curriculum management in kindergarten related to each indicator is shown below.

The indicator of availability of digital infrastructure is shown in Table 2.

Table 2: Management of the digital literacy curriculum in kindergarten related to indicator of availability of digital infrastructure

Indicator	Sub-indicators	Item	Scale (%)		
			3	2	1
Availability of digital infrastructure	School condition has digital facilities (computer/laptop/tab with internet access) to support learning in each class	1	76.5	23.5	0
	School condition has laboratory infrastructure that supports online digital literacy of teachers and children	2	58.8	17.7	23.5
	School condition has laboratory infrastructure that supports offline digital literacy of teachers and children	3	64.7	23.5	11.8

Based on Table 2, it was found that 76.5% of the schools had digital facilities (computers/laptops/tabs with internet access) to support learning in each class, 58.8% of the schools had laboratory infrastructure that supported digital literacy for teachers and children online and 64.7% of the school condition had laboratory infrastructure that supported offline digital literacy of teachers and children.

The indicator of competence of managers and teachers on digital literacy is shown in Table 3

Table 3: Management of the digital literacy curriculum in kindergarten related to indicator of competence of managers and teachers on digital literacy

Indicator	Sub-indicator	Item	Scale (%)		
			3	2	1
Competence of managers and teachers on digital literacy	Principal browses the Internet in preparing school programmes	4	82.4	17.6	0
	Principals and teachers use digital media as a means of information to parents	5	100	0	0
	Teachers share information and communicate with fellow colleagues through social media in a safe environment.	6	82.4	17.6	0
	Digital applications invite teachers to explore, exchange ideas and apply learning by doing	7	94.1	5.9	0

Teachers access the internet in developing themes and learning materials at each change of themes	8	76.5	23.5	0
Teachers use digital media (laptop/tab with internet access) in discussing learning materials with children (5W + 1H)	9	52.9	47.1	0
Teachers access the internet in developing learning activities	10	64.7	35.3	0

Based on Table 3, it can be stated that 82.4% of the principals browsed the Internet in preparing school programmes; 100% of the principals and teachers used digital media as a means of information to parents; 82.4% of the teachers shared information and communicated among colleagues through social media in a safe environment; 94.1% of digital applications invited teachers to explore, exchange ideas and apply learning by doing; 76.5% of teachers accessed the internet in developing themes and learning materials every time they changed themes; 52.9% of teachers used digital media (laptop/tab with Internet access) in discussing learning materials with children (5W + 1H); and 64.7% of the teachers accessed the Internet in developing learning activities.

The indicator of curriculum objectives related to mastery of basic digital literacy competencies in children is shown in Table 4.

Table 4: Management of the digital literacy curriculum in kindergarten related to indicator of curriculum objectives related to mastery of basic digital literacy competencies in children

Indicator	Sub-indicator	Item	Scale (%)		
			3	2	1
Curriculum objectives related to mastery of basic digital literacy competencies in children	Curriculum content develops competencies to be responsible for dealing with other people safely through social media (social networking)	12	0	11.8	88.2
	Curriculum content develops competencies to be responsible for managing the security of one's identity (managing identity)	13	0	5.9	94.1
	Curriculum content develops the competence to find/choose, collect content/activities in cyberspace	14	0	5.9	94.1
	Curriculum content develops competencies to create content	15	5.9	17.6	76.5
	Curriculum content develops competencies for sharing to create content	16	5.9	17.6	76.5

Curriculum content develops competency in filtering and selecting content 17 0 5.9 94.1

Based on Table 4, it can be stated that 0% curriculum content developed responsible competence in dealing with other people safely through social media (social networking); 0% curriculum content developed responsible competencies in managing self-identity security (managing identity); 0% curriculum content developed the competence to find/choose, collect content/activities in cyberspace; 5.9% curriculum content developed competency to create content; 5.9% curriculum content developed competency to share creating content; and 0% curriculum content developed competency in filtering and selecting content.

