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Development of Multimedia ICT-Based Online Learning (CAI, CBI, Mobile Learning And E-Learning) In The Age of Industrial Revolution 4.0 And Society 5.0

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ABSTRACT

The purpose of this study is to describe the development of online learning based on Multimedia ICT in the Industrial Revolution Age 4.0 and Society 5.0. This research method uses a qualitative method with the type of library research. The results of the study indicate that as part of the effort to reform learning is to take advantage of ICT in learning activities. One of the ICT products that can be used in learning is a computer or laptop/netbook, an Android cellphone and the Internet. By applying ICT-based learning, students can learn "from" and "with" ICT products. Learning "from" ICT products is carried out using ICT-based learning such as from products in the form of CAI, CBI, Mobile Learning and E-Learning. Learning "with" technology is the use of technology as cognitive tools and the use of technology in a constructivist learning environment. Thus, the role of ICT-based multimedia in learning is becoming increasingly significant today, because these media are designed to complement each other so that the desired learning objectives will be achieved properly.
Keywords: Development, Online Learning, Multimedia ICT

A. PRELIMINARY

Learning is an interactive process. A student will have knowledge faster because of the help of educators, trainers or mentors. The assistance is a two-way interaction process between students and educators. The learning process is a communication process, which means that there is a process of delivering messages (information) from a person to a person

or group of people.[1] So, learning is a process of scientific communication between teachers and students.

The learning process has developed very rapidly in the Industrial Revolution 4.0 and Society 5.0. This is because the development of Information and Communication Technology (ICT) is growing rapidly and ICT has become a medium that can facilitate and succeed in the learning process in educational institutions. Arief S. Sadiman[2] stated that ICT is increasingly felt thanks to the increasing number of information channels in various forms of media, both printed and non-printed. One of the sectors that is affected by the massive development of ICT is education, so the term "educational technology" is growing rapidly as with learning using multimedia learning.

At this time the development of ICT is increasingly gaining its existence, especially during this Covid-19 pandemic, learning must be online or online-based. In Indonesia, the phenomenon of online learning is known by many people from urban to rural circles. This situation is due to learning that cannot be done at school but must be done online. Online learning is a process of student interaction with teachers and learning resources through an online system or using the internet network. The activities of students and teachers cannot be face-to-face, but must use online media.

Online learning must require learning innovation for teachers. Teachers must make creative and applicable breakthroughs in online learning. Teachers must also be smart and creative in using online-based media with all existing program tools. If the teacher takes these steps, online learning will run optimally and effectively.

One of the innovative breakthroughs that teachers can make is using ICT-based learning multimedia, such as Computer Assisted Instruction (CAI) or Computer Based Instruction (CBI), Mobile Learning and E-Learning. Multimedia learning like this will accelerate students to understand the learning material presented by the teacher dan will also create independent learning which is one of the missions of online learning

[1] Rudi Susilana dan Cepi Riyana. *Media Pembelajaran*. (Bandung: CV Wacana Prima, 2007), 2.
[2] Arif S. Sadiman, *Media Pendidikan*. (Jakarta: Raja Grafindo Persada, 2000), 2.

B. THEORITICAL REVIEW

1. Basic Concepts of Multimedia

Phillips[3] says multimedia is, "… a mixture of media, including animations and digital video… using the most appropriate medium for the required massage." Mixed media, including animations and digital video … use as much media as possible in relation to the (learned) message. Azhar Arsyad[4] also stated that the definition of multimedia is still not clear, but simply it is defined as more than one media. It is a combination of some text, graphics, animation, sound and video. This simple definition also includes one type of combination, for example a combination of slides and audio tape.

In addition, Phillips[5] explained that technological advances in education have encouraged people to make various innovations from single/combination media, then mixture in a set or multimedia, and finally interactive multimedia (MMI). The characteristics of the multimedia component are that it contains elements of text, images, sound, animation, and video, some or all of which are organized into a learning program.

2. Basic Concepts of Learning

Utomo and Anjaya[6] explained that in the National Education System Law No. 20/2003 Chapter I article 1 (1) reads: "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential." Based on the above understanding, it shows that there is a shift in the term teaching to learning. The term teaching shows the teacher's role as a teacher, while learning shows the active role of students as well as the dominant role of the teacher. Degeng[7] argues that learning means an effort to teach students. In learning, the educator as an important component of the education staff has the task of carrying out the learning process. In addition, educators are also expected to understand and master all the needs and characteristics desired and possessed by students.

