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Mobile Learning to Increase Higher-Order Thinking Skill (HOTS) in Facing the Industrial Revolution 4.0

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Abstract

The purpose of this paper is as a reference for mobile learning to increase Higher-Order Thinking Skills (HOTS). The industrial revolution 4.0 has a human impact that will be facilitated by technology in completing their work. On the other hand, this era also had a negative impact, namely that the role of humans would be replaced by technology. In order for students as the nation's future generations to be able to face the impact of the 4.0 industrial revolution, students need to be equipped with the skills needed in that era, namely HOTS. HOTS is a process of students at a high level of cognitive development through various learning concepts which include problem-solving skills, creative thinking skills, critical thinking skills, argumentative skills, and decision-gathering abilities. Following the 4.0 industrial revolution, of course the learning concept needs to be adjusted. Part of electronic learning, namely mobile learning as an alternative to learning in the era of the industrial revolution 4.0 or better known as e-learning. The use of mobile learning as learning can be in the form of: (1) supplements; (2) complement; and (3) substitution. Efforts to increase HOTS in students can be done by triggering questions that contain cognitive levels at C4, C5, and C6 that are submitted to students, then students can use their gadgets as mobile learning in solving problems in learning.

Keywords: mobile learning, higher-order thinking skills, industrial revolution 4.

Introduction

Currently, Indonesia has experienced the impact of the development of the Industrial revolution 4.0. This revolution is one of the strategies for implementing Germany's modern technology 2020 (Germany's High-tech Strategy 2020) (Lele, 2019). The characteristics of the Industrial Revolution 4.0 are marked by the fusion of technology that is able to integrate every human activity without knowing boundaries (Ningsih, 2018). According to (Hidayat, 2019) at the beginning of the Industrial Revolution 4.0, Indonesia had a demographic advantage and a population profile where there were internet users who reached 54.68%, namely 143 million of the total population of 243 million. With this advantage, it can be estimated that Indonesia has a high potential for readiness to face the Industrial Revolution 4.0.

The Industrial Revolution 4.0 has had both positive and negative impacts on Indonesia. Humans will be facilitated by technology in completing their work. On the other hand, the role of humans will be replaced by technology which becomes a problem that must be faced by the Indonesian generation with the industrial revolution 4.0. In this case, it is necessary to make strategic efforts so that the Indonesian generation is able to withstand the industrial revolution 4.0.

Students as the future generation of the Indonesian nation need to be equipped with skills to face the industrial revolution 4.0. The skills in question are higher order thinking skills or Higher Order Tinking Skills (HOTS) because this revolution demands that 21st century skills education is not enough, but it must consider the thinking capacity of students (Puncreobutr, 2016).

Level thinking skills are a process of students at a high level of cognitive development through various learning concepts which include problem-solving skills, creative thinking skills, critical thinking skills, argumentative skills, and decision-making abilities (Fensham & Bellocchi, 2013). These abilities are needed by students as protection against the swift flow of information changes whose truth is not yet known. Apart from that, this

capability also prevents the enslavement of technology, meaning that it is humans who take advantage of technology and not the other way around.

The internet is a technology that plays a very important role in the Industrial revolution 4.0, where the use of the internet cannot be avoided by students. This is shown by a survey conducted by (APJII, 2017) of 143.26 million people or 54.66% of students using the internet on a daily basis. The data also states that 44.16% of the devices used use smartphones / tablets, 4.49% use computers / laptops, and 39.28% use both devices (smartphones / tablets and computers / laptops). The widespread use of the internet among students is one of the impacts generated by the industrial revolution era. (Chalim, 2018) stated that even though students use the internet with high intensity, it is not related to learning. From this statement it can be illustrated that currently learning in schools is still not effective.

Internet technology, which should have been used as a capital in making learning effective in the classroom, has instead become a "boomerang" for students. The solution that can be done by education actors is to use Mobile Learning. Mobile learning is part of electronic learning (e-learning). Mobile learning as a combination of cloud computing and e-learning becomes a source that can be accessed anywhere, makes it easier to find information and interactions, so it really supports effective learning without time and place restrictions (Quinn, 2000). In this study, we will discuss the use of internet technology as mobile learning to improve higher-order thinking skills in Facing the Industrial Revolution 4.0. The research is literature review with the literary study writing method with data / information obtained from various literatures and arranged based on the results of the study from the data / information obtained.

