

Development of Multimedia Learning Economic Models to Improve Student Learning Outcome

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Abstract: *This research is aimed to produce audio visual media for the course subject of economics learning models. To achieve this goal, research and development method are being used. Model conceptual design refer to that of Lee and Owens (2004) which cover 5 main steps: 1) analysis (needs assessment and Front-end analysis), 2) design, 3) development, 4) implementation, and 5) evaluation. The needed data for the design importance are being collected through instruments of questionnaires and tests. The data analysis are using percentage technique and chi-square test. The research result shows; First, product audio visual learning media has resulted on an interesting and effective learning multimedia. Second, the developed multimedia has a real positive effect in the form of improved student's learning result.*

Keywords: *development, multimedia, economics learning models, learning outcome.*

I. Background

Organizing courses Learning Models economy still faces some problems. The problems identified are as follows; (1) The learning activities are still using the conventional system in which the activities of lecturers more dominant; (2) the learning device is still oriented to the interests of the implementation of the curriculum SBC, (3) the unavailability of products (software) multimedia engaging and effective; (4) the presentation of learning have not been fully utilizing Computer Assisted Learning, and (5) assessment of learning outcomes have yet to implement authentic assessment; leading to a (6) low learning outcomes of students in the last three years. To solve the above problems required the development of quality multimedia, engaging, and effective and oriented to improve student learning outcomes.

Multimedia learning in general is a tool of teaching and learning process, covering everything that can be used to stimulate thoughts, feelings, concerns and abilities or skills of the learners so as to encourage the process of learning. This limitation is quite extensive and includes in-depth understanding of resources, the environment, human and methods used for the purpose of learning / training. According to Briggs (1977) learning media is the physical means to convey the content / learning materials such as books, movies, videos and so on. Meanwhile, according to the National Education Association (1969) learning media is a means of communication in the form of print and view, listen, including hardware technology. Multimedia programs helpful to present material that is authentic, safe, cost-effective or practical training for students. Learning content development tools such as Adobe Flash, Sun Java, Microsoft PowerPoint, video, audio, Captivate®, Articulate®, Softchalk® and many applications that were once the exclusive domain of computer programmers, is now available for computer-based learning. Some faculty often have creative ideas to solve learning problems both individually and in teams to develop learning multimedia content (Frey & Sutton, 2010: 492).

Educational technology has a major role in education (Ouyang & Stanley, 2014: 161). An emerging need for technology in education has increased the development of multimedia in education. A multimedia application must have a combination of text, graphics, animation and sound (Frey & Sutton, 2010: 491; Karthikeyan, & Aravindh, 2012: 26). Multimedia applications must have the potential to link learning activities with an integrated media objects (Azlina, Masood & Apandi, (2014: 156).

Clark and Mayer (2003) has contributed significantly to the understanding of how to interpret the cognitive process visual and auditory information can affect learning. Multimedia development with regard to how to incorporate images, audio, video, writing and speaking and narration. With this background knowledge, critical practitioners can analyze a multimedia component to prevent excess stimulation can inhibit cognitive learning (Clark & Mayer, 2003).

In addition to the consideration of learning, there is some evidence that the use of multimedia learning more motivating, engaging, and accessible anytime and anywhere than conventional learning methods (Zheng, 2009; Astleithner & Hufnagl, 2003). Furthermore, Bernard and others (2004) reported that students actively involved in their course motivated to achieve at a higher level than students who were not involved. To enhance this involvement, Lui, Toprac, and Yuen (2009: 174) identifies the following five factors as contributing to intrinsic motivation: (1) solving problems, (2) having fun or play, (3) information processing, (4) self-control or acting voluntarily, and (5) socialize.

Some research Also shows that with the help of this multimedia learning process Becomes more interactive and engaging (Jamian, Hashim, and Othman, 2012: 12), more Easily understand the material presented, and not easy to forget the material received and absorbed (Setiawan , Purnama, and Riasti, 2012: 5), and the increasing interest of student learning (Taradipa, Siswandari, and Sumaryati, 2011: 146).

The use of multimedia in learning will impact the efficiency of the time so teachers have enough time to give attention to help students' learning difficulties, the formation of personality, and motivates learning (Sudjoko, 2013: 71). Results of other studies that look at the effect of using instructional media in the realm of Social Sciences (IPS) showed that affects the outcome of instructional media to learn geography, the contribution of the effect of 30 percent (Mulya Sari, Sumadi, and Zulkarnain, 2014: 7). Student learning outcomes that learned using interactive learning media (experimental group) is higher than student learning outcomes that learned by using learning media textbook (control group) (Siagian, 2011: 28). Learning history using the medium of learning through multimedia interactive learning history can increase students' interest towards the subjects of history, thus improving student achievement (Son, 2013: 24). There is a positive and significant impact on the Use of Media Education Learning Achievement in Accounting with rx1y value (0.638) (Kurniawati, 2013: 15).

