International Journal of Engineering & Technology, 7 (4.33) (2018) 182-185

SPC

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Understanding Technology Literacy: The Characteristics of ICT Literacy Vocational Teachers

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Abstract

Information and Communication Technology (ICT) Literacy is the ability to use digital technology, communication tools and/or networks to define, access, manage, integrate, evaluate, create and communicate information well and legally toward a knowledgeable society. This literature study looks at the level of ICT literacy of vocational high school (SMK) teachers. The purpose is to determine the ICT literacy skills of vocational teachers in integrating and assessing ICT learning. The method used is literature review by searching and selecting articles / journals with suitable topics which then are proceed to analysis. The results of this literature study are to look the ICT literacy of vocational school teachers in using technology to conduct learning in the classroom.

Keywords: *Literacy; Information and Communication Technology; vocational teacher.*

1. Introduction

Teachers' ability to integrate ICT is the key to success in the learning process. This is in line with the 21st century learning that requires teachers to have ICT skills [1]. Integration of ICT in learning can make learning environments more dynamic of which the students can be more directed and motivated to learn [2].
Research related to teachers' ability to use ICT in learning [3, 16] suggest that the ability of teachers to access ICT is still low. Besides conducting research on teacher's ICT literacy level based on their age and gender [3] the study showed that teacher's age influences teachers' knowledge of ICTs, where young teachers were more knowledgeable and able to use ICT compared to older ones. Furthermore, the study revealed that male teachers were more aware and able to use ICT compared to female teachers. This is in line with [4] research which suggests that teacher skills in accessing information technology and technology is influenced by age, teaching experience, anxiety, attitudes, computer use and access, and school facilities.
ICT literacy for teachers also provides benefits in developing effective learning and can expand access to information, so teachers and students can develop knowledge-based learning communities [5]. Besides, the use of ICT in learning [6] can be used to; (1) extend teacher's knowledge background; (2) learn that is more dynamic and flexible; (3) overcome the limitations of teaching materials / learning resources; (3) contribute and enrich teaching materials / learning resources; (4) implement Student Active Learning (SAL), CSBA, and PAKEM. Among the advantages of using technology [15] are speed, accuracy, operation, easy to operate, can hear and inform, and can approach various technical knowledge and students can immediately manipulate.
This research is also expected to provide information about ICT literacy application for teachers and students as well as the characteristics of ICT literacy in vocational schools. This literature review is presented with preliminary systematic description that explains ICT Literacy and Vocational Teacher ICT Literacy in brief. The writing method is done through searching and selecting articles / journals with appropriate topics and then analyzed. The appropriate research topics and findings are included in the results and discussion to support this literature study.

2. Methodology

The research method is divided into two, i.e. searching and sorting and data analysis. Research is limited to the topic of ICT literacy and ICT literacy of Vocational teachers. The review of this topic refers to empirical findings. The first stage is the search and sort the electronic databases by using keyword ICT literacy and ICT literacy level of vocational teachers. This electronic database is used as research reference obtained from ERIC, Elsevier, Taylor and Francis online, Special Encyclopedia of Education, and resources from other books.
The next stage is data analysis stage. Databases that have been collected and sorted are then analyzed according to the purpose of this literature. Each article is read, analyzed and summarized according to the needs of this literature review study. This is repeated for all databases that have been owned and in accordance with the topic category of this research.

3. Results and Discussion

3.1. ICT literacy

The term literacy comes from Latin word "literature" which means letter. Literacy has the meaning of literacy so that people who have the ability to read and write are called literate or literate people [7]. According to UNESCO, literacy is the ability to identify,

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understand, interpret, create, communicate and calculate, print and write materials related to various contexts [12]. But, the notion of literacy in 21st century in white books [8]. Besides reading, writing also has the following meanings; (1) Technology literacy: the ability to utilize new media such as the internet to effectively access and communicate information. (2) Information literacy: the ability to collect, organize, filter and evaluate information and to form solid opinions based on that ability; (3) media creativity: individual capacity that continues to grow everywhere to create and disseminate content to various audiences; (4) Social responsibility and competence: the competence to take into account the social consequences of online publications and the responsibility for children.

Information and Communication Technology (ICT) means information technology and communication technology. Information and Communication Technology is everything related to processing, manipulation, management, transfer of information between media [16]. ICT is a technology term intended for effective use of information and communication through different means [16-17]. It is divided into hardware such as computers, notebooks, smart phones, tablets and software such as operating systems, applications, browsers. Thus the notion of Information and Communication Technology (ICT) literacy is one's ability to use digital technology, communication equipment, and internet networks to access, manage, integrate, evaluate and create information as an information function in society [9].

The ICT literacy area, according to the results of the International ICT Literacy Panel in 2007, has five components, i.e.:

a. Access: Knowing what and knowing how to collect and / or retrieve information.
b. Manage: Organizing or classifying existing patterns and ways.
c. Integrate; interpret and represent information. This involves summarizing and comparing information into everyday life.
d. Evaluate: Assessing the quality, relevance, usefulness, or efficiency of information.
e. Create: Produce information by adapting, implementing, designing, creating, or writing information [10].