Thus, learning is not only conveying information or knowledge, but also conditioning students to learn, because the main purpose of learning is that students learn. The success of educators in providing effective learning is marked by the existence of a

[3] Nurul Anam. *Media Pembelajaran PAI*. {Jember: Staiqod Press, 2014), 23.
[4] Azhar Arsyad. *Media Pembelajaran*. Jakarta: PT.Raja Grafindo Persada. 2005), 170.
[5] Nurul Anam. *Media Pembelajaran PAI*), 24.
[6] Utomo dan Anjaya. *Media Pembelajaran Aktif*. (Bandung: Nuansa, 2010), 25.
[7] Made Wena. *Strategi Pembelajaran Inovatif Kontemporer: Suatu Tinjauan Konseptual Operasional*. Jakarta Timur: PT Bumi Aksara, 2009), 2.

learning process for students. The success of the learning process is influenced by the development of science and community life that takes place from time to time. Learning is a process that is not only the process of disclosing knowledge, but also the process of actively disbursing knowledge or the process of formulating knowledge.

3. Multimedia Learning: Definition, Functions, Benefits and Utilization of Learning Multimedia

Multimedia learning is defined as a combination of several texts, images, graphic arts, animations, sounds and videos that are delivered in the learning process. Several various media are combined into a single work unit that will produce information that has a very high communication value in the learning process. This means that information can not only be seen as a printed product, but can also be heard, forming simulations and animations that can arouse interest and have high graphic art value in its presentation.[8]

Sadiman et al[9] conveyed the functions of learning media and multimedia as follows: a) clarifying the presentation of messages so that they are not too visual; b) overcome the limitations of space, time, and senses, for example objects that are too big to be brought to class can be replaced with pictures, slides, etc., events that happened in the past can be displayed again through films, videos, photos or film frames; c) increasing enthusiasm for learning, enabling students to learn on their own based on their interests and abilities, and overcoming students' passive attitudes; and d) provide the same stimulus, can equalize the experiences and perceptions of students towards the content of the lesson.

There are several advantages and benefits that can be obtained by utilizing media or multimedia in learning, namely: a) new ways of working with computers will generate motivation to students in learning; b) colors, music and animated graphics can add to the impression of realism and demanding exercises, laboratory activities, simulations and so on; c) rapid personal response in student learning activities will result in high reinforcement; d) memory ability allows students' past performances to be recorded and used in planning the next steps in the future; e) patience, programmable personal habits complement a more positive attitude atmosphere, especially useful for slow learners; the ability to record power allows individual teaching to be carried out, individual orders can

[8] Soetedjo sebagaimana dikutip oleh Nurul Anam, *Media Pembelajaran PAI*), 23.
[9] Arif S. Sadiman dkk., *Media Pendidikan: Pengertian, Pengembangan dan Pemanfaatannya*, (Jakarta: Pustekkom Diknas dan PT. Raja Grafindo Perkasa, 2003), 19.

be prepared for all students, especially for specialized students and student learning progress can be monitored continuously; and the span of teacher supervision is widened as the amount of information presented is easily managed by the teacher and helps close supervision of direct contact with students. [10]

Edgar Dale also explains the benefits of multimedia learning in the form of classifying experiences according to the most concrete to the most abstract levels, in visualizing the cone of experience. Several experts explained the benefits of learning media, including Kemp & Dayton[11] who broke it down into eight, namely, a) the delivery of learning becomes more standard, b) learning becomes more interesting, c) learning is more interactive, d) shortens learning presentation time, e) improves quality. learning outcomes, f) learning can be given anytime and anywhere, g) a positive attitude to what is learned, and h) the role of the teacher changes in a positive direction.

So that the benefits of the media can be felt well and used effectively and efficiently, there are several steps that need to be followed in the use of multimedia learning. So, there are three steps that must be taken, namely: preparation before using multimedia, activities while using multimedia and follow-up activities. If these three steps are carried out, the use of multimedia learning will be felt well in the learning process.

C. RESEARCH METHODS

This research approach uses qualitative research. While the type of research used in this study is library (Library Research). The data sources use primary sources and secondary sources. In this study, the data analysis used the Descriptive Content Analysis data analysis method. To check the validity of this data, the Data Validity of Source Triangulation is used.