The indicator of digital literacy implementation in school (children’s learning experiences) is shown in Table 5

Table 5: Management of the digital literacy curriculum in kindergarten related to indicator of digital literacy implementation in school (children's learning experiences)

Indicator	Sub indicator	Item	Scale (%)		
			3	2	1
Digital literacy implementation in school (children's learning experiences)	Teachers discuss with children about when, where, how, and why to use the internet for children’s personal productivity	20	5.9	88.2	5.9
	Teachers provide direct experiences for children to explore, be creative and play with digital media	22	5.9	35.3	58.8
	Teachers condition technology as unifying children through social interaction, not individually	23	0	58.8	41.2
	Teachers discuss internet contents that are safe for children to access	24	17.6	47.1	35.3
	Teachers invite children to identify negative behaviour when using digital media	25	17.6	52.9	29.5
	Teachers discuss with children how to protect themselves in cyberspace	26	0	47.1	52.9

Based on Table 5, it can be stated that 5.9% of teachers discussed with children about when, where, how and why to use the internet for children’s personal productivity; 5.9% of the teachers provided direct experiences for children to explore, be creative and play with digital media; 0% of the teachers conditioned technology as unifying children through social, not individual interactions; 17.6% of the teachers discussed safe Internet contents for children to access; 17.6% of the teachers invited children to identify negative behaviour when using digital media; and 0% of the teachers discussed with children how to protect themselves in the cyberspace.

The indicator of digital literacy teaching materials and strategies in schools is shown in Table 6.

Table 6: Management of the digital literacy curriculum in kindergarten related to indicator of digital literacy teaching materials and strategies in schools

Indicator	Sub-indicator	Item	Scale (%)		
			3	2	1
Digital literacy teaching materials and strategies in schools	Teachers and parents compile the content of the school curriculum (basic competencies) that characterise the ability to surf healthy in children	27	0	17.6	82.4
	Teachers access online resources and links, videos and communities that provide examples and applications of technology and digital media and then demonstrate, share and discuss them with children	28	5.9	1	0
	Teachers guide children to collaborate in exploring learning material according to the theme online	29	5.9	23.5	70.6
	Teachers use a method that gives children the opportunity to independently choose, think critically when exploring the cyberspace	30	11.8	41.2	47
	Teachers give children the opportunity to be creative in playing activities after exploring the cyberspace	31	11.8	76.5	11.8
	Teachers give children the opportunity to communicate all the processes that have been carried out when using technology in the classroom	32	23.5	41.2	35.3
	Teachers evaluate the achievement of healthy internet skills on children	33	0	17.6	82.4

Based on Table 6, it is known that 0% of the teachers and parents compiled school curriculum which characterises the ability to surf healthy in children; 5.9% of the teachers accessed online resources and links, videos and communities that provided examples and applications of technology and digital media and then demonstrated, shared and discussed them with children; 5.9% of the teachers guided children to collaborate in exploring learning materials according to

themes online; 11.8% of the teachers used methods that gave children the opportunity to independently choose, think critically when exploring in cyberspace; 11.8% of the teachers gave children the opportunity to be creative in playing activities after exploring the cyberspace; 23.5% of the teachers gave children the opportunity to communicate all the processes that had been carried out when using technology in the classroom; and 0% of the teachers evaluated the achievement of healthy Internet skills on children.

The indicator of parental involvement in curriculum development is shown in Table 7.

Table 7: *Management of the digital literacy curriculum in kindergarten related to indicator of parental involvement in curriculum development*

Indicator	Sub-indicator	Item	Scale (%)		
			3	2	1
Parental involvement in curriculum development	Parents are involved in composing a curriculum that educates healthy Internet	34	0	11.8	88.2
	Parents are involved in digital literacy training that is applicable and has an impact on the family, such as the use of safe sites for children, how to use social media wisely and how to maximise the internet in seeking information and knowledge	37	0	5.9	94.1

Based on Table 7, it was found that 0% of the parents were involved in the curriculum compilation that educated healthy Internet; and 0% of the parents were involved in digital literacy training that is applicable and has an impact on the family, such as the use of safe sites for children, how to use social media wisely and how to maximise the Internet in seeking information and knowledge.

The FGD results with 24 kindergarten institutions can be summarised as the criteria for digital literacy education curriculum management in kindergarten, as shown on Table 8.

