

Teachers' Skills and ICT Facilities for Science Learning at Senior High School in Padang City

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The aims of this study are to determine the level of ICT accessibility outside the school related to teachers' personal ICT development, to explore the main purpose teachers make of computers and internet utilization, to observe teachers' attitude toward ICT, and measure teachers' skill and their implementation of ICT in teaching science. Data was drawn randomly from 30 Senior High School teachers across Padang city with analysis presented in descriptive percentage, mean and deviation standard. The results revealed that less than half of the respondents possess computers outside the school, though more than half have internet access. The intention of internet and computer availability is to facilitate teachers access to teaching resources and to accomplish school tasks. The research reveals that teachers' attitude toward ICT is high, in contrast, teachers' skills in delivering learning based on ICT is low. Furthermore, teachers' skill on ICT use in teaching science is at a modest level. The implication of this research is to recommend upgrades teachers' knowledge and skills in designing as well as delivering learning based on ICT. Teachers Training Institutions are recommended to redesign their curriculum and set computing as one of their compulsory subjects.

Introduction

Changes in education requires dealing with innovation in technology, and a demand for higher knowledge from graduates, in both quality and quantity. Information and Communication Technology (ICT) plays important roles in this matter. Palloff and Prat (2000) stated that higher education institutions have evolved by inserting ICT in their programs, especially e-learning, which has triggered a huge change for students and educational institutions. In this ICT era, where computers are the tool for receiving and delivering information rapidly, skill and

knowledge related to ICT are mandatory for new generations. The one who is mastering ICT is the one who succeed in life. ICT developments facilitate effective teaching and learning process, however, this implementation is affected by learning environment, such as school, campus, and community. Kryukov and Gorin (2017) considered that implementation of education based on digital technology in higher education is feasible, though it requires university readiness. There are three interconnecting criteria in educational process; methodology, technology and professionalism. These models are suggested as the base of digital technology development in educational process. Kryukov and Shakhgeldyan (2007), stated that information technology ensures processing, presenting and publication of data related to education and assists teachers in providing required teaching learning materials, helping their teaching approach. Some experts argue that information technology: a) improves education quality by using comprehensive information and stimulate students' motivation and tutorial activities; b) increases individual efficiency and intensity of learning; c) adapts new education technology and converts education process from passive to active learning; d) information support in various integrated activities; e) transforms learning culture and reduce teacher's dependencies; and f) increase quality of assessment on computer bases. "Knowledge is power" means that the one who has knowledge, has a better chance to be successful in the world. For that reason, cultivating IT and ICT at school and higher education are necessary, so that students as well as teachers are able to keep updating their knowledge. When students have positive viewpoint and admit IT & ICT challenges, it is valuable for their future. Zoraini (1997) explained that if we step back to the past, we might still have chosen information and communications technology path, because only those who are willing to upgrade their knowledge and skill will succeed in the future community. Education based on digital technology innovation in higher education is a major factor fostering innovative change in educational processes, subsequently, digital technology is one of the key mechanisms in creating competitive difference in the educational market (Kryukov & Gorin, 2017). There are several essential external factors that affect the implementation of digital technology at universities that need to be considered, such as, demography, globalization, student's age, education reformation and new technological challenges. IT facilities in universities need to be developed accordance to those factors. And in order to develop quality in education, progressive technologies are required to be applied. Information technology to collect, process,



