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How does educational technology answer challenges? Empirical theoretical studies and public perspectives

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ABSTRACT

Educational technology is part of a scientific that is mostly engaged in education. Actually, this scientific has significant benefits, especially in the field of education. However, many people do not understand the role of educational technology in education. This can be seen from the diverse perspectives of society on educational technology. When it is associated with educational technology science, there are many views of the community that are very opposite to the scientific clusters of educational technology taught from lectures. So, the purpose of this study was to find out the various perspectives of society regarding educational technology itself. This paper is presented with the addition of theoretical educational technology clumps. This research employed a descriptive qualitative approach. This study used indirect interviews, which means giving unstructured questions but still focusing on what will be researched. The subjects in this study were six participants who were people outside the educational technology scientific clump. In addition, the author also conducted a literature review which was taken from six articles from three different journals. The results of this study reveal a diverse picture of views on educational technology. All participants argue that educational technology has a significant role, but in terms of the dominant conception they still do not understand it like other scientific. From the results it can be a separate challenge for educational technology. It can be used as an alternative reference in improving the quality of educational technology, either through formal education or other forms.

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1. INTRODUCTION

Technological developments in education have occurred recently after the spread of the corona virus. Starting from television, radio, computers and smart phones, all of them have an important meaning in reaching the potential of students. As stated in Law No. 20 of 2003 of the National Education System [1] that "Education is a conscious and planned effort to create an atmosphere of learning and the learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by themselves, society, nation and state". Thus, the use of various educational communication technologies is part of developing the potential of students, especially in this pandemic era.

With the use of communication technology in education, it does not mean that education does not have problems in it. At the time before the pandemic occurred, education problems in Indonesia included

learning that was not in accordance with the needs, lack of learning experience and so on. After the current pandemic, there has been a massive change in the world of education, so that the teaching and learning process is difficult to do because there are still efforts to adapt to existing changes. Therefore, this can be a challenge in itself for the world of education in solving these problems.

Educational technology is part of a scientific family that seeks to solve educational problems. The form of efforts that can be made in solving educational problems is by facilitating learning [2]. Facilitating learning here means the same as providing convenience in learning through various fields, such as learning media, teaching and learning, curriculum to training. So this field has a significant impact because sometimes there are some areas that are in resource-limited areas where they do not have access to technology or other infrastructure (i.e. the internet), or do not have the necessary digital literacy [3]. So the existence of educational technology affects self-confidence in the teaching and learning process carried out [4]. Because educational technology should encourage to rethink the whole teaching and learning process and lead beyond what can be achieved without it [5].

A person who is engaged in educational technology is theoretically named as the educational technology profession. In this profession it relates to work in schools or colleges, training and other professional development. This is due to the fact that learning continues throughout one's life, education in modern times has been associated with formal programs in schools and colleges, and work has been linked to what a person does after completing education. If it is related to the industrial era, according to Noble's analysis [6] the important points are: 1) Developing and using technology is to increase efficiency; 2) Technology includes "scientific investigation and the systematic application of scientific knowledge to the process of commodity production" and; 3) Technology are the result of extensive" research and development". Therefore, the educational technology profession has an important role in realizing these points. This is because this profession is related to the design, development, utilization, management and evaluation in the process of implementing learning, both in schools and other institutions.

The educational technology profession is still rarely known by the general public. This can occur because the science of Educational Technology has not been well published and there is still a lack of support from the Government legally in accordance with the scientific development of Educational Technology [7]. In fact, educational technology graduates are also expected to become experts and/or proficient in implementing learning by regularly combining parts of learning facilities such as humans, materials, media or teaching materials, techniques, tools and the environment. Therefore, this paper will provide an overview of the general public's perspective on educational technology conceptually. So that later this picture can be a "mirror" of knowledge about the general public's perception of the concept of educational technology that they know.

2. RESEARCH METHOD

This study used qualitative research using the analysis of Miles and Huberman [8]. Theoretically, the meaning in this analysis is an activity that is carried out interactively and takes place continuously to completion. As for the description framework of the research components according to this model are: 1) Data collection; 2) Data reduction; 3) Data presentation; and 4) Conclusions. These components are shown in Figure 1.
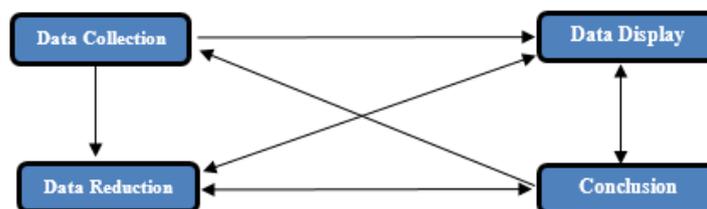

