

A Systematic Review of Digital Literacy Training for High School Students

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Abstract— The increase of false news (hoax), hate speech, access to negative content, and misuse of internet as a crime media indicated a low level of digital literacy, especially in teenagers and young adults as the age group with the most access to the internet in Indonesia. Digital literacy, the ability needed to compete in the Information Age, is important to be taught to the younger generation since they are in high school level as the cognitive level of the students is likely to have been advanced. One method to teach this skill is through training. This study was conducted to find out topics of digital literacy training in high school students that had done previously. The method used was systematic literature review on six research databases. The findings depict about five different topics, namely knowledge of digital world characteristics, the ability to choose sources of information, the ability to evaluate information, the ability to produce content and the ability to prevent of problematic internet use. In terms of training methods, the findings indicated that methods used to improve digital literacy of high school students were lectures, discussions, playing video games, producing content for blogs, project-based learning, and interactive workshops.

Keywords— *digital literacy training; high school students; systematic review*

I. INTRODUCTION

Indonesia is one of countries with the biggest internet users worldwide [11]. Among other age groups, young people (25-44 years old) have the biggest number among those users while there are also increasing number on the age group of 10-24 years old [4]. Unfortunately, the increase of false news, hoax, hate speech, cyber bullying, online pornography and misuse of data is also growing bigger. This growing number of negative online activities has become a concern of many stakeholders, from government to grassroots movement. One of the aspects that should be increased regarding to this case is digital literacy skills.

The development of digital technology brings to Information, Communication, and Technology (ICT) to maximized and could not be ignored of administration affairs in country (Mutiarin, YP Moner & Nurmandi, 2019).

Digital literacy is the ability to use and understand information in various forms from so many sources that are displayed through computers or other digital devices [9]. Many stakeholders had tried to improve the rate of digital literacy among young adults in Indonesia [13]. Research conducted by Kurnia & Astuti (2017) showed that there were

several methods used by digital literacy activists in the digital literacy movement in Indonesia, including socialization or lectures, workshops or training, seminars or discussions, research, talk shows, publications, campaigns and advocacy, curriculum, and others (competition and mentoring and establishment of an anti-hoax unit).

From various efforts mentioned in Kurnia & Astuti's work, there had been no specific training developed for high school/equivalent students. Therefore, this study would serve as part of creating a digital literacy training module that consists of systematic literature review and module validation study.

Previous researches on systematic literature review were made for various goals. The aim of this study was to look for the pattern of previous studies related to the topics of the digital literacy training for high school students.

II. LITERATURE REVIEW

A. Systematic Literature Review

Systematic literature review is conducted to look at the previous literature and to know the pattern of the studies that have been carried out [16].

The stages in conducting a systematic literature review are as follows [16] : 1) Determine research questions, inclusion criteria and exclusion criteria, 2) Determine keywords and keyword combinations that will be used to guide search, 3) Determine the journal databases that will be the place of search, 4) Search the databases based on a predetermined keyword combination, 5) Make a selection based on the title of the article, 6) Make selections based on abstracts, 7) Make selections based on full articles (full text reading), and 8) Extracting selected articles.

B. Digital Literacy

In literacy studies, the term digital literacy has many variations. As revealed in a literature review conducted by Ala-Mutka (2011), several terms related to digital literacy are computer literacy / ICT literacy, internet literacy / network literacy, information literacy, and media literacy. These variations illustrate the emphasis on different skills according to the terms used. For example, the term information literacy emphasizes skills to access, choose, and use information as needed. Another example, the issue of media literacy underscores a good understanding of the variety of various media available and how the message is delivered in each of

these mediums, including how to actively participate in creating content in the media.

The utilization of technology as tools in media affairs makes smart citizens in more beneficial and efficient, Due to important things to do created good media as tools more useable for all citizens (Fradiyah & Nurmandi, 2018). Thus, the ICT has strong effect for all aspect included implementation of government affairs and policy organizer, hence, the involvement of ICT toward public services organization (Supardal et all, 2017).