present and publish educational data, to assist tutorials by providing the learning material needed for teaching-learning activities, as well as to identify the divergence and adjusting content of the materials to the pedagogic approach in particular group of students. Scholars argue how information technology is valued in learning enhancement in university (Kryukov & Shakhgeldyan, 2007) where social technologies foster significant changes in accordance to individual's social organization and level. (Griesbaum J, 2017). IT & ICT sophistication facilitates teaching-learning process, to boost learning effectively that leads to improvements in educational quality. Despite extensive utility in education, ICT use is affected by political and social climate, defining the environment of student learning, school or campus, group and community. The development and change brought on by science and technology have resulted in massive change in economies, industry, commerce, socio-cultural environments, and national politics (Yusof, 2000). These changes have forced educational institutions to be respond and implement sufficient IT and ICT, with the objectives that students and teachers are able to gain knowledge in more effective ways, so they can compete in the workplace. Western countries such as the USA and Britain have been pioneers in the use of these technologies and have obtained the benefits for more than 50 years. They are continuously researching and developing IT and ICT technologies, realizing its necessity, and supporting knowledge, skill development, and a positive view toward ICT enabled population, able access information and make use of IT developments in all aspect of human life. It is necessary to understand that computers and technology are only tools, therefore their utilization can make positive and negative impacts. Religion and moral values in education are required for each student in order to able to differentiate which are knowledgeable and destructive information, personally and to the community. Rodriguez (2003) describes various approaches and strategies simulated on library research regarding internet utilities as a learning tool for students, such as WebQuest, its core activity on engaging students through a web based constructive approach. Carroll et al (2003) argued that the main challenge faced by training institutions and universities is digital technology utilities. One of the keyways to cope with this challenge is re-establish traditional training through the use of information technology. Every student has their own learning style, thus the materials presented by a teacher will interpreted differently. Noisy classrooms, students moving around the class, consequence teachers more likely to apply a teacher centred approach rather than a constructivism approach (Moursund



2003). Constructivism, however, has some weaknesses, for example; it is time consuming, students need to have preparation to perform it in class, lesson plans are unable to have a detailed allocated time. Therefore, constructivism requires planned time allocations (Moursund 2003). E-learning has been defined by Jeurissen. V, (2004) which argued that e-learning is innovative technology utility that change the way of people or particular group to achieve a new skill. In general, this definition refers to learning technology using digital tools, however, Rosenberg, M (2001) defined e-learning as learning technology through the utility of the internet. Furthermore, Martin, G and Jennings, S (2002) also stated that web technology is for design, managed, executing and also directing e-learning process. Haddad & Jurich (2002) proclaimed that ICT potentially improves quality of education through motivating, facilitating to mastering the basic skill, promoting curiosity and explorations, as well as preparing individual for the world which is controlled by technology. Effective learning processes are learning that can boost students' intellect and are fun, so that students actively engage in constructing and developing processes. Most teachers use ICT for preparing learning and completing administrative tasks. There are a small number of teachers who introduce their students to educational software's which are available in High Schools. As a result, ICT utilities are limited to word processing and searching information only. Students complain that they lack knowledge related to ICT utility as a tool to support a new learning method. ICT utility as media and aspect of learning is very limited in Teaching Institutions (Fullan 2001). Web based teaching and learning is a concept that integrates Information and Communications Technology in education system. ICT development is an education advancement that leads to utility of technology in accessing information with the purpose of improving knowledge and achievement. With the aims of improving teachers' quality and professionalism, all teachers have to compete to use the latest information technology, thus ICT would be integrated in teaching learning process. ICT is not only for searching information and learning material through web, but it also involves learning activities which include; online discussion, knowledge construction, managing accountable and unlimited learning environments. In addition, engaging students on learning process via web media, promotes student's creativity and critical thinking, and improves learning among students (Chang 2001). Effective learning in the 21st century is focused on innovation and teacher professionalism in education. Teachers' innovations throughout learning have been applied by Law et al (2002) who shows that where

student attitude was positive, they exerted effort to learn information literacy skills of internet utility, and they created websites to perform their work. Besides that, they put in the effort to think critically, learned from various resources, and learned from their community to respect each other ideas. Furthermore, Jung et al (2002) argued that there are connections between academic, spirit of collaboration, and social interaction toward learning satisfaction, students' engagement, viewpoint about learning environment and web-based learning. Academic interactions refer to all students' interaction and internet learning resources, as well as students –teachers' interactions. Development and evaluation of learning materials along with collaboration among students occur when a group of students can cooperate on doing a topic, idea, and materials to deal with the problem. Thioune (2003), stated that in the last two decades, there have been numerous changes due to ICT, especially in education. In order to verify the effectiveness of technology integration in education, students feedback related to perception and their acceptance about teaching-learning innovations which were done by teachers are required.

Research Purposes

The **purposes** of this research are;

1. Finding out the level of ICT accessibility outside the school;
2. Determining teachers' main purposes of using computer and internet;
3. Finding out degree of teachers' attitude about ICT;
4. Determining teachers' skill in preparing learning materials based on ICT; and
5. Finding out the degree of teachers' skill in ICT utility in science learning.