Figure 1. Miles and Huberman model analysis component

The authors sampled six people outside the field of educational technology with various groups, ranging from teachers, students and others outside the field of educational technology. As for conducting research, the author uses data collection techniques using interviews. The data collection in this interview was carried out *online* using WhatsApp as an intermediary in conducting research. The questions raised in this interview are about the conception of educational technology which contains two main questions,

namely: 1) What is educational technology? and 2) Is educational technology important? This interview activity was carried out in an unstructured manner, which means that the guidelines used were only outlines of the problems to be asked.

As for the data collection, the author uses interviews that will be processed every answer. In carrying out the research, the steps taken as Sugiyono's [9] opinion are: 1) Determining to whom the interview will be conducted; 2) Preparing the points that will be the subject of discussion; 3) Starting the interview flow; 4) Conducting the interview; 5) Confirming the summary of the interview results; 6) Writing the interview results into notes; and 7) Identifying the follow-up results of the interviews that have been obtained The types of questions in this interview relate to the participants' own opinions. So that later this research can be a picture with regard to public perceptions about educational technology.

In addition to conducting interviews, the authors also conducted literature reviews related to previous educational technology research. The details of the articles studied are displayed in Table 1.

Table 1. Meta analysis of articles reviewed

No	Article Title	Journal/Proceeding	Year
1	Validating items of different modalities to assess the educational technology competency of pre-service teachers	Computers & Education	2020
2	The role of teacher capacity and instructional practice in theintegration of educational technology for emergent bilingual students	Computers & Education	2018
3	How instructors frame students' interactions with educational technologies can enhance or reduce learning with multiple representations	Computers & Education	2019
4	Learning fractions with and without educational technology: What matters for high-achieving and low-achieving students?	Learning and Instruction	2020
5	Educational technology conditions to support the development of digital age skills	Computers & Education	2020
6	Utilization of Educational Technology to Enhance Teaching Practices: Case Study of Community College in Malaysia	Procedia - Social and Behavioral Sciences	2015

In these articles contain research results relating to the scientific family of educational technology. There are five articles from three different journals. The journals/proceeding taken are "Computers & Education", "Learning and Instruction" and "Procedia-Social and Behavioral Sciences". The three journals and proceedings have all been Scopus indexed, so in addition to conducting interview research, the author also conducts literature reviews by referring to reputable and recent articles.

3.   RESULTS AND DISCUSSION

Research objects and problems influence considerations regarding the approach, design or research method to be applied [10]. The results of this study are the general public's perception of the basic conceptions of educational technology based on personal opinions. The following are the results of research regarding the general public's perceptions of the basic conceptions of educational technology which are explained through the questions the author has asked the participants along with their descriptions.

3.1.   What is Educational Technology?

Table 2 presents the result of qualitative data from questions relating to "What is educational technology?".

Table 2. The results of data reduction from the answers of participants

Participant	Answer
1	The content of technology in the education system
2	Facilitate and facilitate learning through the use of computer technology
3	Educational technology is like Informatics Engineering
4	Developing technology applications for education
5	Education and technology
6	Combinations of information technology applications in education

After knowing the results of the reduction that has been done, the Figure 2 presents a data display that provides an overview of the data presentation that has been combined.
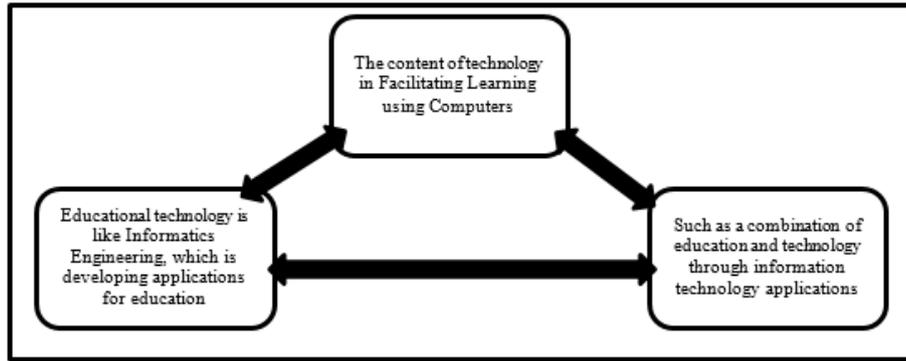
Figure 1. Display data from reduction results

So this shows that dominantly, the general public does not yet understand the basic conception of educational technology in which 1 person can answer almost correctly and the rest is still far from the actual conception. From these various perceptions it can be concluded about the general public's view of educational technology, namely *"The content of technology in facilitating computer-assisted learning, such as the combination of information technology with education in the form of educational applications, so it is similar to informatics techniques"*. Based on this analysis, it can create a challenge for educational technology activists in understanding and educating the public regarding the concept of educational technology, so that later this educational technology will become familiar to society.