The Ministry of Communication and Information Affairs of Republic of Indonesia provides ICT literacy levels as presented in the following table.

Table 1: ICT literacy level according to the Ministry of Communication and Information Affairs [11]

Level 0	If an individual does not know at all and does not care about the importance of information and technology for everyday life
Level 1	If an individual has had one or two experiences, information is an important component to achieve the urge and problem solving, and has involved information technology to look for it.
Level 2	If an individual has repeatedly used technology to help with daily activities and has a repetition pattern in its use
Level 3	If an individual has standards of acquisition and understanding of the information or technology which is needed, and consistently uses these standards as a reference to carry out daily activities
Level 4	If an individual has been able to significantly improve (can be described quantitatively) the performance of his daily life activities through the utilization of information technology.
Level 5	If an individual has accepted information and technology as an inseparable part of daily activities, and has directly or indirectly influenced his behavior and culture (part of information society or human information)

The challenge for vocational education is to achieve a broader and deeper understanding of technological literacy which in turn, can contribute to the development of teaching practices in the future. In fact, teachers are faced with new and innovative technology throughout their work at school. Interactive whiteboards, I-pad and e-books will be provided for schools and teachers must develop their understanding of these new technologies. School teacher competency standards based on UNESCO in Table 2 [12].

Table 2: Teacher competency standards for vocational schools based on UNESCO [12]

Approach of Technology Literacy		
Vision and Policy	The policy objective of this approach is to prepare students, citizens and workers to take new technologies so they can support social development and increase economic productivity. Education policies related to goals include increasing school enrollment, making quality resources available to all, and enhancing basic literacy skills, including technological literacy.	
	Curriculum Objective	Teacher Competence
Policy	Police Awareness: With this approach, the program makes a direct connection between policy and practice in class.	Teachers must be aware of policies and can determine how to practice in class in accordance with government policies and support
Curriculum and assessment	Basic Knowledge: The curriculum changes adopted by this approach include enhancing basic literacy skills through technology and adding ICT skills development in relevant contexts, which will involve time in other subject curricula to incorporate relevant ICT resources and tools to improve learning productivity	Teachers must have strong knowledge of subject curriculum standards and knowledge of standard assessment procedures. Besides, teacher must be able to integrate standards of technology utilization and technology for students into the curriculum.
Pedagogics	Integrating Technology: Changes in pedagogical practice involve the integration of various technologies, tools, and e-content as part of entire class, group, and individual activities of students to support effective learning processes.	The teacher must know where, when and how to use technology for teaching and learning activities and presentations.
ICT	Basic Tools: The technology involved in this approach includes the use of computers along with the software; web content; and the use of internet network to support learning.	The teacher must know the basics knowledge of hardware and operate the software such as the supporting applications, web browser, communication, presentation, and application management.
Administration and Settings	Class Standards: Small changes in social structure occur in this approach, spatial placement and integration of technological resources in the classroom or in the laboratory.	Teachers must be able to use technology throughout the class, small groups, and individual activities and ensure equal access.
Teacher Professional Development	Digital Literacy: The implications of this approach to teacher training focus on developing digital literacy and the use of ICTs is to improve teacher professionalism.	Teachers must possess technological skills and knowledge of Web resources which are needed to obtain additional subject matter and pedagogical knowledge in support of the teacher's own professional development.

From the description above, ICT literacy by teachers is expected to have a positive influence on the education progress, so it is very important for teachers to know ICT competencies. There are also characteristics of ICT literacy described in Figure 1 [27].

Characteristics of Users at Various Level of Technology Literacy

	Typical Activity	Literacy Question
Awareness	Hear about new technologies Learn of capabilities of new technologies	What can it do?
Praxis	Practice customary implementation Ex-plore/attempt variety of applications	How do you__? Do you? Are you?
Phronesis	Effective use of technologies capabilities Discerning/appropriate use of technologies	Why are you?

Fig. 1: The Characteristic of ICT Literacy

This framework involves three levels: awareness, praxis and phronesis. This understanding is the highest level that is logical and aims to develop ICT policies. Students need to be literate or have certain level of technological awareness. Besides students, teacher becomes an important person in understanding and moving in using technology. Basic goals and remote functions. This is literacy at the most basic level. They are able to answer the question, what can technology do or give? [27-28].

At the praxis level, teachers are expected to practice using ICT wisely and begin to get used to using ICT in learning activities. It is expected that the teacher will be able to complete simple tasks. Someone at this level can answer the question: how do you use this technology? This is a procedural form of knowledge [27-28].

Phornesis level is the highest level of ICT literacy where teachers have been able and got used to using ICT. They are skilled in learning new technology and are not afraid to choose, whether they will use it or not. At this level, it will be able to answer why. Why do I use or not use technology in learning? The highest level of ICT literacy is able to develop the conceptual or conditional attainment or knowledge [27-28].