Mobile Learning (m-Learning)

The difference between e-learning and m-learning is that e-learning tends to use computers and the internet as the main media, while m-learning tends to use mobile mobile devices such as cellphones, tablet PCs, laptops, smartphones, PDAs, etc. (Korucu & Alkan, 2011). Technically, m-learning is personal learning that connects students to the internet using gadgets (Gharibpoor, Sargazi, & Aref, 2013). By utilizing these gadgets, students will find it easier and more flexible to access learning resources without being limited by time and space.

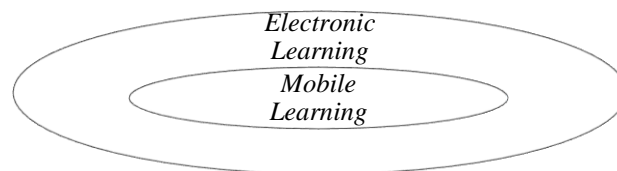


Figure 1. Position of e-Learning and m-Learning

The involvement of m-learning in learning can provide the following benefits (Jinlong, Yawei, & Zhaolei, 2012):

1. Providing effective learning that can be accessed anytime and anywhere.
2. Adding variety to learning in the classroom.
3. Adding learning resources for both educators and students.
4. Helping students to focus more on learning for a longer time.
5. Foster self-confidence and self-assessment.

There are several classifications on m-learning from various points of view, namely (Georgiev, Georgieva, & Smrikarov, 2004): (1) in terms of ICT technology, the main indicator is the type of gadget used: notebook, tablet, PDA, smartphone, cell phone; (2) The type of connection used (GPRS, GSM, IEE 802.11, Bluetooth, IrDa); (3) Support for e-learning standards; (4) Access made online and / or offline; (5) Access to learning materials and / or administrative services; (6) Communication between students or teachers; and (7) Points of access. The description of this m-learning classification can be seen as follows:

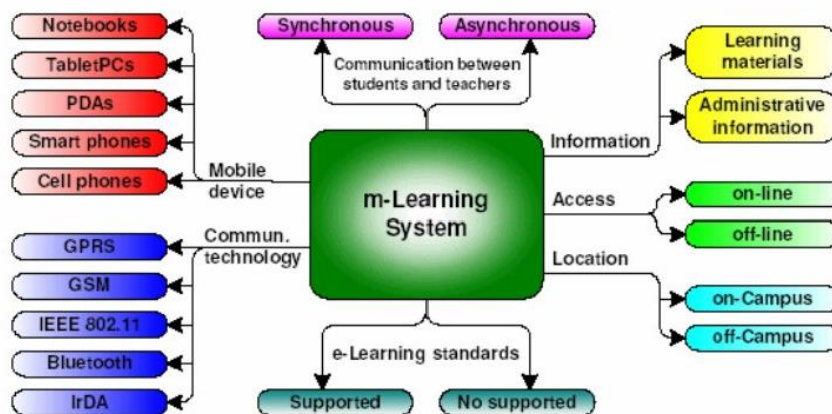


Figure 2. Classification of m-Learning

Higher Order of Thinking Skill (HOTS)

Thinking is from the cognitive domain which Bloom classified into six cognitive levels: 1) knowledge; 2) comprehension; 3) application; 4) analysis; 5) evaluation; and 6) creation (Mainali, 2013). In cognitive levels 1 to 3 it is classified as Low Order of Thinking Skill (LOTS), while cognitive levels 4 to 6 are classified as high level thinking skills / HOTS (Gunawan & Palupi, 2016).

HOTS is a process of students at a high level of cognitive development through various learning concepts which include problem-solving skills, creative thinking skills, critical thinking skills, argumentative skills, and decision-making abilities (Fensham & Bellocchi, 2013). High-level thinking is a type of thinking that explores questions about existing knowledge related to abstractly defined issues (Casey, 2011). HOTS trains students to associate new information with their knowledge and then use it to find a solution to a problem.

The main goal of HOTS is to improve students' thinking skills to a high level, especially those related to thinking critically with the information they receive, and thinking creatively in solving a problem. The basic concepts of higher order thinking skills can be as follows (Wilson, 2016):

Table 1. Basic Concepts of Higher-Level Thinking Skills

No	Level	Concept	Verb
1	Analysis (C4)	Specifies aspects / elements	Comparing, examining, criticizing, testing
2	Evaluation (C5)	Make your own decisions	Evaluation, judge, argue, decide, vote, support
3	Creation (C6)	Create your own ideas	Construct, design, create, develop, write, formulate

Results and Discussion

The Role of Mobile Learning in Education in the Era of the Industrial Revolution 4.0

Education in the industrial revolution 4.0 is marked by the integration of technology in learning. Internet of Things (IoT) is one of the technological developments brought about by the 4.0 industrial revolution where in education it is possible to connect with each other virtually, so that it can support learning. The use of IoT can be applied through mobile learning.

