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The Comparative Analysis Of Technological Content Knowledge (Tck) Through The Digital Module And Google Classroom In Integrated Science Learning

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Abstrak

Penelitian ini bertujuan untuk menganalisis perbandingan hasil belajar dan keterampilan *Technological Content Knowledge* (TCK) pengguna melalui teknologi yang digunakan yaitu modul web digital dan *Google Classroom. (GC)* Subjek penelitian ini adalah mahasiswa semester 6 untuk memperoleh hasil belajar. Penelitian ini adalah penelitian eksperimental semu. Penelitian ini menggunakan dua platform e-learning, yaitu modul digital dan Google Classroom, untuk membandingkan hasil pembelajaran dan kuesioner untuk menganalisis kemampuan TCK mereka. Studi ini menunjukkan bahwa ada perbedaan menggunakan modul digital dan menggunakan kelas Google dengan uji t. Penggunaan modul digital lebih meningkatkan hasil belajar kognitif dibandingkan dengan kelas Google. Profil TCK menggunakan modul digital lebih baik daripada menggunakan GC.

Kata Kunci: Technological Content Knowledge (TCK) , Modul Digital, Google classroom, IPA Terpadu

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Abstract

The development of information technology has become one of the measures in ranking the nation's competitiveness. The success of technology integration in education comes primarily from curriculum content, learning processes, and the use of technology in education. A complex planning is needed in order to produce the output as expected, so in this case, the domain of capability in technological knowledge content (TCK) known as Technological Content Knowledge is needed, especially in science material. This study aims to analyze the comparison of learning outcome and TCK skills by user experience through used technology which is digital web modules and Google classroom. The subjects of this study were 6th semester students to obtain learning outcome. This study was a quasi-experimental study. This study used two e-learning platforms, namely digital modules and Google Classroom, to compare learning outcomes and questionnaire to analyse their TCK abilities. The study showed that there were differences using a digital module and using Google classroom by t- test. The use of digital modules further enhances cognitive learning outcomes than with Google classroom. The profile of TCK using the digital module is better than using GC.
***Keywords**: Technological Content Knowledge (TCK) , Digital Module, Google classroom, Integrated Science Learning.*

INTRODUCTION

The phenomenon of the 4th world revolution not only affected the economic sector, but also on the foundation of human resources (Gamar, 2018). The Industrial Revolution (IR) has changed the landscape of educational innovation, where a quick revolution in innovation has delivered another model of education for the future, especially for higher education (Shahroom, 2018). Similar to the previous statement, the global competition of information technology development, compete effort of nation can be enhanced by motivating from high institution (Subekti, et al, 2018). This situation also affects the learning system, where schools starting from the primary education level must prepare a generation that is competent and able to compete on a global scale, especially in the era of digital literacy. We know that Indonesia is a big country should be able to develop literacy culture as requirement for life skills in 21 century with integrated education, start from family, school and then society. Traditional learning system must became a modern learning system, which means learning must using technology that developed today (Aqib, 2018).

There is sufficient evidence that technology usage in teaching- learning process may result in "increased student writing, enhanced cooperative learning, enhanced integration of curriculum (Celik, 2014) (Ertmer, 2003), in other meaning technology provides students with an exxelent way for exploration, motivation and education in diverse world (Barron, et al., 2002)

A complex knowledge planning was needed, it is known as Technological Pedagogical Content Knowledge (Subekti, 2018); (Harris, 2011)— a total package from technologies, pedagogic, contents, and context knowledge skills (TPCK) (Mishra, 2006). A theoretical framework for understanding teacher knowledge required technology integration between all three basic components of knowledge technology, pedagogy, and content) well known as TPCK, and the acronym was changed to TPACK for easier pronunciation (Thomson, 2008). There are 7 relation sub domain of TPCK, they are: TK (Technological Knowledge), CK (Content Knowledge), PK (Pedagogical Knowledge), TCK (Technological Content Knowledge), PCK (Pedagogical Content Knowledge), TPK (Technological Pedagogical Knowledge), dan TPCK (Technological Pedagogical Content Knowledge). The picure below showed the relation between sub domain of TPCK.