D. RESEARCH RESULTS AND DISCUSSION

1. ICT-Based Learning Multimedia Model

As part of the effort to reform learning is to take advantage of ICT in learning activities. With the existence of ICT, students can learn "from" and "with" ICT products. Learning "from" ICT is carried out as in the use of ICT-based learning multimedia. Learning "with" technology is the use of technology as cognitive tools (cognitive learning

[10] Sudjana dan Ahmad Rifa'i, *Tekhnologi Pengajaran*. Jakarta: Bumi Aksara. 2003), 137-138
[11] Azhar Arsyad. *Media Pembelajaran*. Jakarta: PT.Raja Grafindo Persada. 2005).

aids) and the use of technology in a constructivist learning environment.[12] This is very useful for learning by utilizing ICT.

Thus, the role of ICT-based multimedia is becoming increasingly significant today, because these media are designed to complement each other so that the entire existing system becomes efficient and effective, where a single unit is better than the sum of its parts. The use of computer-based multimedia can be accepted in learning on the basis of enhancing the independent learning process and the active role of students. Computer-based multimedia systems also provide stimulation for the learning process that takes place outside the classroom.[13] This stimulation will make the learning process run optimally

ICT can be used as the primary teaching tool to reinforce early learning, stimulate and motivate learning, or for a variety of other possibilities. Many benefits are obtained from the flexibility of this computer because it can include video, audio, graphic elements, forms, processes, roles and other responsibilities.[14] So, learning with computers will create value in learning.

Criswell[15] divides the application of ICT-based learning multimedia in learning into ten learning models, namely: a) lesson or tutorials, b) reinforced drill and practice, c) intelligent ICT in instruction, d) training simulations, e) instructional games, f) training simulators, g) expert systems, h) embedded training, i) adaptive testing, j) computer managed instructions. According to Hannafin & Peck[16] the CBI models are as follows: a) tutorial, b) drill and practice, c) simulation, d) game, and e) hybrid (combined model).

From the opinions of these experts, in general, ICT-based learning multimedia models are as follows. First, tutorial model. This model presents interactive learning between students and computers. Learning materials are taught, explained and given reinforcement through these interactions. In general, this tutorial model is used to present information that is relatively new to students, certain skills, information or concepts.

[12] Ace Suryadi, *Reformasi Sistem Pembelajaran*, Makalah disampaikan dalam seminar nasional dengan tema, "Teknologi Pembelajaran Menuju Masyarakat Belajar" pada tanggal 5-6 Desember 2005 di Depdiknas Jakarta, 9.

[13] Latheru, J.D., *Media Pembelajaran dalam Proses Belajar-Mengajar Masa Kini*, (Jakarta: Departemen Pendidikan dan Kebudayaan Latheru, 1988), 81.

[14] Lee & Owens, A Lee, W. W. & Owens, D. L. *Multimedia-based Instructional Design*. (California: Pfeiffer, 2004), 181.

[15] E. L. Criswell, *The Design of Computer Based Instruction*. New York: Macmillan Publishing Company, 1989), 6-7.

[16] Hannafin, M. J., Peck, K. L.. *The Design, Development, and Evaluation of. Instructional Software*. (New York: Macmillan Publishing Company, 1988), 139-158.

Everything that is needed to obtain information is available on the computer. To find out the level of understanding of students, this tutorial model is equipped with questions in each section of the material. The characteristics of this tutorial model are a) include lesson orientation information, directions during the lesson, feedback and appropriate remedial, b) start with activities that focus students' attention on the monitor so that they are ready to learn, c) there is always information on learning expectations on new material, d) concepts are presented little by little and other support or instructions are provided, e) feedback is given to students based on the answers given, f) using different strategies to deepen the students' understanding process.

Second, Drill and practice. This model places more emphasis on how students practice mastering the material by doing a lot of exercises or practices. This model is designed to achieve certain skills, fast feedback for students on the responses given, and usually some form of correction or repetition of incorrect answers is provided. The characteristics of the drill and practice model are: a) providing broad opportunities for students to practice the skills they have acquired, b) providing clear directions for providing answers that have consequences for appropriate feedback and corrective and remedial learning, c) model This assumes that basic information or material has been obtained by students or has been taught, d) aims to strengthen and emphasize the correct answer and identification and correction of incorrect answers, e) answers given are short and fast, f) focus on one or more only two skills, g) has a good level of flexibility due to the ability of computers to manage sound, color, animation and so on, h) quickly obtains and stores data about students' abilities, i) quickly chooses problems or deficiencies that arise in learning.

