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Educational Technology in a Systems Perspective

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Abstract: Quality human resources can be built through a good education system. And the system is usually always contextual so that it can adapt and respond to all existing challenges. In the current era, technology is important because it enters all sectors, including the education sector. So the purpose of this study is to describe educational technology from a systems perspective. The method used is qualitative with a literature study approach. Documented data that has been collected is reduced, then its content is analyzed so that it is relevant to the theme. Then conclude verification. The results of the study show that Educational Technology in a Systems Perspective is a complex, integrated, interrelated, flexible, and comprehensive component where it has concepts, and characteristics, In addition, it must also consist of messages, people, materials, equipment, techniques, and settings surrounded by four basic elements, namely facilitating, learning, using, and management elements.

Keywords: Educational Technology, Perspective, Systems.

1. INTRODUCTION

Education is a system that consists of many components that are interconnected and very complex but has a big goal, namely to produce quality human resources. The need for quality human resources is an important and strategic agenda for every nation and state, because with quality human resources a country can survive and adapt to every change in life and continue long-term and uncertain developments [1].
The organizers of the education system in a country have differences from each other which are influenced by the socio-cultural system that lives and develops in that society and country. This becomes very complex considering that a country has a very large and diverse number of individuals so the implementation of education also requires systematic and systemic management [2].

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Education itself in its implementation includes several scopes such as educators, students, curriculum, methods, approaches, and institutional management to the level of technology which is often used as a medium in delivering messages, including when in the learning process so it is often termed as technology. education because learning is part of the educational process. In the past when the era had not developed until now, learning still used traditional methods such as writing on stones, trees, palm fronds, or other things, especially during the time of the Prophet Muhammad [3].

As the times continue to develop, the educational process does not want to lose to keep up with it. This is evidenced by the discovery of ink, books, erasers, blackboards, and chalk to markers which are commonly used by educators to teach and convey material in class to their students. All of these things are likened to a unit that influences each other with educators, where when there are no such tools educators will be less than optimal in conveying information, messages, or subjects to their students [4].

Meanwhile, mutual influence as mentioned above also refers to factors from the background that occurred in that era. The fact was that at that time there were no other machines or technology so using it was something natural. But nowadays, where science and technology have developed very rapidly if you use old tools such as chalk, eraser, or something else, it is considered strange or sometimes considered to be out of date [5]. So now all of the components of education are competing with each other in using technology to gain effectiveness and efficiency. For example, educators will use laptops, cellphones, computers, or other media that support learning and student interest so they don't feel bored.

Then some use this technology to make applications, websites, online report cards, draft laws, and other things from developers, makers, and policymakers so that they can more quickly achieve the goals of education as expected. So indirectly it can be said that technology has entered every component of the education system in Indonesia [6]. Even so, it cannot be denied that the existence of this technology can have a positive impact such as facilitating student access to learning anywhere and anytime. And there are also negative impacts such as fraud arising in falsifying data on the existing education system. From this background, the authors are interested in discussing educational technology from a systems perspective so that what is discussed can be more thorough and detailed.

2. RELATED WORKS

Some previous studies that are relevant and related to the theme that the author examines include research from Dodi Ilham entitled Initiating Value Education in the National Education System. The results of the paper show that education must be accompanied by values and morals to be able to control and evaluate the dynamic curriculum in life. In addition, it covers several aspects ranging from the fields of skills, economy, security, society, technology, and culture to the welfare of the nation because the essence of education is to humanize humans [7]. The research has similarities with what the author is researching which discusses education from a system perspective, but what distinguishes it is the result of the study of the research found.

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Then there is the next research from Tajuddin Noor entitled Formulation of National Education Goals in Article 3 of the National Education System Law No. 20 of 2003. The study showed that education is a mandate in the National Education System Law No. 20 of 2003, whose values are contained in the Koran surah ar Ruum verse 30 and surah al 'Araaf verse 172. In addition, it has implications for the formulation of education which includes educators, curriculum, and students [8]. So the research has similarities with what the author studies, namely both discuss education from a system perspective, but what distinguishes it is the result of the study where the research is not listed.

