

Industrial Revolution 4.0: Interactive Multimedia Use in Learning

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ABSTRACT

The revolution of industry 4.0 becomes a new challenge to prepare the students to have high computing technology ability. This demand changes the conventional learning method using more manual tools into the one using digital-based computing ware. Interactive multimedia is a type of media operated using hand-held and mobile computing ware, android-based smartphone. Interactive multimedia can display information in text, image, audio, video, and animation formats. Information can be presented real time anytime and anywhere in real environment setting. Interactive multimedia potentially makes the learning process running effectively. In addition, interactive multimedia potentially improves students' learning motivation and outcome and practices high-order thinking skills such as analytical, critical, and creative thinking skills. The use of interactive multimedia in the learning needs the synergy of technology ware availability, students' preparedness, teachers' preparedness, and school regulation, and stakeholders. The methods employed in this research were observation on learning activity and literature study referring to various relevant sources. Thus, android-based interactive multimedia is one of solutions to improve the quality of learning and to prepare the students for dealing with the competition in industrial revolution era 4.0.

Keywords: *Industrial Revolution 4.0; Interactive Multimedia; Android; Biology*

1. INTRODUCTION

Industrial Revolution 4.0 affects Indonesian people very considerably. Industrial Revolution gives the people who want to go forward and to develop a big opportunity due to the opened access to information and the emergence of various job opportunities never existing before. On the other hand, industrial revolution 4.0 becomes a threat to community with slow adaptability. Many jobs have begun to be replaced with robot and machine. Such condition is called disruptive era characterized with many uncertainties due to the effect of rapid technology change [1].

The first industrial revolution started with the invention of steam engine in 18th century. Historically, this revolution was noted successfully improving economy dramatically, in which Gross Domestic Product of states in the world increased six folds two centuries following the Industrial Revolution.

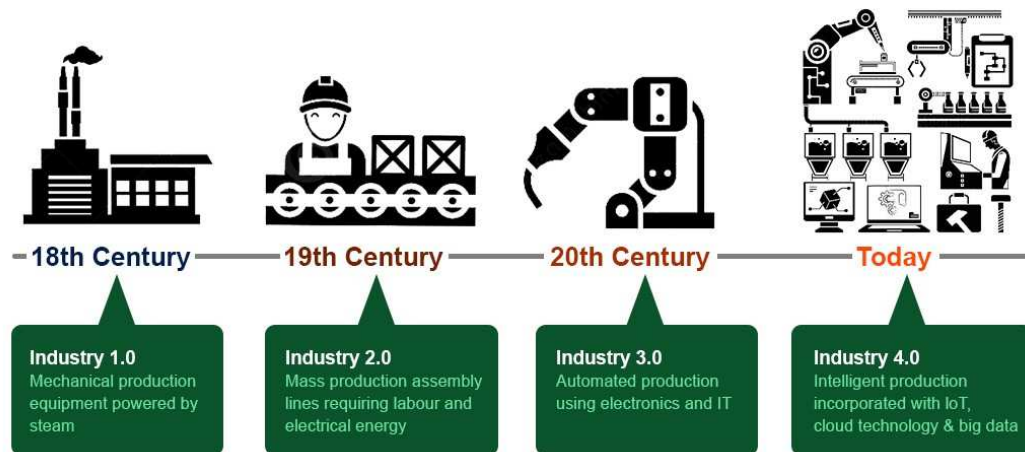


Figure 1. The Fourth Industrial Revolution [2]

Marshall McLuhan [3] stated that this fourth generation of industrial revolution is characterized with supercomputer, smart robot, driverless vehicle, genetic editing, and neurotechnology development enabling human beings to optimize their cerebral function more. It is an era confirming the world as a global kampong (village).

One of facts realizing the globalization process is the development of communication technology such as internet, telephone, or global media. Tomlinson [4] viewed such development as deterritorialization that can be interpreted that we may no longer maintain space and time as merely ours. However, in globalization process, space and time have been everyone's right in the world, so that the state's borders become obscure due to globalization process. For that reason, it can be concluded that the use of media will increase continuously in 21st century and global media affects considerably the establishment of state identity or state development. In line with global media development, education is one of fields needing consideration.