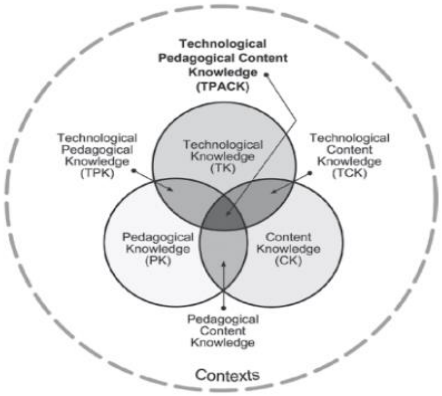


Figure 1. Technological Pedagogical Content Knowledge (Thomson, 2008)

TCK is one of the seventh sub domain of TPACK, which developing technology as a cognitive tool in learning (Listiawan, 2018). TCK or Technological Content Knowledge is a knowledge how to represent material using technology. Many learning terminologies appear to agree with technology development, some of them are e-learning, online learning, web based training, online courses, web based education etc. (Masitoh, 2018). There are can be used as a material in teaching, expecialy in Science.

There are some conseps of science. Science based on (Harsha, 2017) can be defined as a process and as a product. Science

as a process can be defined as a ability to observing, classifyng, measuring, experimenting, questioning, hypothesizing, recording, controlling variables, interpreting data and communicating. Science as a product can be defined as body of knowledge in form of conceps, laws, theories, and generalisations, it have to be transmitted from one to another with direct or indirect class. In developing Distance education is the education of students who always may not be physically present at a classroom, so that the modern use of electronic educational technology (also called e-learning).

Today, there are many technologies developed but only several of them has been used in educations. Web module (digital module) and google classroom can be defined as a plattform of e- learning, but there are only a few studies discuss about that. Google classroom could increased student participation and learning and improved classroom dynamic. The advantage of digital module was able to display some materials with interactive learning. It is in line with the statements of the research results conducted by (Irwandani, 2017), (Sugianto, et al., 2013); (Suwindra, 2012). Only a few of research studies conduct concerning TCK, or there has been no previous research that discussed especialy in integrated science learning about TCK analyze used google classroom and web module. Integrated science is a study which draws upon many disciplines area, such as chemistry, physics, biology, economics, environment, child development, etc. (Deshmukh, 2012). Those two platforms are presented based on scientific literacy that have indicators and are presented in the form of daily cases. This research is expected to be the solution of the problems. A knowledge of science literacy will be benefit students to deal with the various problems they face in daily life. The definition of scientific literacy explained about the ability of scientific knowledge usage, identification questions and description of fact phenomena and human behaviour changing (Rusilowati, 2014). While, the indicators of scientific literacy (PISA, 2010) that would be developed in this Integrated Science digital module are: (a) identification of sciences concept and its application in daily life; (b) sciences inquiry process; (c) sciences understanding; (d) relation of sciences, technology and society knowledge.

METHODS

This study was a quasi-experimental study, with a non equivalent control grup design (Sugiyono, 2010). The participant in this study were 34 to obtain learning outcome between google classroom and digital module. The population in this study were in Science Education at least 6th semester (Science Candidate Teacher). The sample were taken at random cluster sampling technique, which one as experimental class and the other as control class. Digital module was implemented in the experimental class, and gogle classroom in control class. The test method uses postest to obtain cognitive learning outcome. Statistic analysis used t-paired test and independent for representing the conclusion.The research held in may 2019 in 2018/2019 academic year. The 6 statement of questionnares TCK distributed to the 4 participant, using likert scale (1-4) and data analyzed using descriptive persentase. The participant is of user experience is a lecture of science education