3.2. ICT Literacy of Vocational Teachers

Before looking at the teacher's ICT literacy, we should look at students' ICT literacy, so that researchers can find out how teachers should address the development of their students both at school and in their homes. From the results of his research on ICT literacy of students in Europe, it can be seen that ICT literacy of students will provide efficiency and effectiveness of the learning process in the classroom [13], the research was conducted using survey method carried out to 60 students shows that ICT literacy students will improve student competence, effectiveness and efficiency of the learning process and can provide student adaptation to work world, so that they have more opportunities for success in the community. Other findings have found that ICT literacy of students has not utilized the school library much, the skills of ICT literacy students are still lacking, especially in terms of "information search strategies", "location & access" and "use of information". ICT literacy of students is also influenced by the type of school, subject and family background [14].

Therefore, from some of the findings above, the teacher must prepare himself better in the learning process. ICT literacy teachers have an important role in the success of classroom learning. The results of his study of 8 art teachers in junior and senior high schools in China were carried out using a qualitative method with an ethnographic approach [2]. The result is quite significant ICT teacher literacy towards art learning. The following are ICT teacher art literacy modelling.

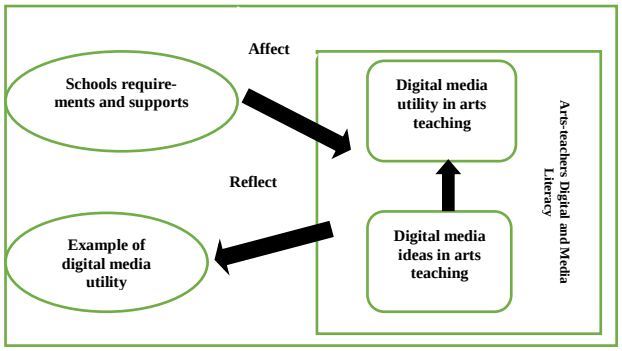

Fig. 2: Art Teacher ICT Literacy Model

From Figure 2, four categories show the ICT literacy of art teachers in the teaching process, and this cannot be separated from each other. For example, teachers' ideas about using media in art teaching and the requirements of school media use influence the way they choose different media. The use of tools and ideas in finding digital media are two aspects of the ICT literacy of art teachers. School support directly influences teacher digital media use. ICT is a tool which has been globally recognized. It needs to be fully integrated in all fields of education, especially vocational schools, given the sophistication of this technology continues to grow and one of them influences the development of Human Resources (HR), industry and humanity in both the public and private sectors. In the implementation, there needs to be an ICT readiness component to support ICT literature in Vocational Schools as illustrated in Figure 3.

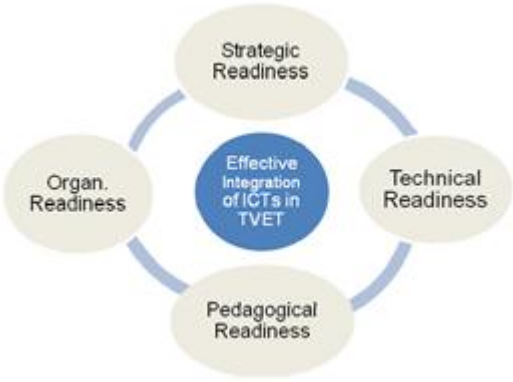

Fig. 3: The component of ICT readiness

The effective integration of ICTs in Vocational Schools cannot be fully realized without some shortfall, either material or human. Some problems which have direct relationship to the topic are identified by researchers in this study [17-18]. This ICT application has successfully shown significant results in various fields of education in student learning outcomes. The challenge in the development of ICT in education is the ability of teachers to integrate ICT in learning [18-19].

Teachers must be able to encourage and instill teaching and learning which promotes creativity, critical, innovative and high-level thinking skills rather than conceptual knowledge, procedural knowledge, and memorization. This application has been carried

out in Malaysia, given the need to change the culture of assessment towards the application of ICT [20]. Furthermore, a research was conducted in Sudan with vocational teacher respondents using quantitative methods. It was done using questionnaires to 130 men and 38 women and the data were analyzed through ANOVA and Independent sample t-test in SPSS version 20. The findings showed that the use of ICT influences demography and age. Young people are more advanced than older ages, and thus ICT training is needed [15].

Digital classes have been proven to produce pedagogical designs and the development of information literacy competencies and critical thinking skills for both students and teachers [21]. Besides, ICT literacy provides convenience, innovation and creates active learning for students, so as to encourage increased competence, ability and knowledge of students in practicum [22-23]. Basically, ICT provides convenience as it can be accessed anytime and anywhere. Besides, active learning, ICT literacy is able to provide independent learning for students [24]. Teachers must be able to provide innovations in ICT literacy so that students are more interested and continue to develop their abilities [25-26].

4. Conclusion

ICT literacy teachers influence teachers' knowledge and abilities in developing classroom learning, so that students can easily implement knowledge through ICT. In order to improve the teacher's ICT literacy, trainings need to be done organized by schools. It can begin by searching, processing, analyzing, interpreting information and data obtained during face-to-face and online learning. With the improvement of ICT literacy skills, teachers are expected to have creative and critical thinking, teachers can diverse media and methods so the learning implementation are more interesting, innovative, interesting, and enjoyable.

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