Table 8: *Criteria of Implementation of digital literacy education curriculum management in kindergarten*

Number	Category	Criteria	Number of respondents
1	40–51	Less appropriate	12
2	52–63	Quite appropriate	11
3	64–75	Appropriate	1
Σ			24

Based on Table 8, it is known that 1 kindergarten institution had appropriate criteria, 11 kindergarten institutions had quite appropriate criteria and 12 kindergarten institutions had less appropriate criteria, namely in terms of implementing digital literacy curriculum management in schools, seen from the components: 1) curriculum objectives of supporting mastery basic competencies of digital literacy in children, 2) implementation of digital literacy activities (children's

learning experiences) in schools, 3) materials and strategies for teaching digital literacy in schools and 4) parental involvement in developing cyber wellness curriculum.

Furthermore, based on the results of the FGD, it can be detailed that the preparation of school programmes carried out by the principal by means of browsing the Internet, including social emotional learning (SEL) programme, creating learning themes and sub-themes, curriculum compilation, provision of infrastructure, school management arrangements, making school annual programmes and educational calendars, parenting, joint exercise, inspiring learning activities, class design and compiling the principal's annual work programme.

Meanwhile, Internet contents that had been accessed by children and teachers in school learning include: YouTube, Sanford Harmony, class dojo, dodo-syamil films, pinterest, learning videos, stories of the prophet, children's creation gymnastics, Google, Clean and Healthy Living Habits, Teacher sharing, Natural Geographic kids and The Kids Page. Some of the forms of parental involvement in preparing school curriculum content (basic competencies) that characterise the ability to surf healthy in children include educating children at home about healthy internet surfing for children, seminars with psychologists, communication/sharing of WhatsApp groups, parenting and recitation and creating motivational content.

4. Discussion

Curriculum is a written plan that explains the learning and development goals of children, as well as the learning experiences, materials and teaching strategies used to help children achieve these goals. The goals include knowledge, skills and dispositions that children will be achieved when teachers choose what to teach (content) based on their goals for children, and how to teach (instructional strategies) and pair these curriculum ideas with their knowledge of children's development (Bredenkamp, 2011). This is in accordance with Ralph Tyler's opinion that there are four components in curriculum development, namely determining goals, choosing learning experiences, organising learning experiences and evaluating (Amaliyah & Pramudiani, 2020). The curriculum is a community dialogue that creates and documents possible transformation for all children, families and teachers (Cahill & Gibson, 2012).

According to the findings of this study, in digital literacy curriculum management, some indicators such as the availability of infrastructure as well as competence of managers and teachers are appropriate to support digital literacy education in kindergarten institutions. However, the content of digital literacy competencies in children, the implementation of digital literacy, curriculum content and parental involvement in developing healthy Internet curriculum is still less appropriate.

The availability of digital literacy infrastructure in schools is based on findings in the field in this study, including computers, laptops, school cellphones, Internet access, projectors and cameras. Based on the research results of Sugiarti et al. (2013), it is found that early childhood teachers in Indonesia are already used to operating mobile phones and the Internet (chatting, social networking and email). However, the use of this technology is still only for entertainment and communication purposes. Therefore, early childhood teachers who usually use ICTs for communication and entertainment only, need to use ICTs to develop their skills. Furthermore, it was said that the pedagogical competence as early childhood education teachers in Indonesia related to competence in using information and communication technology for the benefit of organising educational development activities was still not enough, namely only 21.3%. Meanwhile, professional competence as early childhood education teachers related to the competence of using information and communication technology to communicate and develop oneself was very insufficient, namely only 5.6%. This is similar with the findings on the field which showed that digital literacy implementation in school is still very low.

Meanwhile, Brun and Hinostróza's research (2014) found that teachers in the Republic of Chile in southeastern South America used very few digital resources, mainly projectors and computers, in which they practice 'traditional' teaching and learning. The ownership of computers and internet access is considered by teachers' factors that influence the improvement of school culture towards technology integration (Tezci, 2011). Nowadays, learning can be done in a fun way since teachers use digital resources such as preparing lessons through PowerPoint and word documents or creating communication channels for students and parents via social media and email.

