# DESIGN SUPPORT EDUCATION INNOVATION ON DIGITAL ERA

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## *ABSTRACT*

*Environmental education provides opportunity to joyful learning with integrate of educational contents and entertainment activities. Understanding environmental education is greatly helped by the existence of new technology waves. Fast-moving innovation of new technology waves is digitalization. That is called the fourth industrial revolution. One of them is Artificial Intelligence (AI) technology. AI knowledge and innovation systems have made promising help students to realize that it can be increase respect for oneself and others, express feelings and opinions, and build logical thinking about science, mathematics, computer, etc. This paper build based on elementary school student experiment in Surakarta about how to understand digital technology based on AI and environment. This study is ethnography and qualitative research. As a data collection instrument, the study uses an assesment consisting of observation and questionnaire. This paper reports on 1) creating ideas resources, 2) learning educational contents and entertainment activities, 3) understanding feedback interaction, and 4) evaluating the challenges. The end of this paper shows that AI is very helpful in environmental education for elementary school students.*

*Keywords: Environmental Education, Digital Technology, Artificial Intelligence*

## INTRODUCTION

Learning activities require learning resources and media to get information carried out by indoor and outdoor activities directly such as hearing, seeing, feeling, smelling or through other intermediaries such as television, newspapers, radio. Management of limited learning in the classroom and does not involve field practice cause boredom and restrict the view to the surrounding environment. The environment around is one of the learning resources that can be optimized for the achievement of quality education processes and outcomes [1]. One of the important element that must be considered in using the environment as a learning resource is the factor of play as the basis of the approach [2]. Child's world is the world of playing. Playing for a game or just see each other. Whether at home or at school, the most important thing is they can still learn something new. Playing has characteristics of a pleasant atmosphere, happy, and energetic. This pleasant atmosphere can refresh their mind. In school, the atmosphere of playing can be used by teacher in observing the skills, activeness, emotional development, and intellectual of students. Not only in class but also teacher should practice out class to explore learning media. It is called environmental education.

But, the 21st century presents itself as a challenging time demanding a particular set of skills that is usually overlooked in traditional educational settings [3]. When society develop day by day, not only involves the environment as a learning resource but also involves technology which is currently called the new digital era or 4.0 industry revolution (4IR). Technology has had an influence in education because learning in the new digital era is changing as students now expect to get most of their information from digital sources rather than from reading books [4]. The technology can be combined with teaching to strengthen

student learning [5]. Because of the interactive nature of the digital technology, students can now become meaning makers and co-creators of knowledge through interactions online with teachers, fellow students and the wider community [4].

Since 2018, Indonesia has road map for 4IR that was called Making Indonesia 4.0. This road map has 10 national priority [6]. First, improving the flow of material flow by strengthening the upstream material production. Second, redesigning the industrial zone by building a national industrial zone roadmap. Third, accommodation for sustainability standards. Fourth, empowering MSMEs. Fifth, build national digital infrastructure with the construction of digital networks and platforms. Sixth, attract foreign investment by targeting global leading manufacturing companies through attractive offers and incentives for accelerating technology transfer. Seventh, improving the quality of Human Resources (HR) such as redesigning the education curriculum adjusts the industrial era 4.0 and the talent mobility program for professionals. Eighth, the establishment of an innovation ecosystem with the development of Research & Development & Design (R & D & D) centers by the government, the private sector, the public, and universities. Ninth, implementing technology investment incentives by introducing tax exemptions or subsidies for technology adoption and funding support. Tenth, harmonization of rules and policies by harmonizing cross-ministerial policies and regulations.

The seventh point in 10 national priorities shows that the world of education in Indonesia also needs to prepare itself for this revolution 4.0 by making innovation in applying learning methods in schools. In the world, innovation lead a country to describe how they develop which was showed on The Global Innovation Index as the country's annual report based on their capacity for and success in innovation.

**Table 1. The Global Innovation Index 2014-2019**

| Year | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| Indonesia Rank | 97 | 88 | 87 | 85 | 85 |
| Indonesia Score (0-100) | 29.79 | 29.79 | 30.10 | 29.80 | 29.72 |
| 1st Rank (Asia) | Singapore | Singapore | Singapore | Singapore | Singapore |
| 1st Rank (Asia) Score (0-100) | 59.36 | 59.16 | 58.69 | 59.83 | 58.37 |
| 1st Rank (World) | Switzerland | Switzerland | Switzerland | Switzerland | Switzerland |
| 1st Rank (World) Score (0-100) | 68.30 | 66.28 | 67.69 | 68.40 | 67.24 |

Source: The Global Innovation Index 2014-2019 [7-11]

Table 1. The Global Innovation Index 2014-2019 show Indonesia has stable ranks on 2018 and 2019. The good news, in 4 years, Indonesia was able to go up 12 points. On the other side, Singapore was able to maintain its first position in Asia and Switzerland was able to maintain its first position in World. This innovation calculation is compiled from various aspects including education. Because education as a basis for developing quality human resources so as to maintain and enhance the innovation rankings. In Switzerland, they have education that prioritizes individual expression of education which emphasizes that children should learn from their own experiences. Self-learning strengthens intuition and logic in solving a problem. Next year, Singapore plans to make programming languages a compulsory

subject for elementary school children in grades 4 to 6. Programming languages are indeed very related to 4IR. We need intuition and logic to build innovation which programming language is a way to compile digital technology.