METHODS AND MATERIALS

This research drew on quantitative methods, where the questionnaire was primary tool of data collection. The population consists of science (Biology) teachers from high schools. A total of 30 teachers were identified as respondents. Data analysis was conducted using the SPSS program, descriptively by determining the percentage, mean and standard deviation.

RESULT

This research employed the following variables: ICT facilities outside the school, teachers' main purpose of internet utility, teachers' aim on computer utility, and teachers' attitude toward ICT, degree of teachers' knowledge about ICT and degree of teachers' skills on ICT utilities on learning, such as presented in table 1; availability of ICT facilities outside the school.

Table 1: Percentage of teachers who have ICT facilities outside school

ICT Facilities		N	Percentage (%) N=30
Having Computer at home	Yes	11	36.4
	No	19	63.3
Internet	Yes	17	56.7
	No	13	43.3
Have ever learned computing	Yes	8	26.7
	No	22	73.3
Printer	Yes	26	86.7
	No	4	13.3

Table 1 shows information about ICT facilities outside schools where 36.4 of teachers have computer in their house, while 63.3 % of teachers do not have computer at home. More than half of the teachers have internet facility at home which is 56.7%, and 43.3% of them do not have internet facilities at home. 73.3% of the teachers have never had computer training, and only 26.7% of them have had. 86.7% of the teacher have supporting facilities such as printer, and only 13.3% of them who do not have.

Secondly, Table 2 explains about the main purposes of teachers using the internet, as follow;

Table 2: The main purposes of teachers using computer and internet

No	The main purpose of using internet	Percentage (%) N=30
1	Searching references	51.1
2	Completing the tasks	22.3
3	Spending free time	7.0
4	Chatting	8.4
5	Entertainment	9.2
6	Others	2.0

Table 2 reveals that teachers' main purposes on using internet for finding references is very significant, which is 51.1% and it is the highest reason among other purposes, followed by

completing the task which is 22.3%, and then for entertainment, chatting, spending free time, and other purposes. Thirdly, Table 3 tells about teachers' attitude toward ICT;

Table 3: Degree of Teachers' attitude toward ICT

Questions	Mean	SD	Interpretation
I like students who have knowledge about ICT	3.70	0.98	High
I like students who make use of ICT facilities at school	4.20	0.71	High
ICT is fundamental in education acceleration	3.70	0.95	High
ICT is essential part in community life	4.23	0.77	High
I am motivated to learn ICT for learning process	3.97	0.80	High
ICT enables teachers to perform learning	4.17	0.53	High
Knowledge about ICT support me on teaching science	3.73	0.81	High
Overall	3.98	0.77	High

Overall, table 3 shows that teacher attitude about ICT is high (min=3.98, DS=0.77), 3 questions about teachers attitudes are on the highest level, they are; 1) teachers like students who make use of ICT facilities at school, 2) ICT is fundamental in education acceleration, and 3) ICT enabling teachers to perform learning. However, teachers who provide learning materials based on ICT are in low degree, as it is shown in table 4.

Table 4: Degree of teachers' skill in providing learning materials based on ICT

Questions	Mean	SD	Interpretation
I have created good macro flash media	2.50	0.75	Low
I can create interactive learning media to make learning more interesting for students	2.27	0.65	low
I can use Microsoft office	2.20	0.96	Low
I can operate all menus on a computer	2.27	0.48	Low
I can present power point for learning process	2.20	0.95	Low
I can provide learning materials through ICT	2.42	0.67	Low
Overall	2.31	0.74	Low

Table 4 describes that overall teachers skill on preparing ICT based learning materials is low, for example; creating good macro flash media, creating interactive learning media to promote learning more interesting for students, operating Microsoft office well, operate all menus in computer and preparing learning materials based on ICT are low (mean score = 2.31, SD = 0,74). There are some possibly reasons for this result. It can be interpreted as follows;

- a) Insufficient ICT facilities for teachers.
- b) Teachers lack enthusiasm to learn ICT.
- c) Inadequate curriculum provided about ICT during their formal education.

The next table is present about teachers' skill on ICT utilities for learning process. Table 5 can be interpreted as follows;

Table 4: Degree of Teachers skill on ICT utilizing for learning process.