3.2. Is educational technology important?
The Table 3 is the result of qualitative data from questions relating to "Is educational technology important?".

Table 3. Results of data reduction from participants' answers

Participant	Answer
1	Important, because it can be an innovation and increase the creativity of educators
2	Important, because it is useful in educating the nation's life provided that it is not misused
3	Important, because it creates development innovations
4	Important, because of updates
5	Important. Because studying ethics in technological resources
6	Important, because it supports material, keeps up with developments and helps effectiveness.

After it is known the results of the reduction that have been done, the Figure 3 presents a data *display* that provides an overview of the combined data presentation.
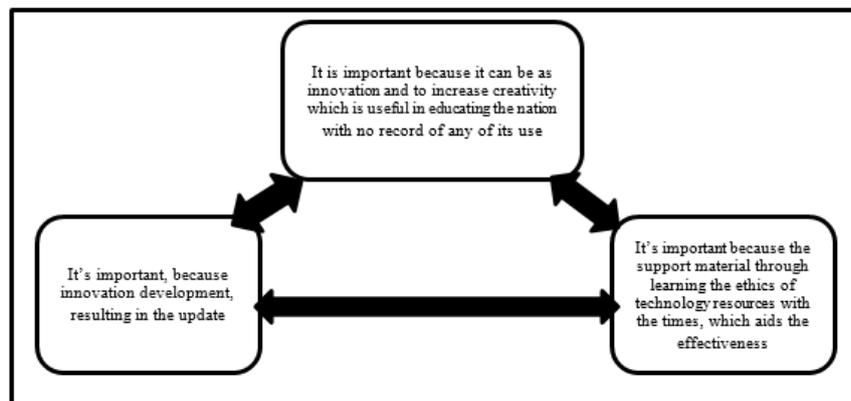

Figure 1 Display data from reduction results

So this shows that predominantly, the general public already understands the significant role of educational technology, with the overall details correct, although still from one point of view. As for the various perceptions, it can be concluded about the general public's view of the role of educational technology, namely *"As a creative innovation that supports material by studying the ethics of technological resources so as to help effectiveness and renewal in it"*. Based on this analysis, it can be a challenge for educational technology activists to play a more role in society with the expectations described.

3.3. Conceptions of educational technology: Actualization of the educational technology profession

In the current era of openness, all human beings are competing to solve a problem. This is because the rapid development of technology (the internet in particular) causes the information conveyed through news or seminars / webinars to spread widely without limitation of time or place. Education is also part of the rapid dissemination of this information. This is a big challenge, especially for educational technology in order to become a solution for today's education world.

Even though it has the name educational technology and is often identified with computers or other electronic media, the reality is that educational technology does not always talk about it. For example, at the beginning of the development of educational technology in Indonesia, which refers more to how the learning system is applied. Not always discussing learning media, but also discussing learning systems. In addition, educational technology emphasizes how learning can take place more effectively.

Educational technology is basically a scientific family in solving educational problems. According to AECT [11] the latest definition of educational technology is the study and practice of ethics in an effort to facilitate learning and improve performance by creating, using or utilizing and managing appropriate technological processes and sources. Thus, the aim is still to facilitate learning to be more effective, efficient and enjoyable and to improve performance [12]. Facilitating is the same as providing convenience. Simply put, educational technology is the same as solving problems using software and hardware [12]. The use of software is intended in terms of analysis activities, designs, and assessments to solve problems. While hardware means the use of hardware (it can be learning media or learning resources like book, module and any else) to solve a learning problem. So from this description it can be concluded that educational technology is a scientific family in facilitating learning in the form of software and hardware with the aim of solving educational problems.

In the analysis of Miarso [13], there are reasons for the scientific clumps of educational technology, namely: 1) There are learning people who have not received enough attention related to their conditions, needs and goals; 2) There is learning that does not get enough education from adequate sources; 3) The existence of new sources; 4) The existence of systemic activities in developing learning resources starting from theoretical foundations and research results; and 5) The existence of management of, namely learning activities utilize various sources, produce activities and or select learning sources. This is in line with the latest analysis relating to the COVID-19 pandemic era from Fatwa [14] that: 1) There is a technological imbalance between schools in both big cities and regions; 2) There is limited teacher competence to take advantage of learning applications; 3) Lack of resources in learning development such as the internet, quotas and so on; and 4) The relationship between teachers, students, and parents for online learning that is inseparable. From this description, this is a challenge in itself for educational technology in answering these problems.