Teacher should understand how technology presents learning material and synchronizes it with the enabling learning approach [5]. If a theoretical knowledge teaching is equipped with practical exercise, the higher learning efficiency will be achieved. Therefore, school should consider various competences required to deal with industry era 4.0 [6].

Many school have applied varying preparation to deal with industry 4.0 but only very few have appropriate target corresponding to the need of industry 4.0 [7], while school should follow and adjust, thereby can produce competitive alumni [8], and it has been an imperative to the school to organize digital technology-based learning [9].

The presence of ICT, facilitates the education process, one of which is an ability of accessing electronic learning material. Schramm [10] suggested that learning media is a message-carrying technology that can be utilized for learning purpose. The learning media developing today largely pertains to the mobile communication technology and internet technology wares, thereby enabling the design and development of learning media in android-based multimedia format. The presence of cellular or android technology promises a sufficiently potential opportunity of developing new learning media, recalling the high level of ware ownership and the cheaper ware price and the more sophisticated feature.

2. METHOD

The research method employed in this research was literature study by studying many sources becoming the references, including books and journals related to Android-based interactive multimedia. Furthermore, the result of analysis would be used to identify the effectiveness of android-based interactive multimedia, so that it can be a solution to improve the learning interest that in turn can improve the learning outcome of Biology subject in revolution era 4.0.

3. RESULT AND DISCUSSION

3.1. Industrial Revolution 4.0

There are at least 4 competencies needed in 21st century (thinking, working, life tool, and living) affecting the learning implemented [11], producing the 21st century's learning closely related to the 21st century's teaching as well. And the competency to be developed to deal with industry 4.0 should at least involve technical, transformation, and social competencies with learning paradigm focusing more on research and technology transfer than on training and learning, requiring the clear framework and procedure of collaboration thereby can accelerate the learning process.

Grzybowska and Lupica identified the competencies needed to deal with industry era 4.0 [12]: (1) creativity, (2) entrepreneurial thinking, (3) problem solving, (4) conflict resolution, (5) analytical ability, (6) researching ability, (7) efficiency-orientation. Aberšek and Flogie (2018) stated that education system, according to scenario 4.0, should develop: 1) Technical knowledge and skill to develop sistem cyber- physical, Internet of Things (IoT) connected to Internet of People (IoP) and Cloud Computing. 2) Digital literacy 4.0 meaning the competency to communicate with each other through Internet of Things (IoT) or / and Internet of People (IoP). 3) Skill for human beings to make appropriate decision and to solve urgent problem in short time. 4) Decentralized decision – asking people to work particularly in the case of exception, disorder, or contradictory objective, task, delegated to the higher level.

Meanwhile, UNESCO's International Bureau of Education UNESCO [13] mentioned that to deal with the change in 21st century and industry era 4.0, education curriculum should develop at least the following competencies: (1) creativity, communication, critical thinking, problem solving, curiosity, metacognition; (2) digital, technology, and ICT skills; (3) basic, media, information, financial, scientific, and counting literacy, (4) cross-cultural skill, leadership, global consciousness; (5) initiative, self direction, persistence, responsibility, accountability, adaptability, and (6) knowledge on discipline, STEM mindset.

3.2. Biology Education in Revolution Era 4.0

The presence of industrial revolution 4.0 affects the cornerstone of innovation creation in education field. The rapid revolution pace in this era focusing on artificial intelligence gradually leads to the emergence of new learning models consistent with the future term, education 4.0 [14]. Many high educations not only teach theory related to certain disciplines, but also practice the students' ability of adapting and competing globally in dealing with industry 4.0 [9]. One of which is through industrial project-based active learning approach corresponding to the curriculum in study program [15].

Biology education in conventional learning era is still a teacher-oriented learning, brief debriefing session in the end of learning by giving homework, and dealing with final exam with the same problem pattern in each semester [16]. It is such learning system that makes nearly all students in biology field having same mindset and characteristic [16] [17]. Thus, educators in biology field are expected to develop biology education into the more effective one relevant to the demand of global need [16]. With the advance of technology, learning media and learning source keep innovating, thereby encouraging the students to learn independently and to solve the abstract problems using scientific approach [18] [19].