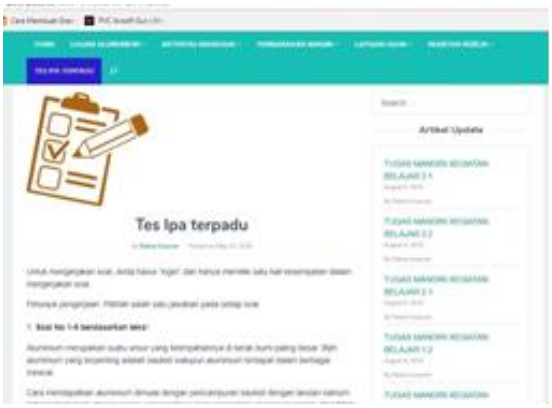
FINDINGS AND DISCUSSION

There are eight aspects for validity of this digital module, they are: contents, rational, characteristic, curriculum appropriate, languages, displays, and flexibility used likert scale (1-4). Validation integrated science digital module was conducted by four experts; material experts, media experts, lecturer, and science teacher. The themes of digital module content are energy, environment and pollution.

The contents in this digital modul consisted of four scientific literacy aspects, they are sciences as a body of knowledge, sciences as the way of investigating, sciences as the way of thingking, and sciences as interaction of science, technology, and society.

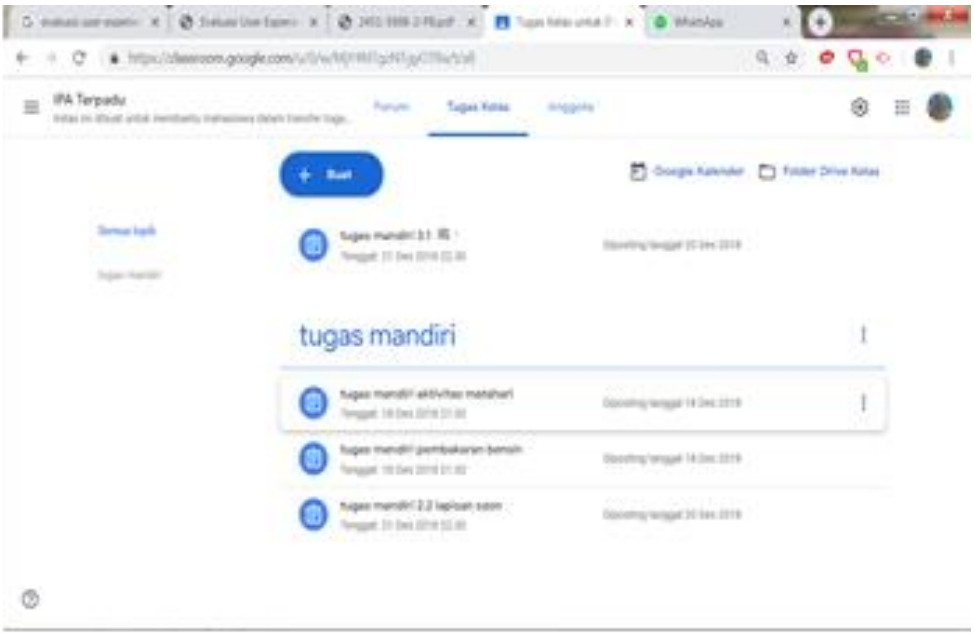
Digital module (Suryawati, 2013) can be meant material which used in e-learning. Module was learning material that consist of arranged contents systematically guide students to learn by themselves and assessment form lectures, besides there were coherent learning experiences explicitly with learning outcome and assignment. According to (Matanluk, et al., 2013) module usage implementation the learning process could enhance thinking ability and active participating on exploring knowledge, Module can be printing out media or arranged with software. Digital module is known as online learning module, it is usually used in the e-learning model. So, this digital module is only able to be accessed online with certain website.

Integrated Science digital module based on scientific literacy with themes of Energy, Environment and Pollution can be accessed at www.ipaterpadu.com. The web module used wordpress as open source system and the content use formatted text which is equipped with scientific literacy indicators, weblinks, topics of discussion, assignment, test or quizzes. Word press features in the module are very possible to be used in learning. There is an online discussion forum in which can be explained on learning materials, quiz and test can be done online and there are also chat facilities for communication between users or author (lecture). The features presented in the Content Management System (CMS) in the blog will provide opportunities for users to improve their creative thinking skills, so blogs are effective enough to be used in teaching and learning (Li, 2013). All students in experiment class would participate using digital module. First, they will be asked to open a table of contents from the digital module, and explore the contents of the module's chapter, a scientific case will be provided, which has several specific instructions. The case questions will then be given some clues that are included in the realm of chemistry, physics, and biology. After that to make them more independent, students are asked to do independent assignments. The last they will be asked to do quizz questions (evaluation tests) in the module as their cognitive learning outcome