3. METHOD

The method used in this research is descriptive qualitative with a literature study approach. This approach means collecting data that is by the theme, be it from books, journals, articles, ebooks, websites, or anything else with documentation techniques, namely noting what are the important parts [9]. It was carried out on two data sources, both primary and secondary sources. After all the data has been collected, it is arranged properly while being reduced, namely sorting and selecting which parts are important to display and then analyzing the contents. Finally, draw conclusions that are verified, namely that you must be accountable for what is the answer to the problem from the background [10].

4. RESULT AND DISCUSSION

System Concept

a. Understanding System

Definitions that are widely used to explain the word system, among others, according to Amsyah, namely as an organized way to achieve goals, such as for the community, part of the community, or for a teacher, lecturer, and instructor where it becomes an integrated work plan of all components of a system to solve a problem or to meet a specific need. So it can be said some understanding of the system from the explanation above namely [11]:

1. A system is a complex or organized whole, an assemblage or combination of things or parts that form a complex whole or whole.
2. The system is a set of interrelated components that work together to achieve a goal.
3. The system is a set of components or subsystems that are organized and related according to a plan to achieve a goal.

From the detailed description above, it can be said that the system is a collection of concepts from one object to several regular forms that influence or depend on each other [12]. Or in another sense it is said that if the system is an organic or composed whole it also illuminates the system or a new system drive tool, thus the system can be said to be a component or elements that interact with each other towards a certain goal that has been set. The system is a totality of interrelated parts.

b. System Features

A system is characterized by certain characteristics which are described as follows [13]:
Objective

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Having a goal, such as the purpose of an educational institution is to provide educational services to those who need them.

Function

Namely the existence of goals that must be achieved by a system according to the implementation of the various functions needed to support efforts to achieve these goals.

Components

For the sake of the implementation of each function that supports efforts to achieve goals, in a system, it is necessary to have components that carry out a function.

Interaction and interdependence

The components in a system interact and depend on each other. Congestion in one component will affect other components and the system as a whole.

Surrounded by other systems

A system does not stand alone. It receives input from other systems and in turn, these systems receive the output produced by the system earlier.

Transformation Process

Each system has a mission to convert inputs into outputs. This process is called the transformation process

Synergistic Effects

Each system has a synergistic effect (the effect of integration) which is obtained through a strong and harmonious blend of mutually supporting components.

Feedback mechanism

Each system has a feedback mechanism as its control function, to maintain system quality.

Relative

A system is relative because depending on the situation or scope of view, a system can be seen as a sub-system or it can also be seen as a system.

c. Systems Approach in Educational Technology

Educational technology is a complex and integrated process that involves people, procedures, ideas, equipment, and organizations to analyze problems, find solutions, implement, evaluate, and manage problem-solving involving all aspects of human learning [14]. In educational technology, problem-solving is incarnated in the form of all learning resources that are designed or selected and used for learning purposes. These learning resources are identified as people, messages, materials, equipment, techniques, and settings (environment) [15].

One of the many existing approaches is Neuroscience where teachers have the privilege to optimize the potential of their brains and are allowed to increase the quality and quantity to achieve success in the future. In addition, a diverse approach is also needed to design and synergize neuroscience in education and learning technology because children have their learning styles [16].

d. Requirements for the Establishment of an Educational Technology System

Educational technology is an impression of technological processes, production processes, and production services, which are spread through learning activities that are created in such a way that students understand (literate) technology, according to Primary several important requirements are marked as characteristics of education technology ie [17]:

1) Based on technology concepts (Broad-based technological concepts)

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2) Skills in using machines and mastering cutting equipment (Tool and Machine skills)
3) Technological literacy
4) There is a hand-skill activity (Hands-On Activity)
5) There are problem-solving activities related to technological problems (Problem-Solving)
6) In the learning process using the concept of learning while working (Learning by doing)
7) The existence of quality leadership (Leadership Qualities)
8) There is a decision maker (Decision making)

These technological education requirements are very important factors in implementing technology education. The implications of having these requirements certainly have an impact on the preparation of the curriculum, learning strategies, facilities, and so on where all of these things become the backbone that must be considered from an early age. In addition, this system is set up to complete the goal [18].

The meaning of the requirements above explains that technology education emphasizes technological concepts, skills in using tools and machines, the form of learning places more emphasis on hand-skilled activities, is based on learning by work, does a lot of problem-solving, targets technological literacy, and based on technological concepts, besides that they are also trained to be skilled in decision making [19].