Educational technology has a profession which theoretically is often called the educational technology profession. This profession has a scope in accordance with the five areas of educational technology, namely design, development, utilization, management and evaluation. In this case, an education /learning technologist can become an expert in designing learning, developing learning (can be models or media), utilizing, managing and evaluating various learning resources such as messages, materials, people and so on that can be used really in helping the teaching and learning process. Most instructional technologists have jobs that require special expertise in one or two areas, for example the design and development of certain technologies, or the use of media. These competencies are of course indispensable in an effort to improve the quality of education, so that this can solve the problems of education in Indonesia.

3.4. Challenges of educational technology as complementary to community needs

Indonesian society today and in the future is a society that has a technology culture. This culture has and will develop in all aspects of life, including education. Therefore, technology needs to be effectively empowered in the field of education, as the mandate has been set forth in the preamble to the 1945 Constitution, namely to educate the nation's life. Figure 2 shows the relationship between society and education.
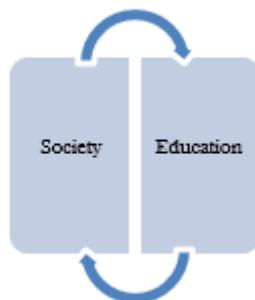
Figure 2. Relationship between society and education

Community and education are like making tea. So that the tea is sweet, the key lies in a water with sugar. If the water is mixed with sugar, the water will become sweet because it is combined with sugar. The mixture will create a sweet tea, making it delicious to drink. From this description, in order for education to be better and more advanced, it must be integrated with society. The goal is that problems or problems, especially those related to education, can be resolved. So the educational technology here acts as a "bridge" in achieving these goals. Much has been discussed about how technological determinism and views pervading popular mindsets can influence the professional practice of educational technology, shape interactions among stakeholders, and sometimes influence decisions [15].

As a description of the research results that have been presented by the author, the dominant community still does not know the field of educational technology, even though all participants said that educational technology has a significant role, especially in the world of education. So this is a challenge in itself, so that the author will try to explain through this article.

Educational technology has a role in human resource development. One of them is with regard to education and training. According to Miarso, in the Human Resources Education and Training (PLSDM) procedure in general, it consists of identifying needs, identifying conditions, formulating goals, developing schedules and learning materials, implementing, evaluating and feedback. So if it is withdrawn, it can be concluded that the role of educational technology is as an assessor, needs assessor, learning material developer, media developer, compiler of learning programs to training and education strategy developers [16]. In fact, from this profession, an arable that may sound foreign to be part of educational technology is born, namely Performance Technology. Performance technology is a study and applied practice to improve organizational performance through training and non-training interventions [17]. This family can build productivity at work [18].

Apart from implementing education and training, educational technology also has a role in the field of curriculum. In this digitalization era, the role of educational technology is increasingly important, because this knowledge is fundamental in the teaching and learning process [19], [20]. In the teaching and learning process in the classroom, teachers are God's creatures who are not created as superheroes who can solve whole problems on their own. In this case, educational technology acts as a facilitator who helps the teaching and learning process to run smoothly by creating, using or utilizing and managing technology processes and resources appropriately adapted to the applicable curriculum. As with the dedication carried out by Thaariq, *et al.* [21] which shows the success of the educational technology service program in helping teachers and students solve learning and learning problems, so that the quality of education quality increases. Because classrooms can be built inclusively [22]. So that this can equip students with the knowledge, skills, attitudes, and motivation to learn [23].

The educational technology family is also engaged in the production of media and resources. Such as developing video, audio, image, teaching materials, web learning and so on. So it is possible to facilitate the delivery of information as messages, both in schools and in the community [24]. This is because the use of digital technology in learning is increasingly being carried out. In a learning design perspective, this shows that the use of media can provide time and resource effectiveness, so that it can focus on interesting tasks that build learning activities [25].

Based on this description, it can be seen that the field of educational technology is very broad. According to Ariani [7], the growth and development of the Educational Technology profession in each region will not be separated from the context in which the concept of Educational Technology grows, as well as what and how the early development of the concept of Educational Technology in each region. So that it has become a common task, especially educational technologists in fostering the existence of educational technology in the community, so that later educational technology can be qualified in facilitating learning to solve educational problems, as planned.