Before mobile learning can run, there are at least a number of conditions that must be met (Suranto, 2016): (1) Learning using an internet connection; (2) There are learning media that support especially gadgets; and (3) There is a tutor service that can help students in case of difficulties. When the requirements have been met, the mobile learning function in learning can be:

1. Supplements (additional)

In learning, students have the freedom to explore material on mobile learning or not. Students are not required to access learning resources using gadgets available via the internet. The role of mobile learning is largely determined by the strategies applied by the teacher. In order to take advantage of supplementary mobile learning, teachers should use a student-centered learning model. The use of this learning model is intended to require the activeness of students to find learning resources independently.

The use of inquiry-based learning strategies can increase student motivation (Handoyono & Arifin, 2016). That is, inquiry-based learning or what is known as scientific / research principles can trigger students to play a more role in learning. The provision of mobile learning can support this strategy in the freedom of students to seek answers related to material problems given by the teacher. This is in accordance with the learning recommended by the government, especially at the SMK level with the 2013 curriculum, namely strengthening

the use of scientific / scientific methods, learning based on research disclosure, namely (discovery / inquiry learning).

2. Complement

Mobile learning is designed to contain learning resources that function as a complement to classroom learning. In this case, mobile learning as an amplifier or remedial learning resource in conventional learning. It is said to be reinforcing, that is, if students can master the material quickly given by the teacher, then students can access mobile learning as additional material. Said to be remedial, that is, if students have difficulty learning in class then they are given the opportunity to access mobile learning as an alternative learning material so that students can better understand the material.

Mobile learning has the advantage of providing learning materials for students to make it easier for students to overcome learning difficulties (Gikas & Grant, 2013). Mobile learning can be said to be an independent learning media in the era of the industrial revolution 4.0 which requires internet data access. On the internet, there is a lot of material that is not even provided by the teacher, so it is not surprising that students are more advanced than teachers. This is a challenge for teachers in the Industrial Revolution Era 4.0 so that they can always update their knowledge to keep up with the times.

3. Substitution

Mobile learning can be designed as an alternative model of learning activities so that students can manage their learning flexibly (Tambunan, 2011). What is meant in this learning activity model is: (1) full face-to-face meeting; (2) meetings partly face to face and partly through the internet; and (3) full internet meetings. With the existence of mobile learning, teachers can choose from the three models of learning activities according to the applicable curriculum.

Mobile Learning in Improving HOTS

The Industrial Revolution 4.0 has an impact on advances in digital technology and the internet which is increasingly accessible, various kinds of information or sources are easily found on the internet. However, this will also bring about rapid technological changes, which must always be followed. In responding to these dynamics, in the world of education it can be used as a strategy to improve high-level thinking skills or what is called HOTS. HOTS is needed by every student because with these skills students can create, evaluate, and analyze what they learn, so that they are able to encourage critical, active thinking, and are able and ready to face the Industrial Revolution 4.0.

Mobile learning, which is part of the characteristics of the development of the Industrial Revolution 4.0, can be used as an effort to increase student HOTS. The concepts in HOTS that need attention for students are:

1. Analyzing, students are required to be able to analyze problems related to the material provided by the teacher.
2. Evaluating, students are required to be able to conclude any material given by the teacher
3. Creating, students are required to be able to develop hypotheses, plan research / projects, and develop new products.

The concept of HOTS can be created because it cannot be separated from the role of the teacher. Teachers can strive to increase student HOTS by using appropriate learning methods, as well as raising questions that contain cognitive levels at C4, C5, and C6 that are asked to students. The connection with mobile learning is that students can use it as a source of information or reference to solve problems in learning proposed by the teacher. Shiva can access mobile learning by using his gadgets (mobile phones, tablet PCs, laptops, smartphones, PDAs, etc.).

Conclusion

All developments in the Industrial Revolution 4.0 have positive and negative impacts on the world of education, but of course it must be addressed wisely. In this era, teachers can use it as a means to increase HOTS in students. HOTS is needed by every student because with these skills students can create, evaluate, and analyze what they learn, so that they are able to encourage critical, active thinking, and are able and ready to face the industrial revolution 4.0. The strategy that can be done by the teacher is to use mobile learning as a source of information or reference for students to solve problems in learning. Shiva can access mobile learning by using his gadget.

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