Picture 2. Test evaluation based digital module

Google Classroom (GC) based on [25] is a network based platform that integrates a G suite for education account with all G Suite services like Google Docs, Gmail, and Calendar. Teachers can create an virtual classroom as an online learning, they can share study materials, announcements, quizz or questions. The use of GC can be potential in teaching classroom (Iftakhar, 2016) . All student in control class would join via GC for distributing information and interaction (Kim, 2012)]From GC, we also integrated some tools, like google slides to share materials, google drawing tool to create mind maps, or google form to create surveys. Evaluate as cognitive learning outcome on GC using the google form add-in added with timify.me to add a running timer and form limiter that limits the processing time. Thus, the results of cognitive tests in the form of postes are given in the same way as evaluations in digital modules.



Picture 3. Test evaluation based Google clasroom

Based on the evaluation test, the use of digital module is better than google classroom based on their cognitive learning outcome.

Table 1. The result of t-test post test

class	Sig (2-tailed)	information	
control experiment	0,008	< significant	0,05

The result showed there are difference learning outcomes between cognitive and experiment.

Table 2. the result of cognitive postest

	minimum	maximum	Mean
control	55	90	74,46
Experimen	43	97	83,58

From table above, showed that minimum score experimental class lower than control class, and mean score of experiment class is higher than control class. There are several reviews in using digital module better than google classroom. Google classroom is more useful when applied on academic purpose like announcement and assignment (Joy, et al. 2018). Besides, GC is better used as a support or complement because it is not supported by a practical user experience.

Their Technological Content Knowledge (TCK) profile were measured by quessionare method using likert scale (1-4). This knowledge type shows that technology and content affect and support each other. Hence, teachers must have an idea about their content areas, as well as the use of certain technologies that improve student learning (Sahin, 2011). Other research said that TCK means knowledge about the method or the manner in which Technology Knowledge (TK) and Content Knowledge (CK) are related to each other (Yalley, 2016). Table 3 shows result that data collected, based on technological resources google classroom and digital module.

Table 3. TCK of Science lecture

NNo	Technological content knowledge	GC (%)	Digital module (%)
11	I can transform the content of science using technological resources	50	75
2 2	I can use technology to build on students'existing knowledge in developing new knowledge	25	75
33	I can engage students in high-order thinking through the use of technological resources	25	100
44	I can use technology resources to bring the content of science to life in the classroom	25	100
55	I obtain educational information and facts from the internet to enrich the science content	100	100
66	I have the technological skills needed to use technology in the classroom	50	75
	mean	45,83	87,5

From the table result shows that a mean score of GC is lower than digital module (41,6 < 87,5). User experience from digital module supported by complete fitur, GC is an attractive and practical e- learning, but the application have a difficulties in usability (Asnawi, 2018). The complete fitur in digital module impact with the complecity of content, sure enough it will attract more than GC. The ease of use and learning from digital module is better than using GC, based on item no 2 and 4 of questionaire. The score of satisfaction from item no 5 shows that using GC or digital module able to enrich the educational information and facts of science student. the item no 3 of GC is lower than digital module, even though, higher order thingking skills like analysis, syntehesis, and evaluation using multimedia is become active learner rather than memorizing knowledge.

CONCLUSION

Our next generation are more attracted to the use of smartphones and apps. The industrial revolution 4.0 challenges could be encountered with the management of changes on the higher education in the form of innovations and inventions, so we need one step forward strategy to deal with that. The digital education technology has brought revolution in education and learning, but the goal of ICT need support many role and aspects, like learning and teaching resources,

teacher cappability, and curriculum. The research investigated the comparative analysis between google classroom and digital module. From the result above that cognitive learning outcome of GC is lower than digital module, and so the TCK profile from using GC is lower than using digital classroom

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