According to Gilster & Glister (1997), digital literacy is the ability to understand and use information in a variety of forms from so many sources that are displayed through computers and other digital devices. Digital literacy is the ability to use information and communication technology to find, evaluate, create and communicate information that requires cognitive and technical abilities [2]. Meanwhile, according to the European Commission, digital literacy is a person's awareness, attitudes and abilities to properly use digital equipment and facilities to identify, access, regulate, integrate, evaluate, analyze and synthesize various digital sources, form new knowledge, create expressions media, and communicate with other parties, in specific life contexts, in order to achieve constructive social action and reflect on each process carried out [14].

Aviram & Eshet-Alkalai (2006) define digital literacy as a set of cognitive, social-emotional, and procedural skills needed to carry out activities and solve problems in the digital environment. Whereas Littlejohn reveal that digital literacy is a capability or ability to grow inside and beyond education, in an era where communication and information in digital form dominate [6].

From the various definitions, it can be concluded that digital literacy is the ability to access, evaluate, and produce information through digital equipment according to the context.

III. METHODOLOGY

In this study, a systematic literature review was carried out to find out:

- a) Topics of digital literacy training taught for high school students
- b) Training methods that have proven effective for conducting digital literacy training for high school students
- c) Results of the intervention/program

The purpose of this systematic literature review was to get the concept of digital literacy training that would be given for high school students. The databases used were online databases such as JSTOR, EBSCO, SAGE Journal, SciVerse Scopus, ERIC, Wiley Online and gray literature. These databases were considered to have a complete collection of psychological interventions in the field of education, had a contemporary collection and could be accessed by researchers.

The limitations of the literature search are:

- 1) Journals that have gone through peer review in English or Indonesian

- 2) Published in the period 1997 to 2018.

The assessment of relevance journals was guided by the objectives and review questions. The literature that was continued for review was research containing training and preparation for digital literacy training for high school students and had the results or evaluation of the program.

Inclusion criteria for this study were as follows:

- Studies containing information about the curriculum and / or the topic of digital literacy training
- Study with high school / equivalent students as the subject
- Studies reporting the results of evaluations from digital literacy training programs
- Studies containing the following keywords:
 - Digital literacy
 - Media literacy
 - Information and telecommunications literacy (IT literacy)

An exclusion criterion for this study was studies using languages other than Indonesian and English.

The search using the search words is listed in Table 1, while the combination of keywords is listed in Table 2.

TABLE I. VARIATION OF KEYWORDS

Keyword(s)	Variation of keywords
Digital Literacy	Media Literacy, ICT Literacy
Training	Instruction, Tutoring, Coaching
High school Student	Secondary school students

TABLE II. BOOLEAN SEARCH COMBINATION

No	Boolean search combination
1	digital literacy AND training OR instruction OR tutoring OR preparation AND high school student OR secondary school student NOT university student
2	media literacy AND training OR instruction OR tutoring AND high school student OR secondary school student NOT university student
3	ICT literacy AND training OR instruction OR tutoring AND high school student OR secondary school student NOT university student

After selecting articles based on the criteria, all of the articles were analyzed qualitatively with the method of thematic analysis. In this method, the data were extracted thematically from the selected articles based on the aim of the study.

IV. RESULTS AND ANALYSIS

The literature review carried out involved 8 selected journal articles from the initial number of 1527 ++ journal articles. The databases used in searching journal articles were ProQuest, Scopus, EBSCOHost, JSTOR, ERIC, Wiley Online, and Google Scholar. Year of publication ranged from 1997 to 2018.