Competence of managers and teachers regarding digital literacy in kindergarten institutions, such as the ability to browse the Internet in the preparation of school programmes; ability to use digital media as a means of information to parents; the ability to share information and communicate among colleagues through social media in a safe environment; and the ability to explore in themes and learning materials, as well as the development of playing activities. Therefore, using technology in kindergarten institutions is expected to educate, stimulate and be focused on encouraging teamwork. In addition, it also supports playing-based pedagogy, engages children in responsibility, is informative, avoids aggression or stereotypes, encourages parental participation, increases knowledge and safety issues and develops awareness and safety issues, for example, the use of digital stories in interactive learning can increase motivation, involvement, attitudes, attention and children's language skills during language lessons (Girmen & Kaya, 2019).

According to Miller's (2018) findings, the use of interactive technology namely educational applications as part of a playing-based learning experience with children of kindergarten increases children's ability to create abstract ideas and helps improve the development of inquiry practice and language skills. With regard to the way teachers interact with students using technology, it is recommended to use inquiry approaches for instance project-based learning and problem-based learning, which are more child-centred and constructivist and prevent traditional teaching-learning methods (Sun et al., 2014; Tondeur et al., 2016; Wake & Whittingham, 2013). This is not the same with the findings in the field in which digital literacy teaching materials and strategies in schools are low. This happened because teachers rarely accessed online resources and links, videos and communities that provided examples and applications of technology and digital media and then demonstrated, shared and discussed them with children. Teachers also rarely guided children to collaborate in exploring learning materials according to themes online and teachers did not use methods that gave children the opportunity to independently choose, think critically when exploring in cyberspace. Besides that, teachers rarely gave children the opportunity to be creative in playing activities after exploring the cyberspace and rarely gave children the opportunity to communicate all the processes that had been carried out when using technology in the classroom.

Technology usage in education keeps giving better opportunities for enhancing children's cognitive development and active participation in playing and school activities needed for the development of 21st-century basic skills (Hsin et al., 2014; Miller, 2018; Yelland, 2011). According to Gjelaj et al. (2020), the proper and effective integration of digital technology in early childhood classes can empower children by providing ideas that they have never had before. This implies that the use of ICT tools also opens up new avenues for alternative social interactions and changes the learning relationship between children and teachers (Scott, 2015). Therefore, mastering basic competencies related to digital literacy in children needs to be prepared from an early age.

Technology is now considered a major force of change enabling children to connect to the world of the internet, social media and the use of digital devices at a very young age. Thus, the increasing use of digital devices by young children implies that careful consideration should be given to the issue of technology integration in kindergartens, as tablets and touch screens become more economically affordable and accessible (Rideout & Katz, 2016).

Thus, the wise use of technology in accordance with the development of the early years is important in giving chances for children to understand how to operate and engage effectively in the

teaching and learning process with emerging technologies. In addition, using ICT in early childhood classes provides opportunities for teachers to learn and explore new ways of teaching young children, as well as stimulates teachers' views on early childhood development and learning. The use of technology in early childhood classes helps promote children's learning progress and makes learning more enjoyable for children. The use of ICT in kindergarten classrooms is a significant tool in improving children's literacy skills.

There are several factors that influence teachers in using digital technology, namely school culture, teachers' knowledge, teachers' attitudes and teachers' skills. The school culture includes: 1) school strategy, 2) collaborative learning, 3) peer coaching, 4) infrastructure, 5) online learning, 6) curriculum development, 7) online learning, 8) leadership and 9) support. The teachers' knowledge relates to what, how and why technology is used to meet student needs, this component includes: 1) pedagogical skills, 2) teacher training, 3) ability to create student-centred learning, 4) curriculum, 5) technological pedagogical content knowledge (TPACK), 6) assessment and 7) project-based learning. The teachers' attitudes related to the school culture include: 1) ability, 2) motivation and will, 3) perception, 4) opinion, 5) belief, 6) self-efficacy, 7) self-confidence and 8) innovation. While the teachers' skills include: 1) computer proficiency, 2) multimodal, 3) developing technology, 4) inquiry learning, 5) ability to select/develop specific content, 6) constructivist teaching/learning and 7) new rules (Spiteri & Rundgren, 2020). This is different from the findings in the field in which digital literacy implementation in school (children's learning experiences) is still very low. This happened because teachers rarely discussed with children when, where, how and why using the Internet for children's personal productivity and teachers rarely provided experience directly for children to explore, be creative and play with digital media. Besides that, teachers did not condition technology as unifying children through social (not individual interactions) nor discussed safe internet content for children to access and invited children to identify negative behaviour when using digital media. Moreover, teachers did not discuss with children how to protect themselves in cyberspace.