Third, simulation. This is a learning model that is able to reduce costs that are too high, facilitate students' understanding of a concept in "real time", or Eliminate the risks that arise as a result of demonstrations carried out in learning. For example, pilot education, it is very impossible to practice flying a real plane because it has a high risk and relatively large cost. The characteristics of this model are: a) there is a scenario or design of events, a clear choice of student participation, and the consequences achieved for the response given, b) the appearance of this model must be high fidelity visual images (high quality images), c) a set of available a situation that can be trusted, rational choice of

answers, logical consequences of answers and a set of situations resulting from interactions or responses, d) there is a clear direction that students need, e) there is an identification of critical changes in the scenario, f) a modified version of the scenario is available based on students' responses or answers and become a new situation, g) there are three answers given by students, namely effective, ineffective or not so.

Fourth, games. This game model specifically aims to increase student motivation. This Games Model is a highly motivational approach for students to provide reinforcement for the competencies that have been learned, concepts and information. This game format should give emphasis to the development, strengthening and discovery of new things for students in learning. Another element that appears in the use of this game model is the element of competition. Competitions are built either for students' personal self, between students or groups of students. The characteristics of this model are: a) there is a good explanation of the instructions, the purpose of the game and the procedures that must be carried out by students, b) attracts the enthusiasm of students, c) there is a causal relationship between student responses and the consequences of the game, d)) students can be given a summary of the abilities they have achieved in the learning, e) provide entertainment for students.

2. Procedures for Developing ICT-Based Learning Multimedia

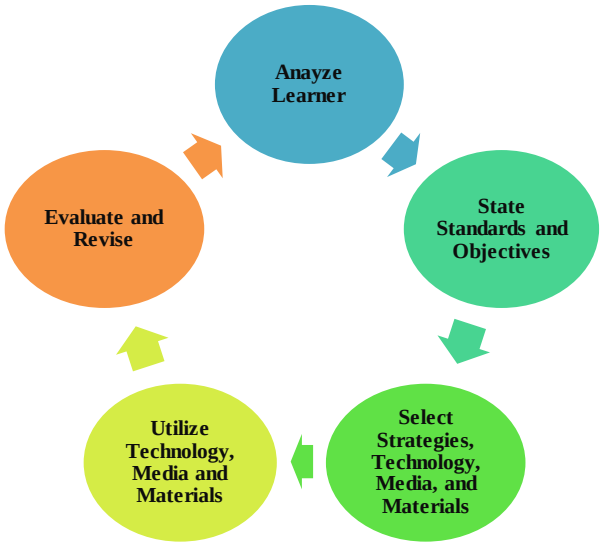
Arief S. Sadiman[17] explain that the procedure for developing ICT-based learning multimedia includes six steps, namely: 1) analyzing the needs and characteristics of students, 2) formulating instructional objectives, 3) formulating material items, 4) developing success measuring tools, 5) writing media scripts, 6) conduct tests and revisions. According to Criswell,[18] there are ten stages of developing computer-based learning multimedia, namely: "1) conduct environmental analysis, 2) conduct knowledge engineering, 3) establish goals and instructional objectives, 4) sequence topics and tasks, 5) write courseware, 6) design each frame, 7) program the computer, 8) produce accompanying documents, 9) evaluate and revise, 10) implement and follow up".

Philips[19] presents development steps called the waterfall model. In this model, to achieve design perfection can be improved before project construction begins. The steps

[17] Arif S. Sadiman, *Media Pendidikan*. (Jakarta: Raja Grafindo Persada, 2006), 100.
[18] Criswell, E. L. *The Design of Computer Based Instruction...*, h. 50.
[19] Philips, *A Practical Guide For Educational Applications*. (London: Kogan, 1997), 37.

are: 1) requirements analysis and definition, 2) software and system design, 3) implementation and testing, and 4) system testing. The necessary modifications are made from the start of the project.