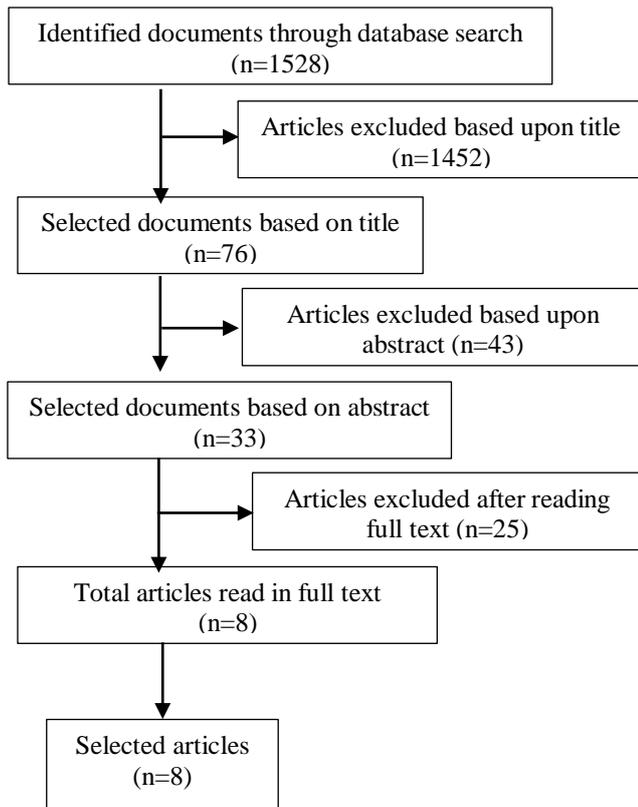


Fig. 1 PRISMA flow diagram for identifying studies to be reviewed

The process of systematic literature review began with 1528 which was found through database searches. Of the 1528 journals, further screening was carried out according to the inclusion criteria that had been made. Based on the title selection, 76 articles passed. Then, based on abstract selection, 33 articles were declared to have passed. In 33 articles, screening was carried out more deeply and thoroughly. As a result, there were eight articles that passed the criteria. The 8 articles were then extracted and Table 3 below showed the results of the thematic analysis.

TABLE III. Result

Title	Topics	Training Methods
Collaborating for academic success: a tri-institutional information literacy program for high school students	Some of the topics taught included making search plans, using online catalogs, introducing databases, information related to print collections, as well as research-related consultations	project-based learning in collaboration with academic libraries and local public libraries
Developing skills in digital contexts: video games and films as learning tools at primary school	(1) working on content, (2) editing and producing	video-game & blog
Developing web literacy in collaborative inquiry activities	(1) search strategies on the web, (2) reading and interpretation strategies, (3) assessment and evaluation strategies	project-based learning activities (in this case, the project was making brochures

Promoting literacy in digital age: approach to training for information literacy	Case study 1 : recognition of a need for information, choice of appropriate sources, information retrieval, evaluation of retrieved information, organization of information, communication and storage of information, and effective use of information. Case study 2 : the nature of digital literacy, information and communication technologies, the library in society, information resources, digital information in libraries, finding and accessing information, evaluating and organizing information, training the trainer, libraries in the digital age, and digital literacy in open societies	about healthy food) Lectures, seminars, practice classes, student presentations, e-learning, discussions, etc.
The effects of BeNetWise program on youth media literacy: A mixed methods research	The media literacy component targeted through this program: (1) functional consumption, (2) critical consumption, (3) functional consumption and (4) critical assumption	This program was delivered in the form of learning, classroom activities and interactive workshops for around 2 years.
Design of Contents for ICT Literacy In-Service Training of Teachers in Korea	(1) information society, (2) information devices, (3) information processing, and (4) information sharing and handling	Not stated
An Evaluation of a Media Literacy Program Training Workshop for Late Elementary School Teachers	identification of the purpose of a message, understanding the impact of a message on a particular group, identifying persuasion techniques on a message, and analyzing and evaluating content in a message	Not stated
Effects of a Brief School-Based Media Literacy Intervention on Digital Media Use in Adolescents	Internet use, online communication, gaming, and gambling	Group discussion, reflection session

A. Training Topics

In conducting digital literacy training for high school students, a number of topics or material for training were found. These various materials could be grouped into five topics, namely 1) knowledge of the digital world characteristics, 2) the ability to choose sources of information, 3) the ability to evaluate information, 4) the

ability to produce content, and 5) the ability to prevent problematic internet use.