Questions	Mean	SD	Interpretation
I use the internet frequently	3.27	0.80	Medium
I use mobile phones for searching learning materials	4.17	0.74	High
I am skilful in using ICT in learning activities	3.17	0.53	Medium
I frequently use in focus in learning activities	4.17	0.83	High
Animated videos contribute profound understanding for students' learning	3.07	0.74	Medium
I prefer to use ICT on teaching-learning	3.03	0.76	Medium
I joined courses in improving my ICT skill	3.10	0.89	Medium
Overall	3.48	0.73	Medium

Overall, teachers' skill on ICT utilities for learning process in a medium level (mean=3.48, SD= 0.73), however there are two questions that present high degree. They are; a) use mobile phone for searching learning materials, b) frequently use in focus in learning activities, while other questions are on medium level.

CONCLUSION

Teachers who have ICT facilities divided into several categories; the number of teachers who have computer facilities is less than who have not. While the amount of teachers who have internet facilities is higher than who have not have internet facilities. The number of teachers who have never learned computing is higher than those who have. In addition, the number of teachers who have printers is higher compared to who have not (see table 1). Furthermore, in terms of purposes, the main purposes of teachers using computers are for searching references, completing tasks, entertainment, chatting, spending their free time and other purposes. Teachers' attitude toward ICT is very high, from the questions given; it can be seen on table 3. However, there are 3 questions which are the highest; ICT is an essential part in community life, teachers like students who use ICT facilities at school, and ICT enabling teachers to perform learning. Concerning, teachers' skills on preparing ICT based learning materials is low, whereas teachers' skills on using ICT in learning is medium, though teachers use mobile phones in searching learning materials at a high level. Similarly, the frequency level of using projectors in learning activities is also high.



REFERENCES

Carroll, V., Legg, R. & Taylor, D. (2003). Redesigning an Undergraduate Geography Course at Trinity College Dublin Using WebQuest. G. Richards (Ed.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Education 2003*, 889-896.

Chang, C. (2001). A study on the evaluation and effectiveness analysis of web-based learning portfolio (WBLP). *British Journal of Educational Technology*, 32(4), 435-459.

Fullan, M. G. (2001). *The new meaning of educational change*. New York, Teacher College Press.

Griesbaum, J. (2017) Trends in e-Learning: Impacts of Social Mobile Technologies on Information Behavior, Formal Learning and the Educational Market. *International Journal of Information and Education Technology*, 7(2).

Haddad, W.D. & Jurich, S. (2002). ICT for Education: Potential dan Potency. Retrieved from http://www.iastate.edu/~ilet/reading_groups/Pdf_files/03UNESCO.pdf

Jung, C. & Cheolil, S. (2002). Effects of Different Types of Interaction on Learning Achievement, Satisfaction and Participation in Web-Based Instruction. *Innovations in Education & Teaching International*, 39(2): 153-163.

Jeurissen, V. (2004). *IBM tackles learning in the workplace*.

Kryukov, V., & dan Gorin, A. (2017). Digital technologies as education innovation at universities *Australian Educational Computing*, 32(1).

Kryukov, V., & Shakhgeldyan, K. (2007). *Corporate information environment of university: methodology, models, solutions*. Vladivostok: Dalnauka.

Law, N., Y. Lee & A. Chow. (2002). Practice characteristics that lead to 21st century learning outcomes. *Journal of Computer Assisted Learning*. 18, 415-426.

Moursund, D. (2003). *Project-based learning using information technology*. International Society for Technology in Education.

Palloff, M.R. & Pratt, K. (2000). *Lesson from the Cyberspace Classroom: The Realities of Online Teaching*. Jossey-Bass.

Rodriguez, S. (2003). Designing WebQuest to Promote Problem-Solving Skills. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2003*, 2164-2167.



Australian Educational Computing, 2019, 34(1).

Rosenberg, M. (2001). *e-Learning: Strategies for Delivering Knowledge in the Digital Age, Organizing Enterprise-Wide E-Learning and Human Capital Management*

Thioune. A. (2003). *Information and communication technologies for development in Africa: Opportunities and challenges for community development*. Ottawa: IDRC.

Zoraini Wati Abas. (1997). *Internet: Naluri Ingin Tahu Perlu Dipupuk*, Utusan Megabait, Utusan Malaysia.