Teachers can work collaboratively, evaluate processes and exchange new knowledge if quality teacher training is empowered in the school culture (Tondeur et al., 2016). Forms of activity in which teachers explore, exchange ideas and use digital applications, including zoom meetings, WhatsApp group, official/foundation webinars, implementation of peak themes, face-to-face teaching and learning, application of Icebreaking in class, implementation of distance learning programmes and use of Microsoft Teams. It is suggested that schools give learning occasions for teachers to use digital technology such as teacher innovations in designing learning (Getenet et al., 2016). School culture affects teachers' manners towards technology integration and effective technology training contributes to positive attitudes and perceptions of teachers (Apeanti, 2016). This is in accordance with the research result which showed that the competence of managers and teachers on digital literacy is high.

The number of teacher tenures affects the use of technology, in which teachers with less than 5 years of teaching experience use technology less than teachers with longer tenures (Gu et al., 2013). Technology is seen as a device to assist teachers teach in a better way to develop student education (Wake & Whittingham, 2013). Anastasiades and Vitalaki (2011) point out that teachers who integrate digital technology in daily practice find it simpler to foster internet-related security issues by discussing these topics with students. This is not the same with the findings in the field in which curriculum content did not develop competency in filtering and selecting content, teachers rarely discuss safe internet contents for children to access, teachers rarely invited children to identify negative behaviour when using digital media and teacher never discuss with children how to protect themselves in cyberspace.

There are still major problems related to the experience of kindergarten teachers regarding the use of ICT tools such as the level of technical knowledge, software availability, curriculum implementation, administration and infrastructure that can hinder the realisation of the possible use

of ICT (Meyer & Gent, 2016). This is in accordance with findings in the field that digital literacy implementation in school (children's learning experiences) is still very low. This happened because teachers rarely discussed with children when, where, how and why using the Internet for children's personal productivity and teachers rarely provided experience directly for children to explore, be creative, and play with digital media. Teachers did not condition technology as unifying children through social, not individual interactions. Teachers rarely discussed safe internet content for children to access and invited children to identify negative behaviour when using digital media. Besides that, teachers did not discuss with children how to protect themselves in cyberspace. That research is also in accordance with the findings in the field that the mastery of basic competencies related to digital literacy in children is still very low. This happened because the content of the digital literacy curriculum in schools had not characterised the ability to safely explore the internet in children, the low ability of teachers to explore learning resources on the internet, guide children to collaborate, think critically, be creative and communicative when using technology and also evaluate the achievement of healthy internet skills in children.

The main obstacles to the use of technology by teachers in learning include lack of technology-based pedagogical knowledge, limited technological resources in the workplace and lack of parental support and kindergarten institution/school policies. Based on this, the identified barriers could hinder the development of digital literacy skills for children in kindergarten. Therefore, it is recommended that training support and pedagogical orientation should be provided for early childhood teachers to enable them to overcome the inhibiting factors in the effective integration of the use of ICT in kindergarten learning. In addition, there is a need for a module on technology integration development in kindergarten classrooms. Policymakers, school management boards and parents must be actively involved in providing ICT tools and maintaining an organisational structure that supports kindergarten teachers to use ICT. This will contribute to the development of children's basic ICT knowledge and literacy skills (reading, writing, numeracy, science and digital), which in turn will develop good behaviour towards technology usage as they develop into digital literacy (Ogegbo & Aina, 2020).

