Technology implementation to promote digital learning

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Abstract. Interactive learning environment (ILE) is one of the keys of successful learning; one of which is triggered by an effective selection of technology implemented. This paper aims to investigate technology implementation promoting digital learning to be able to create ILE. A variety of digital platforms are identified. It has been found that such platforms as virtual environment, digital games, web-based learning platforms, virtual labs/simulations, mobile devices, robots, and social networks are effective technology to promote effective digital learning and ILE. It is implied that effective digital learning and ILE is most likely to meet the requirements of the industry.

1. Introduction
The advent of technological innovation that is new in the current educational environment, especially in learning [1]. Learning is currently required to include information and communication technology (ICT) in learning [2]. Interactive Learning Environment (ILE) is learning that involves software and hardware to support the learning process in education. Interaction between students with the system, the teacher with the system or the teacher and students where both use the system [3,4]. The system is in the form of technology that is designed and created to produce interactive learning media. This interactive learning is supported by electronic devices such as computers, mobile phones, tablets and others [5].

The technology in interactive learning that is being researched at the moment is about simulation technology using Virtual Reality (VR) technology such as those developed by Wang et al [6] and Almousa et al. [7] which implements VR in a Kashmir school, then simulation games in engineering learning developed by Cardin et al [8]. Simulation games are also made by Basttistella and Wangenheim which are then applied in learning techniques [9]. Interactive learning is also used for arts education such as learning to dance using interactive learning [3]. The use of interactive learning in the form of Augmented Reality (AR) in physics learning is applied by Mustafa and Tuncel [10]. Interactive learning in the form of video games has also been used in learning logistics management [11] and is also applied in learning power techniques [12]. The use of ILE is integrated into education and has many uses.

Learning using simulation games has a positive impact on student motivation [13]. Then other studies on the use of gamified in learning tourism results have shown to be beneficial for educators and compliance with the curriculum used [14]. Then the use of interactive simulation technology is used to solve problems in learning physics at the college level and the result is that students who use interactive simulation are satisfied [15]. The use of simulation technology is very broad, ranging from learning technology to tourism, therefore research is interested in discussing what technology is developing now to support interactive learning. This study aims to analyze the use of any technology that is in ILE and the benefits of technology in ILE.
2. Methods

The research method uses Systematic Literature Review. The first process is the search for journals about technology and interactive learning environments from database sources through search engines such as Google Scholar and Crossref. The databases involved in this search are Taylor & Francis, Elsevier, IEEE, and Sage Publication. The journal used is a journal published between 2014 and 2019 that discusses technology in an interactive learning environment. The key words used in the search journals such as interactive learning environment, technology in education, a tool in engineering education, interactive simulation technology, digital games in an interactive learning and interactive simulations. Journal results obtained are then identified and analyzed starting from the title, abstract, research objectives, data analysis and content. The final process provides conclusions from the results of the analysis.

3. Results and discussion

3.1. Technology in ILE

The device referred to here is the device used in ILE including learning tools, teaching devices and evaluation tools, the following devices in ILE are shown in table 1:

| Technology in ILE                  | Tool name                        |
|-----------------------------------|----------------------------------|
| Virtual environment               | Google Expedition                |
| Digital games                     | Minecraft Education Edition      |
| Web-based learning platforms      | Moodle                           |
| Virtual labs/simulations          | Virtual Laboratory               |
| Mobile devices                    | Mobile phone                     |
| Robots                            | LEGO Mindstorms NXT             |
| Social networks                   | YouTube                          |

Based on table 1 above explains the technology and device names in ILE, the following explanation:

3.1.1. Virtual environment. Virtual environment that is used so that students can interact with other participants through 3D space technology. Different learning activities where students have more freedom in using it, so they are involved in the exploration process and help users to experience the simulation of the content displayed on the screen [16]. A user can interact with virtual objects, elements, features and the like in this virtual environment using various electronic devices, such as, for example, helmets or other head-mounted devices including the screens, glasses or glasses that users see when looking at display devices, one or more hand-held electronic devices such as controllers, joysticks and the like, gloves equipped with sensors, keyboards, mice, and other electronic devices. Virtual reality (VR) is a popular information technology (IT) field that provides indirect experience by creating virtual spaces that interact with human censorship systems and overcome the spatial and physical constraints of the real world. VR technology can be categorized as follows: (1) expression technology to stimulate the human sensor system, (2) interaction technology to interact significantly with VR, (3) writing technology to develop VR content, and (4) collaboration technology that produces works some participants in VR. VR technology has a variety of applications, from industry to education/training, and entertainment. In addition, many manufacturing companies also apply aspects of VR technology [17]. In this paper the author writes an example of the name of a virtual environment device such as Google Expedition.

3.1.2. Digital games. Games learning is learning that involves technology-based games to convey, support and enhance teaching, learning, assessment and evaluation [18]. The following are examples of device names from digital games that have been used such as Minecraft Education Edition.
3.1.3. **Web-based learning platforms.** Learning platform that offers instruction via the Internet. Here, students and instructors interact via the web (online). Students access their learning material and activities needed through the Internet. In addition, when a teacher uses an online platform in the context of blended learning (face to face and online) [19]. For example, the use of web-based learning platform technology is like Moodle.

3.1.4. **Virtual labs / simulations.** This device students directly interact with actual physical equipment, so students can analyze real-time changes and practice interactions in controlling the equipment [20]. Device names that use virtual labs / simulations such as Virtual Laboratory.