From the explanation above, it can be said that the system has a basic concept that all of its components are related to each other and try their best to achieve one goal. In addition, it also has certain characteristics such as purpose, functioning, interacting with each other, transforming and even being flexible which can adapt to existing situations and conditions. For example, when it is used to expedite the payment economy, it turns into a digital wallet, or also when it is used in religious education, it can turn into videos or pictures that attract students [20]. Of the many systems, the most crucial one is related to educational technology which has a variety of specific approaches and certain requirements.

Three Basic Principles of Educational Technology Systems

There are three basic principles of educational technology systems that are used as a reference in the development and utilization of learning, including the system approach principle, the learner-centered principle, and the utilization of learning resources principle [21].

a. Principles of the System Approach (System Approaches)

The systems approach in educational technology and instructional systems is one of the basic principles that greatly determines the success of learning and solving learning problems. The principle of the systems approach explains that the implementation of education and learning needs to be designed or designed using a systems approach. Where the system approach is any collection of parts that are interconnected and together form a larger unit that influences learning [22]. Through a systems approach, learning directions and objectives can be planned clearly. We can imagine what will happen, if in a learning process without clear goals. Of course, the learning process will not be the focus, and learning will not be focused on the goals to be achieved and it is difficult to determine the effectiveness of the learning process.

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In addition, in the implementation of education the system approach is very important because with a good system, good educational results will also be obtained [23].

b. Learner-Oriented Principles (Student-Centered Learning)

Student-oriented is an educational effort, learning, and practice that focuses on students or students. Students or learners are the central points in educational activities paying attention to the characteristics, interests, and potential of students [24]. This learning positions students as subjects in learning, thereby providing full student involvement starting from lesson planning, and the learning process to learning evaluation [25]. In student-centered learning, students take more responsibility for monitoring their learning progress. Students are more deeply involved in higher-level thinking (high-order thinking). In this principle approach, students and their groups independently explore a problem as a form of innovation in improving the quality of the learning process and are expected to be able to develop all the potential of students [26].

c. The Principle of Using Learning Resources (Utilization of Learning Resources)

The principle of using learning resources means that students learn because they interact with a variety of learning resources or make use of various learning resources. In utilizing learning resources, teachers have a responsibility to help students learn so that learning is easier, smoother, and more focused. If the learning activities implemented by the teacher are based on various or varied sources, it is hoped that the learning activities will be perceived by students as fun activities and are always missed by students. In addition, the use of learning resources is intended to improve the teaching and learning process so that it becomes more effective [27].

From the principles above, it can be seen that educational technology can participate in improving the components of the education system starting from raw input, and instrumental input to the teaching and learning process [28]. This role will make the concept of educational technology more holistic because it always connects and pays attention to the educational process and the goals to be achieved by always considering all the impacts on students and society.

General Structure of the Education System

According to Law No. 20 of 2003 concerning the National Education System, in Chapter VI Article 16, it is stated that the level of formal education in Indonesia includes three levels, namely: Basic Education, Secondary Education, and Higher Education [29].

a. Basic Education

Basic education is the level of education that underlies secondary education. The government stipulates 9 years of compulsory basic education, and every citizen who is 7 (seven) years old is obliged to attend education at the basic education level free of charge. Basic education takes the form of Elementary School (SD) and Madrasah Ibtidaiyah (MI) or other equivalent forms for 6 years; and Junior High School (SMP), Madrasah Tsanawiyah (MTs), or other equivalent forms for 3 years.

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b. Middle Education

Secondary education is a continuation of basic education. Secondary education consists of General secondary education, in the form of Senior High School (SMA), Madrasah Aliyah (MA), or other equivalent forms; and Vocational secondary education, in the form of Vocational High Schools (SMK) or Vocational Madrasah Aliyah (MAK), or other equivalent forms, for 3 years.

c. Higher Education

Higher education is the level of education after secondary education which includes diploma education programs (2-4 years); undergraduate (4 years or more); masters, specialists, and doctorates (2 years or more); organized by the university. Higher education can take the form of an Academy, Polytechnic, High School, Institute, or University. Universities are obliged to organize education, research, and community service. Tertiary institutions can organize academic, professional, and/or vocational programs.