Students are expected to deal with the going-global, automated, virtualized, networked, and flexible work environment successfully requiring not merely cognitive knowledge but also non-linear thinking ability, social and cross-cultural skills, self-management, and self-competency [20]. Some real facts appearing in academic environment in daily life results in the complexity affecting such learning activities as: the students' increasing diversity level, the presence of cellular ware and social media found easily, the development of learning programs; varying settings, formats, and technologies available (e.g. e-learning, blended learning, rolled class, peer teaching, and etc), the increasing demand for students' learning ability, rapid development in various disciplines producing new knowledge continuously, and real time accessibility of information [20].

3.3. The Role of Multimedia to Deal with Revolution Era 4.0

Diverse global challenges due to industry current 4.0 lead to the increased need for human resources that can integrate scientific knowledge and its application [21]. It is important to improve the biology competency in the 21st century, and to improve competency in STEM (Science, Technology, Engineering, and Mathematics).

Concept of STEM education in modern world is a meaningful integration of various disciplines used to solve problems in real world [22]. Some aspects that can be developed through integrating scientific learning and its application are the capability of STEM education's graduates involving skills (research, learning and inquiring; problem solving, technical skills and observation, experimenting, and presentation); ways of thinking (analytical, logical, critical thinking, systematic, structured, fact-based, rational; open-minded, innovative, creative, and lateral thinking/multiperspective); and knowledge (scientific method, science as process, STEM-integrated learning; knowledge, and STEM knowledge-based vocabulary) [23].

Those ability aspects are linear to the qualification of worker need in industrial era 4.0. Therefore, it is very important to develop the learning oriented not only to one discipline (disciplinary) but also transdisciplinary in nature, so that knowledge and skill acquired from various disciplines can be applied to real world problems and can improve the students' learning experience.

Educational practitioners often recommend the teachers to use comprehensive media as needed and touching many senses in implementing the learning process. For that reason, the use of multimedia is a good alternative choice to provide impressive teaching and learning.

Multimedia-based learning has many advantages over blackboard and chalk learning. Multimedia-based learning involves nearly all sensory elements. The use of multimedia can facilitate the students in learning, and can use time more effectively and efficiently. In addition, the learning using multimedia will improve students' learning motivation, so that the higher the motivation, the more optimal is the achievement obtained. Interactive multimedia combines text, voice, image, audio and video to provide interactive application.

3.4. Discussion

Many constraints should be solved to enable the mobile technology to be used in the learning; teachers should change the pedagogy of biology learning, moreover when using technology aid; one of problems needing solution immediately is teachers' varying perception on adopting smartphone technology often inhibiting the implementation of smartphone-based technology, while mobile technology will penetrates more deeply into the life (Swanson, 2018), even with the rapidly developing technology, teachers serving, among others, as director and guide in learning activity are irreplaceable, but adaptation is needed in order to be compatible to the technology used.

The 21st century's learning requires the adjustment of curriculum with economic need, yielding the fourth education revolution (Education 4.0) constituting the education system supporting the students to make innovation from the knowledge yielded, enabling the students develop along with knowledge and competency in their lifetime, and to live within society, so that they can compete with others in both local and global environments, and can follow the change.

Biology teaching and learning using digital learning media need teachers' participation in planning and realizing it, and more students feel its benefits. Interactive multimedia can develop students' ability by multidisciplinary integration and high-quality innovation ability and deal with the sustainable development process in the future. Android-based interactive multimedia in biology learning developed and equipped with exercise system can be an alternative to the organization of education as it affects strongly the creation of skills needed in 21st century [27].

4. CONCLUSION

The use of Android-Based Interactive Multimedia is very relevant to be applied to the learning process. Android-Based Interactive Multimedia can clarify the material learnt interactively including text, image, video and audio, either online or offline, thereby improving the students' learning interest, corresponding to the need of industrial era 4.0.

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