1) Topic 1: Knowledge of the digital world characteristics

This topic included an introduction to the digital world, the psychological characteristics of the digital or internet world, and information characteristics that exist in the digital world. From the systematic literature review from 2 of the 8 journals, it was mentioned that these topics were needed to be taught in order to improve digital literacy. This knowledge is important because the lack of understanding of the characteristics of the digital world can lead to misuse cases of information, violation of privacy, miscommunication, and others.

In the first case study presented in the research conducted by Bawden & Robinson (2002), the topics included in this category were related to awareness and recognition of the need for information. While in the second case study of the same study, the related topics were the characteristics of digital literacy, information and communication technology, and library position within the digital community.

In Kim, Jung, & Lee's (2008) research, the topics included in this category were information society and devices. The topic of information society discussed about the protection of information in the digital world, including privacy and personal information provided information protection technology in a network, and how technology has changed ethnic and legal issues, as well as ethics in the use of software. Furthermore, the topic of information devices discussed the architecture in computer systems, the principles of operating systems and their usage, and the principles and components in a network. Based on the two journals above, it can be concluded that the knowledge of the digital world characteristics becomes important knowledge in improving digital literacy.

2) Topic 2: The ability to choose the sources of information

From 4 of the 8 journals from the systematic literature review, it was known that this topic was needed to be taught to improve digital literacy. This capability is important because the digital world is composed by various sources of information with their respective characteristics. If the students can recognize the characteristics of existing information sources, then they can determine the sources of information obtained. It means that their ability in digital literacy can be classified as good.

In the research conducted by Angel & Tewell (2013), there were topics related to this category including making search plans, using online catalogs, introducing databases, and information regarding print collections. Similar topics were also found in research conducted by Kuiper, Volman & Terwel (2009), Bawden & Robinson (2002), and Cheng et al. (2017). Based on those 4 journals, the ability to choose the sources of information can be achieved if the students know some materials such as the knowledge about the types of media in the digital world, types of information sources in the digital world, and strategies in accessing information in the digital world, including compiling search plan and choosing a valid source of information.

3) Topic 3: The ability to evaluate information

This ability includes strategies for selecting information in the digital world and understanding the process of incoming information to the users. From 5 out of 8 journals from the systematic literature review, it was revealed that this topic should be taught in order to improve digital literacy. This capability is important because any information that appears on a digital device has its own process and message. With this ability, students can choose information that fits their needs, analyze the message in that information and evaluate whether the information will be used or not.

Research conducted by Checa-Romero (2016) used topics that fall into this category, namely "working on content". While in other studies conducted by Kuiper, Volman & Terwel (2009), the topics included in this category were assessment strategies and information evaluation. Bawden & Robinson (2002) in their research used the topic of information retrieval, evaluation of information received and organization of information received on the training method they did. In addition, Scull & Kupersmidt (2011) specifically used topics related to this category in the module, including identification of the purpose of a message, understanding the impact of a message on the group, identifying persuasion techniques on a message, and analyzing and evaluating content which exists. Based on the results of the systematic review, the materials needed to achieve this ability are the identification of goals, impacts and persuasion techniques in a message and understanding the process of arriving at information.

4) Topic 4: The ability to produce content

This ability includes knowledge of copyright, information processing strategies in the digital world into digital content, and the ability to participate in the digital world through content creation. From 4 of the 8 journals from the systematic literature review, it was known that this topic needed to be taught to improve digital literacy. This ability is needed in order to become citizens who can participate wisely and do not violate the rights of others in producing information / content.