Components in an Educational Technology System

The educational technology system has several components that interact with each other to achieve learning objectives, namely to produce quality graduates according to the set competencies. Each component has its function, and if there is a problem in one component, it will affect the other components [30]. The components of the educational technology system include; messages, people, materials, equipment, techniques, and settings. Following are the functions of these components, viz [31]:

a. Message.

MessageInformation conveyed, usually in the form of ideas, meanings, and facts related to learning.

b. Person

The person referred to here is a person involved in storing or distributing messages.

c. Material

The material here is called software. In this case, the function of the material is to store messages before they are distributed using the tools that have been designed. These materials can be in the form of written text, print, electronic recordings, the web, and others that can be used for learning.

d. Equipment

Tools here are referred to as hardware. In connection with this tool is used to issue messages stored in the material. Tools are also objects in physical form which are often referred to as hardware which serves to present learning materials.

e. Technique

Techniques which are standard procedures or guideline steps in conveying messages. In this case, in other words, the technique is a method or procedure used by people in learning activities to achieve learning objectives.

f. Background

The setting is the environment in which the message is received by students.

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Four Basic Elements of Educational Technology Systems

Several important elements make up the system in educational technology as well as being a reference and basis for the birth of other policies, namely [15]:

a. Facilitating Elements (Providing Ease of Learning)

This element implies that facilitating provides convenience by designing the environment, organizing resources, and providing conducive tools to support the learning process as needed, effective, efficient, and attractive.

The scope of facilitating covers direct learning to distance learning through a virtual environment. Examples of the influence of learning theory, technology, and their implications for efforts to facilitate learning include (1) the emergence of a shift in the teaching paradigm from controlling facilitation, and (2) the emergence of a shift in learning objectives from shallow learning to deep learning. The influence of technology has implications for the shift in the role of technology itself from controller (to control) (such as presenting information, drill, and practice) to supporting learning (as a driver and enabler of learning).

b. Elements of Learning

This element implies that learning is a formal object that is the main problem that must be solved through educational technology. The purpose of learning is to acquire knowledge and skills that can be applied in active use outside the classroom (real world). The implication is that the learning process must be authentic & challenging tasks, active, contextual, meaningful, and simulative based on real situations/problems.

c. Using Element

This element implies that it relates to theory and practice to bring learning related to learning conditions and resources, use begins with selecting the right processes and sources (methods and materials), wise selection based on materials evaluation, determining existing sources suitable for goals and objectives, utilization, namely planning and implementing so that learners can interact with learning resources in a particular environment and follow certain procedures

d. Managing Element

This element includes project management, delivery system management, personal management, program evaluation, and Quality Control [32].

1) Project management

Needed when media production and learning development processes become more complex and on a large scale.

2) Management delivery system

It is needed when implementing a distance education program based on communication and information technology (ICT) is developed.

3) Personal management and information management

This relates to the issue of managing the work of people regarding planning and overseeing the storage and processing of information in managing projects or organizations.

4) Program evaluation

Where wise management requires program evaluation.

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5) quality control
In a systems approach, management requires quality control measures to determine results.

4. CONCLUSIONS

A system is a complex or organized whole, an assemblage or combination of things or parts that form a complex whole or whole. The characteristics of the system include objectives, functions, and components, and are relative. In addition to these characteristics, there are also requirements for forming a system, namely based on technological concepts, skills in using machines and mastering cutting tools, understanding (literacy) of technology, the existence of manual skills activities, and so on. There are three basic principles of educational technology systems that are used as a reference in the development and utilization of learning, including the principles of a system approach, learner-centered principles, and the principle of utilization of learning resources. According to Law No. 20 of 2003 concerning the National Education System, in Chapter VI Article 16, it is stated that the general structure of formal education in Indonesia includes three levels, namely: Basic Education, Secondary Education, and Higher Education.

The components of the educational technology system include; messages, people, materials, equipment, techniques, and settings. In addition to components, there are basic elements in educational technology systems, namely facilitating, learning, using, and management elements. and Higher Education. The components of the educational technology system include; messages, people, materials, equipment, techniques, and settings. In addition to components, there are basic elements in educational technology systems, namely facilitating, learning, using, and management elements. and Higher Education. The components of the educational technology system include; messages, people, materials, equipment, techniques, and settings. In addition to components, there are basic elements in educational technology systems, namely facilitating, learning, using, and management elements.

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