In addition, there is an ASSURE model. The ASSURE model has 6 stages of procedure, namely: a) anayze learner; b) state standards and objectives; c) select strategies, technology, media, and materials; d) utilize technology, media and materials; e) require learner participation; and f) evaluate and revise the product. The pictures of the ASSURE model systematic steps are as follows:



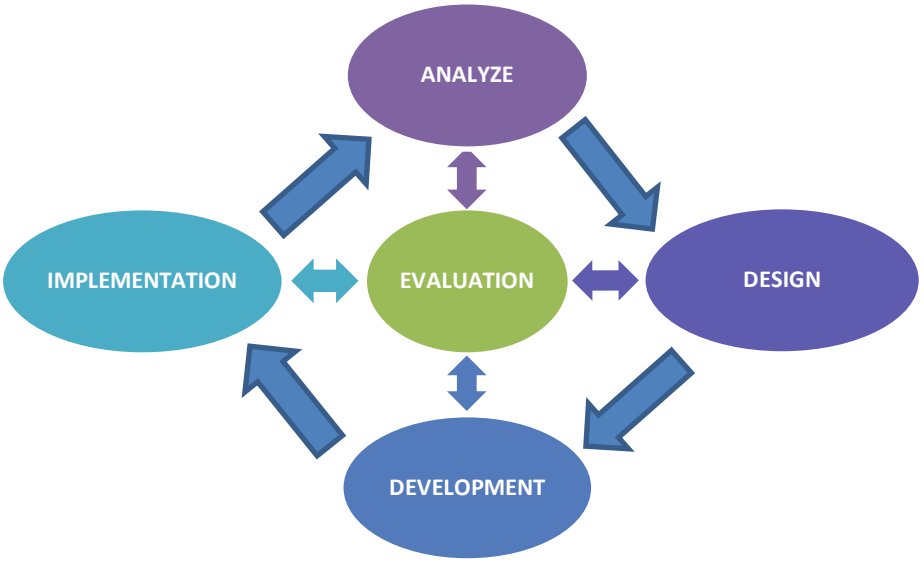
Picture I Example of ASSURE Procedure Flow[20]

In addition to ASSURE, there is also the ADDIE model. The ADDIE model was developed by Dick and Carry[21] in 1996 to design a learning system. In the product development steps, the ADDIE development research model is considered more rational and more complete. Mulyatiningsih[22] stated that this model can be used for various forms of product development in learning activities such as models, learning strategies, learning methods, media and teaching materials.

[20] Sharon Smaldino dkk. *Teknologi Pembelajaran dan Media untuk Belajar*. (Jakarta: Kencana, 2011), 49.

[21] Candra Hidayat. *Pengertian Model Penelitian Pengembangan ADDIE*. 2018. Diakses pada Maret, 08, 2022, dari ResearchGate: https://ranahresearch.com/model- penelitianpengembangan-addie/

[22] Candra Hidayat. *Pengertian Model Penelitian.*



Picture 2 ADDIE Development Model

The ADDIE Research Model Development Stage. First, Analysis. In the ADDIE development research model, the first stage is to analyze the need for new product development (models, methods, media, teaching materials) and analyze the feasibility and requirements of product development. The development of a product can be initiated by a problem in an existing/applied product. Problems can arise and occur because existing or available products are no longer relevant to target needs, learning environment, technology, student characteristics and so on. After analyzing the problem of the need for new product development, we also need to analyze the feasibility and requirements of product development. The analysis process can be done by asking several questions, for example: (1) is the new product able to overcome the learning problems faced?, (2) does the new product have the support of facilities to be applied?, (3) is the lecturer or teacher able to apply the new product . New product analysis needs to be done to determine the feasibility if the product is applied.

Second, Design. Design activities in the ADDIE development research model are a systematic process that starts with designing the concepts and content in the product. Designs are written for each product content. Instructions for implementing the design or manufacture of the product are attempted to be written in a clear and detailed manner. At this stage the product design is still conceptual and will underlie the development process at the next stage. Third, Development. Development in the ADDIE development research model contains activities for the realization of product designs that have previously been made. In the

previous stage, a conceptual framework for implementing a new product has been developed. The conceptual framework is then realized into a product that is ready to be implemented. At this stage it is also necessary to make instruments to measure product performance.