3.1.5. **Mobile devices.** It is a technological device that can be used for assignments and collaborations or as a support for the learning process. This device can be used by users anytime and anywhere [21]. The name of the device that is often used, such as mobile phones.

3.1.6. **Robots.** Robot is machines that are tasked with performing complex tasks and can assist in the teaching of computer programming, science, physics and mathematics [22]. Here are the names of devices that use robotic technology such as LEGO Mindstorms NXT.

3.1.7. **Social networks.** The use of social media in learning allows teachers and students to interact in social media. This technology can be used in distance learning [23]. The example of the device name is used like YouTube.

The technologies in ILE above have been widely used in learning, for example devices that use virtual environments such as the use of Google Expedition English learning where these devices use using Google Cardboard, mobile phones and tablets, so that students can learn interactively in various places and increase knowledge [24]. In digital game technologies such as the use of Minecraft Education Edition where the game is used in learning as an interactive media which includes features such as video games, buttons for selection and then the navigation panel [25]. Moodle is one of the Web-based learning platforms where Moodle stands for Modular object-oriented the ward learning environment, which is a full-featured package, combining several sources, such as assignments, chats, forums, glossaries, quizzes, surveys, surveys, polls, wikis, and much more. Moodle is an e-learning portal in the form of open source software that helps the online learning process, where its use involves the web, computers and the internet [26,27]. Virtual laboratories were developed to teach basic robot concepts such as mechanical design, sensors and controls. Smart systems track student interactions with software to tailor the teaching process to their needs [20].

Mobile devices are technologies with examples of very common devices, such as mobile phones. Mobile phones are used as learning media in the classroom by utilizing some features such as the use of cameras and recording devices, can access some material through the internet as a learning resource, then teachers and students as well as between students can interact through video calls [28]. LEGO Mindstorms NXT is an example of an ILE device that uses robot technology and this media is very popular with students. This technology introduces students to be able to build a construction framework and make a program. This feature is equipped with a sound sensor, light sensor, proximity sensor and infrared sensor, then with a display that can be combined with a computer so students can see changes in real-time. The use of NXT is very interactive so students enjoy learning [29,30]. YouTube is a part of Social Networks technology where this technology utilizes uploaded videos and then students can download them, learning in real form through audio and visual and moving so that students can easily understand the material presented. YouTube can be accessed via the internet [31,32].

3.2. **Benefits of using ILE technology**

The current use and utilization of technology in ILE. The results of the analysis of several journals obtained the use of the above technology is displayed in table 2 form.
Table 2. Benefits of using ILE technology in learning.

| No | Technology in ILE | Benefit |
|----|-------------------|---------|
| 1  | Virtual environment | Empathy, collaboration, problem solving improve cognitive skills, creativity |
| 2  | Digital games      | Problem solving and creativity |
| 3  | Web-based learning platforms | Collaboration and student learning motivation |
| 4  | Virtual labs/simulations | Problem solving, critical thinking, innovation and creativity |
| 5  | Mobile devices     | Communication, problem solving and creativity |
| 6  | Robot              | Problem solving, creativity, responsiveness, confidence and critical thinking |
| 7  | Social networks    | Collaboration and student learning motivation |

Table 2 above explains the benefits of technology in ILE, such as the use of a virtual environment. Virtual technology allows students to develop empathy competencies, self-awareness, collaboration, problem solving and improve students' cognitive skills, Augmented reality can increase creativity and problem solving as well as increase motivation and learning students [10]. The use of digital games helps increase student motivation and creativity and stimulates students to think and solve problems [33]. Web-based simulations are very acceptable to students and seem to provide learning benefits that are in harmony with other simulation approaches and add to face-to-face teaching, this technology can increase collaboration and increase student motivation [34]. The use of virtual labs / simulators is useful to improve problem solving skills, think critically, and increase innovation and creativity [20]. Mobile devices support the process of thinking and also build communication, problem solving, creativity, and various levels of student ability [35]. Learning using robots can motivate student learning so that they can feel free in learning, increase competence such as problem solving, communication and creativity, culture awareness, confidence, critical thinking in math and engineering [22]. Social network This device enhances student interaction and communication, increases student motivation and learning, increases student motivation and relationships in groups [35].

4. Conclusion
The technology used in ILE includes features and examples of existing devices such as virtual environments where available features such as 3 dimensions, sensors, goggles and helmets so that users can easily see the virtual world, an example using virtual technology is Google Expedition. Digital games in the digital world there are some features such as video games, buttons for selection and then navigation panels, for example the game Minecraft Education Edition, web-based learning platforms that are superior to this technology are chat features that help students and teachers to interact as for examples of devices such as Moodle, virtual labs / simulations, there are virtual labs, while the features are smart systems, sensors, and controls, for example devices such as Virtual Laboratory, mobile devices such as mobile phones have camera features and recording devices, can also access material through the internet as a learning resource, the robot has a voice sensor, light sensor, proximity sensor and infrared sensor and this tool can also be combined with a computer so that it is more interactive as contained in the LEGO Mindstorms NXT and social networks, for example on YouTube which has video features. Utilization of this technology helps increase student motivation and learning, stimulates innovation and creativity, increases the ability to think and solve problems, is able to increase interaction and communication in groups and cooperation.

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