There are many parts of learning technologies in the digital era such as big data, cyber security, cloud computing, internet of things, and artificial intelligence. Big data is an evolving term that describes a large volume of structured, semi-structured and unstructured data that has the potential to be mined for information and used in machine learning projects and other advanced analytics applications [12]. Cyber security is a subset of information security [13]. Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale [14]. The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers ( UIDs ) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction [15]. Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction [16].

From the explanation above, the most suitable to show the basic of affecting creativity and innovation is artificial intelligence because AI can define things using rules. This paper build based on elementary school student experiment in Surakarta about how to understand digital technology based on AI and environment.

## Teaching and Learning

Nowdays, we live in an era of fast-moving technological and educational which requires new-knowledge, skills, spiritual self-improvement, and building relations with others. It means that the teachers' work is in flux. Educators should be flexible and adaptive to teach who acts not only as a subject translator of knowledge, but acquires a special significance for the student, able to reveal deep potentials of one's personality, and to become a direct participant of the project as improvement of the teaching skill of educators. And for further step, educators know how to build each of her/his students' talent. Last but not least, educators should provide about social life knowledge and how to behave in dealing with problems. It is related to the higher pressure for competition to get good university seats or fine job. Clearly, education has a major role to play in transforming both the mind-set and skill-set of future generations [4].

## Creativity and Innovation

Core factors affecting creativity and innovation found include relevant knowledge, cognitive ability and thinking skills, personality and motivation, interactions between individuals, and culture [17]. Whereas creativity has been conceived of as the generation of novel and useful ideas, innovation has generally been argued to be both the production of creative ideas as the first stage and their implementation as the second stage [18]. Creativity and innovation can build distinction among digital natives those born and raised in constant interaction with computers, videogames, smartphones and digital immigrants older generations who have to master technology in a later stage in life is important because significant differences arise on how information is appropriated and processed, and when those are not taken into account, learning process of the students can be hindered [19].

## RESEARCH METHODOLOGY

### Research Model

This study is ethnography and qualitative research. Ethnography means the researcher grasp what people act, think, and speak. The qualitative research describes the phenomenon or situation from experiments.

As a data collection instrument, the study uses an assesment consisting of observation and questionnaire. Observation was carried out by the researcher. The questionnaire was answered by students.

### Research Sample

The scope of research sample has been carried out on the primary students randomly selected from five different elementary schools in five different regions in Surakarta. The sample of the study consisted of 100 students from 2nd grade.

The students were asked to answer one question related to the experiments done in environmental education learning. The question was explain how you felt about environmental education learning.

## RESULTS AND DISCUSSION

AI is programming ajcomputer (or any device) to perform a task that traditionally is only possible with human intelligence due to its complexity. AI-based systemsjderive their knowledge firstly from the initial data, programs and algorithms providedjby human programmers. Secondly, they "learn" through their own experiences and observationsjwithout being explicitly programmed.

For years, teachers have struggled to help each and every student with their individualizedjeducational needs. That gets incredibly tough in a classroomjof twenty, thirty, forty, or fifty students all requiredjto pass the same standardized test, regardless of personal growth. The use of artificial intelligencejhas the potential to disrupt the traditional and potentially damaging one-size-fits all modeljof modern teaching. MachinejLearning algorithms have already begun helping teachers fill the gaps while indicating which subjects students are struggling with the most. Parents, teachers and the general publicjneed to understand AI and its potential educational implications.

By using the programming language, AI code is built on image recognition. The image that used is mustard green, broccoli, cucumber, and long bean which get on online website. Using real time recognition, vegetable images can recognize what its name and nutrition. Based on image recognition program, it generate accuracy 91%.

Students learn about the introduction of benefits and nutritional content in vegetables. Students are introduced how AI can recognize the images of vegetables and fruits. Students practice how the AI works with the help of LCD screens, laptop with cameras, and real vegetables and fruit. With a direct camera of laptop, one of the students holds pineapple in real time, then the screen will display the scan results from the introduction and benefits of the pineapple. After learning about AI, students were invited to plant mustard greens with hydroponics. After planting mustard greens, students were given a quiz by the researcher about how you felt about environmental education learning. 94% students give answer that they enjoy the class. And other 6% students give answer that they normal receiving.

Not in every meeting class, AI is learned. But, just for Ice breaking class can be the solution to increase knowledge of 4IR. Professional from education government or company could give a class to teaching the implementation of AI. The class could run every three

months or six months. To integrate between technology and teaching, the teachers should get a help from professional about software or computer program. Because that installation computer program cause serious disruption to the time setting that has been formed by the teachers. And also, integrating between technology and teaching can create additional challenges for the use of study time in school. Most teachers do not have enough time to implement technology in class because the teachers must spend more time to teach and to test students with national curriculum. If there are technologists who help the teachers to build the programs of integrating between technology and teaching, it can be good collaboration.

There are tons of chance to dig material for image recognition. It is not only for science but also can combine with other lessons. The combination of language, computer, and character education lessons, teacher can introduce sign language using finger-moving artificial intelligence integrated with mobile video capture so that when students hold social activities in children with special needs who use sign language as communication, students are expected to communicate. This is very good to implement because it increases the humanity and gratitude to the Creator. Other examples include watering automation experiments that combine the subjects of physics, mathematics, biology, computers, and art. In addition to training creativity and cooperation, student work can be used for school gardens for both hydroponic and non-hydroponic plants. The involvement of students in maintaining the preservation of school gardens is also included as a natural activist. It's not easy to make changes but combining technology into teaching is not difficult, but it's up to the teacher to decide when and how integration will be done. A teacher must make the learning process interesting and make students believe that science is important, not only for the test but also for their lives.

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