Fourth, Implementation. The application of the product in the ADDIE research and development model is intended to obtain feedback on the product being made/developed. Initial feedback (initial evaluation) can be obtained by asking questions related to product development goals. The application refers to the product design that has been made. Fifth, Evaluation. The evaluation stage in the ADDIE model development research is carried out to provide feedback to product users, so that revisions are made according to the results of the evaluation or needs that have not been met by the product. The ultimate goal of evaluation is to measure the achievement of development goals.

Another opinion regarding the stage of ADDIE development research model by Lee & Owen.[23] They describe the stages of developing the ADDIE model as follows. First, Assessment / Analysis. In the first section we follow Dick and Carrey's (1990) model to separate the analysis phase of instructional design into two parts: requirements determination and front-end analysis. Determination of needs focuses on determining the current state and desired state and the type of business problem that arises from the need. The front-end analysis then determines how to solve the problem with results-based solutions. Second, Design. When you have gathered all the necessary information from assessment, analysis and decision making, you are ready to enter the design stage. The design stage is the planning stage of your multimedia project. Planning is the most important factor in the success of your project.

Third, Development & Implementation. In the multimedia development process, there are components that are commonly used during production including computer-based, web-based components, performance support, and interactive remote broadcast solutions. Lesson outlines and concept maps become programmed lessons in the development phase. This is a concept that is easy to explain, but complicated to implement. Fourth, Evaluation. Every project requires a precise evaluation plan outlining how and to what degree the project will be evaluated. An evaluation plan should be developed at the end of the analysis phase or early in

[23] Candra Hidayat. *Pengertian Model Penelitian*

the design phase so that all project team members can make evaluations into each part of the ongoing project.

According to Luther quoted by Ariesto Hadi Sutopo,[24] there are six stages as steps for developing ICT-based learning multimedia, namely concept, design, collecting material, assembly, testing, and distribution. The development steps are explained as follows: 1) concept, which is to determine objectives, including identification of audiences, types of applications, application objectives, and general specifications; 2) design, is to make detailed specifications regarding the project architecture, style, and material requirements; 3) collecting materials, at this stage collecting materials such as clipart images, animations, audio, along with making graphics, photos, audio, and others; 4) assembly, this stage is the stage where the entire project is made. Making applications based on storyboards, flowcharts, navigation structures, or object diagrams from the design stage; 5) testing, this stage is carried out after completion of the manufacturing stage and all data has been entered; 6) distribution, this is a copy using a storage device. Distribution stage is also the stage where the evaluation of a multimedia product.

According to Lee & Owens,[25] the basic principles of developing computer-based learning remain the same, namely: 1) creating a framework, 2) developing media elements that are in accordance with the framework, 3) reviewing and revising the product made, 4) implementing the product. The development steps that have been stated above are not standard steps that must be followed, but each developer can choose and find the most appropriate steps for his research based on the conditions faced.

3. Evaluation of ICT-Based Learning Multimedia

Arief S. Sadiman[26] stated that there are three stages of formative evaluation, namely: 1) one-to-one evaluation involving two or more students who can represent the target population of the media created. Apart from that, it can also be tried on experts in the field of study (content experts); 2) small group evaluation (small group evaluation). At this stage the media is tested on 10-20 students who can represent the target population; 3) field evaluation is the final stage of evaluation, this evaluation is carried out on thirty students with various

[24] Ariesto Hadi, Sutopo, *Multimedia Interaktif dan Flash*, (Yogyakarta: PT Graha Ilmu, 2003), 32-48.
[25] Lee & Owens, A Lee, W. W. & Owens, D. L. *Multimedia-based Instructional Design)*,162.
[26] Arif S. Sadiman, *Media Pendidikan*), 182-186.

characteristics (level of intelligence, class, background, gender, age, learning progress, and so on) according to the characteristics of the target population .

According to Kirkpatrick[27] there are four levels of evaluation in ICT-based learning multimedia, namely: a) the first level (reaction), assessing participants' responses to activities in the form of impressions about the relevance of the activities that enable them to perform their duties; b) the second level (knowledge), assessing the increase in the achievement of the desired material and skills from the activities carried out; c) the third level (performance), assessing changes in attitudes or behavior as a result of the use of knowledge and skills from activities transferred to work within a certain period of time; and d) the fourth level (influence), assessing the influence of the business in the form of return on investment (ROI) from the activities carried out.