3.5. Implementation of educational technology based on prior research

There have been many previous studies that discuss the usefulness of the application of educational technology. Based on the research conducted by Wang and Lu [26], it shows the results that have been concluded. The conclusions are: 1) Developing items from various modalities in computer-based tests; 2) This study offers some insights to understand the effects of the method through various modalities based on the analysis of educational technology competency frameworks; and 3) This research combines learning studies in a multimedia context with the Multitrait-Multimethod (MTMM) high-order factor model, and the Multidimensional Item Response Theory (MIRT) to form a framework for designing and validating different modality items for assessing technological competency education. The findings from this study can contribute to the current literature by identifying relevant aspects of research on multimedia learning that influence measurement development. Multimedia learning is an integral part of educational technology [27].

Based on the research conducted by Darling-Aduana and Heinrich [28], it shows the results that have been concluded. The conclusion is that this study demonstrates the potential of technology to improve student outcomes in schools serving a predominantly low income bilingual English/Spanish student population. In this study, it was found that the intensity of use was independently related to student achievement. This research shows that the intensity of use is one of the important things. With 3 weeks of technology use, the mean effect size increased to more than 0.50. In this case, the teacher has a role to mediate the effect of technology use on student learning by deciding how and how often learning technology is integrated. Learning is an integral part of educational technology. Based on the research conducted by Wu, Corr, and Rau [29] it shows conclusive results. The conclusions in this study indicate that framing student interactions by encouraging them to focus on physical models increases learning gains on transfer tests, whereas framing interactions with *prompts* that focus on producing intermediate images on paper reduces learning gains, compared to business as usual controls. conditions that do not receive technology-based support. These results suggest that model-focused framing helps students utilize shared resources and collaborate on the difficult aspects of aligning 3D models spatially with 2D images to translate between representations, especially for students with low spatial skills. In short, this study suggests that the way instructors frame students' interactions with educational technology can significantly influence their learning with multiple visual representations.

According to Reinhold, Hoch, Werner, Richter-Gebert, and Reiss [30], it shows conclusive results. The conclusions in this study can be considered as reliable empirical evidence that interactive and adaptive spaces implemented as features of educational technology can lead to fraction concepts that are more developed in students during regular classroom learning than traditional learning and learning scenarios, especially for low achieving students. Research on educational technology must consider the differences between learning materials and their realization with technology, because different users may react differently. Based on research conducted by Olszewski dan Crompton [31] which examined the role of educational technology in supporting digital era capabilities based on conditions. In this study, socio-economic status and school type were not significant predictors of digital age learning opportunities, although the features of the school context around organizational support for technology are important, even after accounting for actual classroom technology use. Furthermore, although progressive policies and adequate funding supporting the use of technology can help teachers provide better learning opportunities for students, a focus on how technology is used by students appears to be the most significant driver of the learning experience and opportunities for building digital age skills. In other words, the ways in which technology is integrated into classroom teaching are critical to the type of learning students experience, and the wide reach and frequent use of mobile apps opens up digital age learning experiences for students. Educational technology plays its role here.

Finally, based on Azlim, Amran, and Rusli [32] it can be concluded that there is a need for the preparation of students with the skills needed in industry, the use of educational technology is able to support rapid changes according to industry demands. Therefore, institution managers encourage lecturers to take advantage of educational technology in their teaching practices. In addition, lecturers also have a positive perception that educational technology enhances and enhances their teaching practice. However, the main obstacle faced by lecturers in utilizing educational technology in their teaching practice is technical support. Institutions must improve Internet and computer facilities. This technical support must be accompanied by expertise support so that educational technology can be maximally utilized [32].

From previous studies that have been carried out, it can be an illustration, that educational technology has an important role, especially in the development of community resources through efforts to facilitate learning to solve educational problems. This important role can indirectly build quality human resources. This is as the term educational technology is a "bridge" towards pre-planned goals.

4. CONCLUSION

Educational technology is an arable field that has a significant role in facilitating learning to solve educational problems. Based on the research that has been done, in usefulness, the community has understood how important the role of educational technology is in the world of teaching and learning. However, in conception, the dominant society still does not understand the basic conception of educational technology as a whole, so this becomes a challenge in the profession of educational technology. In fact, based on previous research conducted by other researchers, educational technology has a very significant role, especially in terms of the development of learning resources. So, there needs to be support from both the government as a policy maker and from stakeholders other. In addition, there is also a need for synergy between educational technologists and prospective educational technologists in fostering the existence of educational technology.

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