The development of digital technology in the school curriculum can be done by holding appropriate technology training so as to make teachers more skilled (Aesaert et al., 2013; Lemon & Garvis, 2016). Ferrari (2013) states that there are five indicators to measure the digital competence of teachers on the effective use of technology, namely first, to manage information, research shows that students do not have the ability to search for information and critical thinking skills about the information found. on the Internet, teachers are responsible for teaching digital competencies related to the ability to manage this information to their students (Kinzer, 2010; Wang et al., 2012). Meanwhile, findings in the field are not in accordance with Ferrari's first indicator. The findings in the field showed that teachers rarely accessed online resources and links, videos and communities that provided examples and applications of technology and digital media and then demonstrated, shared and discussed them with children. Besides that, teachers also rarely used methods that gave children the opportunity to independently choose and think critically when exploring in cyberspace. Second, to communicate; communicating with parents or guardians of students gives teachers big opportunities to design lessons in accordance with the needs of students and activities that start at school can be discussed further at home. Teacher training in the field of digital competency communication can be beneficial because teachers are able to gain latest insight, consider processes and give and receive response from and for students (Brun & Hinostroza, 2014; Tondeur et al., 2016; Wake & Whittingham, 2013). This second indicator is not in accordance with findings in the field which showed that parents were never involved in the curriculum compilation that educated healthy internet nor involved in digital literacy training that is applicable and has an impact on the family, such as the use of safe sites for children, how to use social media wisely and how to maximise the Internet in seeking information and knowledge. Third, to create new content; changes in information on the internet continuously cause content knowledge to change either. Thus, teachers need to

adapt their teaching and learning process. This is in accordance with findings in the field in which teachers' competence on digital literacy was high because teachers used digital application to explore, exchange idea and apply learning by doing, as well as accessed the internet, in developing themes and learning materials at each change of theme. In a constructive educational environment, teachers can develop curriculum and study with students as they get ideas from students (Duveskog et al., 2012). In teacher training on technology integration, it is better to discuss inquiry and problem-based learning. Fourth, for safety; negative websites can be filtered, but it is much better for teachers to inform students so that they can be protected from negative experiences on the internet; in addition, school management can explicitly regulate ICT policies in schools. Meanwhile, findings in the field are different from this indicator. The findings in the field showed that curriculum content did not develop responsible competence in dealing with other people safely through social media (social networking), curriculum content did not develop responsible competence in managing self-identity security (managing identity). Moreover, teachers rarely discussed safe internet contents for children to access, invited children to identify negative behaviour when using digital media and discussed with children how to protect themselves in the cyberspace. Fifth, to solve the problem; teachers require insight, skills and the good manner to apply technology (Barak, 2014; Morsink et al., 2011). This is in accordance with the findings on the field which showed that teachers shared information and communicated with fellow colleagues through social media in a safe environment.

Teachers should be willing to try the latest technology to attract students (Kinzer, 2010). Thus, more inquiry and innovation in learning will be obtained (Sun et al., 2014). As stated by Dalton (2012), teachers have to realize and express their own strengths and interests, do activities they like, and then develop lessons using digital technology. In order to do this, the school cultures must be encouraging, give response, time and collaborative training.

5. Conclusions and recommendations

In implementing digital literacy curriculum management in kindergarten, some components are needed, such as: 1) availability of digital infrastructure; 2) competence of managers and teachers in digital literacy; 3) curriculum objectives related to mastery of basic digital literacy competencies in children; 4) Implementation of digital literacy in school (children's learning experiences); 5) Digital literacy teaching materials and strategies in schools and 6) Parental involvement in curriculum preparation. The availability of digital infrastructure and the competence of managers and teachers in digital literacy is appropriate to support digital literacy curriculum management in kindergartens. Therefore, to support the implementation of digital literacy curriculum management in kindergarten institutions, in addition to the availability of infrastructure as well as competence of teachers and school principals, based on this research, there are four indicators that need to be considered: firstly, curriculum objectives related to mastery of basic digital literacy competencies in children; secondly, digital literacy implementation in school (children learning experiences); thirdly, digital literacy teaching materials and strategies; and finally, parental involvement in the development of digital literacy curriculum in schools.

In addition, there is a need for a technology integration development module in kindergarten classes that becomes a guide for teachers and parents when using digital technology with children.

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