According to Philips[28] "The term 'evaluation', as applied to IMM and education in general, takes on a different emphasis and covers a much broader range of activities". According to Philips,[29] evaluation of ICT-based learning multimedia includes evaluation of documentation, formative evaluation, summative evaluation, evaluation of effectiveness and implementation, and evaluation of long-term impact. Documentation evaluation, which is an evaluation that answers problems regarding the processes and procedures followed during development. The questions to be answered in the evaluation of this documentation are: 1) Is the project on schedule? 2) Who and what has been done during development? 3) Is the time estimate correct? 4) Is communication to users sufficient? 5) What resources are still needed? 6) Is the project going according to plan? 7) What is the next important step? 8) Was the project completion effective? 9) Is the project development approach correct? Are we learning to improve the development process?

Formative evaluation, this is done before reaching the final product of the developed ICT-based learning multimedia. This formative evaluation is to see: 1) the effectiveness of navigation, 2) the enjoyment of students using the developed product, 3) the approach used to convey information, 4) the effectiveness of the screen design, 5) ICT-based learning multimedia is running according to what was planned. Summative evaluation, this evaluation is carried out through expert reviews on matters such as: 1) content accuracy and

[27] Lee & Owens, A Lee, W. W. & Owens, D. L. *Multimedia-based Instructional Design),* 224-225
[28] Philips, *A Practical Guide For Educational Applications*...h.128.
[29] Philips, *A Practical Guide For Educational Applications*...h. 129-146

completeness, 2) motivational and learning strategies, 3) screen design, aesthetics and convenience for users in general, 4) educational approach adapted, 5) the general effectiveness of the approach used. This information can be collected using tools such as: questionnaires, expert review sheets, interview guides, and video recordings.

Effectiveness and implementation, this evaluation answers questions about ICT-based learning multimedia that has been designed, developed, and implemented. The core questions to be answered through this evaluation are: 1) Does the ICT-based learning multimedia developed achieve the learning objectives as stated in the development objectives? 2) Did the knowledge and skills of students increase? 3) Is the attitude of students towards the subject matter getting better? Impact evaluation, this is a long term impact evaluation. A number of techniques can be used to collect data on the long-term impact of multimedia learning materials, including: 1) anecdotal notes, 2) observations, 3) interviews, and 4) indirect measures.

According to Criswell,[30] courseware evaluation includes four components, namely: 1) Evaluation of the lesson structure, namely an assessment of the structure and appearance of the lesson. Structure evaluation is useful for predicting how the courseware will teach without giving students a test. If the courseware does not teach effectively, then the evaluation of the structure identifies weaknesses or the courseware is less effective; 2) Functional evaluation, in this evaluation the skill level of students is measured before and after attending the lesson to determine how effective the courseware is; 3) The opinion of teachers and students, if the teacher and students do not like the courseware for several reasons, it means that the courseware cannot be used even though the courseware is effective; 4) Cost evaluation, consideration of the cost of the effectiveness of the courseware will give a wise decision.

E. CONCLUSION

Multimedia learning is a combination of several texts, images, graphic arts, animations, sounds and videos that are delivered in the learning process. Several various media are combined into a single work unit that will produce information that has a very high communication value in the learning process. This means that information can not only be seen as a printed product, but can also be heard, forming simulations and animations that can arouse interest and have high graphic art value in its presentation.

[30] Criswell, E. L. *The Design of Computer Based Instruction...*, h. 182-183.

As part of efforts to reform learning is to take advantage of ICT in learning activities. One of the ICT products that can be used in learning is a computer or laptop/netbool, an Android cellphone and the Internet. By applying ICT-based learning, students can learn "from" and "with" ICT products. Learning "from" ICT products is done by using ICT-based learning such as from products in the form of CAI, CBI, Mobile Learning and E-Learning. Learning "with" technology is the use of technology as cognitive tools and the use of technology in a constructivist learning environment.

Thus, the role of ICT-based learning multimedia becomes increasingly significant in the Industrial Revolution 4.0 and Society 5.0. The multimedia learning is designed to complement each other so that all existing systems in learning become efficient and effective or in accordance with the learning objectives that have been formulated. The use of ICT-based multimedia will improve the quality of the independent learning process and the active role of students. The ICT-based multimedia system also provides stimulation for the learning process that takes place outside the classroom.

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