In the Checa-Romero (2016) study, the topics taught in relation to this ability were editing and production of content. The students were asked to reflect on the activities they did in the previous stage into the content published on their respective weblogs. Meanwhile, the study carried out by Bawden & Robinson (2002), the topics related to this category were the effective use of information in the context of open societies and communicating information obtained in accordance with the objectives.

Kuiper, Volman & Terwel (2009) in their research used the term "functional assumption" to describe the ability to create content using existing technology and "critical assumptions" to describe the ability to create content and understand the social impact of content created. This capability is very needed in activities in the digital world as wise internet users. This was also mentioned in the research conducted by Kim, Jung, & Lee (2008), in which information sharing activities were also one of the topics taught in the training.

5) Topic 5: The ability to prevent Problematic Internet Use

It includes reflections of internet usage from the duration and types of activity, especially those related to online gaming activities that can lead to problematic internet usage. Research including this topic was conducted by Walther, Hanewinkel, & Morgenstern (2014).

B. Training Methods

Of the eight journals that were successfully obtained, not all articles clearly and specifically included the training methods used.

Based on the findings of the review obtained, the method used in the training was project-based learning in collaboration with academic libraries and local public libraries. In this method, students were asked to arrange a research project for one semester in groups. During the course, the students obtained facilities in the form of consultation sessions with mentors, training using online catalogs and compiling search plans, and compiling research frameworks [3].

Other methods used were video games and compilation of blogs that contain learning outcomes obtained through video game activities. In the study compiled by Checa-Romero (2016), learning activities consisted of two phases. The first phase was working on content which includes playing video games together and comparing the scenes in the movies and the episodes in the games. While in the second phase, namely the editing and producing phase, the activities carried out by students were compiling content that would be displayed on the blog based on activities in the previous phase. In this phase, students were asked to share their activities in the previous phase by displaying images and writing them according to their intended and targeted audience.

In the research conducted by Bawden & Robinson (2002), the methods used in the training were lectures, students' presentations, e-learning, and discussions. While in the study carried out by Cheng et al. (2017) and Walther, Hanewinkel, & Morgenstern (2014), training was provided with interactive workshop and various activities in the classroom.

C. Training Results

In the study of Angel & Tewell (2013) and Bawden & Robinson (2002), no specific outcome was mentioned. While in the Checa-Romero (2016) study, based on an analysis of the results of participant discussions, several outcomes were obtained such as digital literacy and collaborative learning, critical thinking, children as creators, and a culture of participation.

Kuiper, Volman & Terwel (2009) in their research revealed that web literacy skills were outcomes of measured research. In research using this project-based learning method, students were given instructions to make a brochure about healthy food. The content that would be displayed in the brochure was obtained from searches conducted on various websites. In collecting this content material, students were taught about web literacy skills.

Moreover, Cheng et al. (2017) and Scull & Kupersmidt (2011) in their study measured increasing numbers of media

literacy in participants. Cheng et al. (2017) provided an intervention in the form of media literacy training for high school students in Hong Kong, China. After participating in the program for about 2 years, it was seen that the subjects have experienced an escalation in media literacy skills, especially in the aspects of functional consumption and critical consumption. In the Scull & Kupersmidt (2011) study, subjects who were teachers in grade 3, 4 and 5 in elementary school received training about how to teach media literacy to their students. This training was also proven can effectively increase the literacy rate of the subjects.

Another training provided in research by Walther, Hanewinkel, & Morgenstern (2014) also proved that it was effective on decreasing online gaming behavior. Research by Kim, Jung, & Lee (2008) did not produce results in the form of increasing knowledge and skills, but in the form of training topics and details presented in ICT literacy training for prospective teachers.

V. CONCLUSION

Digital literacy as one of the ability needed in the Information Age is crucial to be taught since high school, and training can be one of methods to deliver it. This study highlighted five topics that should be included in digital literacy training for high school students. For further inquiry, there should be validation of the training module.

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