Learning media is a vehicle for channeling messages and information to learn. Media, well-designed study would greatly help learners achieve learning objectives. Each type of learning media has the characteristics, advantages and disadvantages. That is why the need for systematic planning for the use of instructional media. Development of instructional media should fulfill the principles of visuals (Visible, Interesting, Simple, Useful, Accurate, Legitimate, Structured) in a systematic planning for the use of media (Nurseto, 2011: 34). With the interesting learning media and can motivate students to learn about a subject that is delivered then indirectly also will improve the students' learning achievement (Prawiro, and Irawan, 2012: 33).

Formulation of the problem. The problem studied in this research is formulated as follows: (1) how the steps of developing multimedia course on economic models of learning, and (2) Is developed multimedia can effectively improve student learning outcomes ?.

Research purposes. This study aims to (1) produce a product in the form of multimedia courses teaching models economy, and (2) improving student learning outcomes.

Benefits of research. Output or product beneficial results of this research to improve the professional competence of students of Edinburgh University Economic Education FKIP being prepared to become a candidate for educators / teachers who will implement Curriculum 2013 in schools.

II. Theoretical Review

The word comes from the media medium, which literally means an intermediary or introduction. According to The Association of Education and communication Technology (AECT, 1977) in the Soul (1997: 2) are all forms of media that are used to process information distribution. According Djamarah (1995: 136) media are any tools that can be used as a conduit message in order to achieve the learning objectives. Purnamawati and Eldarni (2001: 4) suggested the media is anything that can be used to deliver a message from the sender to the receiver so that it can stimulate the mind, feelings, concerns and interests of students such that there is a process of learning. Media is an intermediary or an introductory message from the sender to the receiver. Gagne (in Sadiman, 1986: 6) states that the media are different types of components in the environment that can stimulate students to learn.

There are so many types of media that has been known and used in the delivery of information and messages of learning. In a web-based learning audio-visual media in the form of the most popular videos to be used, it is because in addition to displaying motion video also provides audio that are increasingly popular in learning through the internet. The messages can be presented facts (events, key events, news) or fictitious (story), it could be educational or instructional information. To develop learning media in the form of video required a variety of software (editing machice / programs) such as Movie Maker, Ulead Studio, adope Premier, and Camtasia Recorder which is commonly used to make video tutorials in learning an application with the computer program. According Asyhar (2011: 188) Camtasia Recorder is a software released by TechSmith Corporation, which is part of Camtasia Studio is useful to make a record or records regarding the appearance of the desktop. According Sadiman, et al (1986: 74) This video media has several advantages, such as; (1) to increase the attention in certain periods (2) to demonstrate that hard objects, (3) save time, (4) The picture and sound can be adjusted according to need, and easy to operate.

Video is one of the multimedia media that can generate sound elements and display elements of motion pictures, including the DVD, videotape, computer animation and others. Video can display recorded images and sound through the television screen because television has audio and video facilities. While monitors typically only display the image either still or moving images and audio have to add additional audio perangkat. Newby et al, (2000: 102) defines video as follows: "Video is defined as the display of the recorded pictures on a

television-type screen. Any media format that employs a cathode-ray screen to present a picture can be referred to as video: videotapes, videodiscs and DVD "(video is defined as a live recording of the image on the television screen. Many media formats that use cathode display to display an image may be called as video, videotape, videodisc and DVD).

In the affective domain, the video is very useful in shaping the personality and social attitudes. When there is an element of emotion or the desire for affective learning, video usually works well (Smaldino, Lowther & Russell, 2008: 310-311). One example is the instructional video footage documentary program that has been frequently found to have a measurable impact on the attitudes of learners. Documentary is fact not fiction or fact that has been fictionalized. Documentary program tried to portray the essence of the story is actually about the actual situation and the person. Video is the primary media for documenting actual events and bring it into the study.

Audio-visual media such as video selected in this study due to its ability to display real contextual picture of life. While watching the show from the video, learners will feel the sensation like being in actual reality. "One of the appeals of the video is that It provides a sense of being there" (Denning, University of Victoria). So that learners gain a learning experience that touches the feelings that come to feel the state disaksikannya via video player. When students experience significant learning experience and felt it is expected to form the affective. This is because the video media also has the potential formation of behavior and motivate learners. Denning, University of Victoria stated "Video can be used to model of positive behavior and to MOTIVATE students".

Besides that, the use of audio-visual media is due to its ability to provide a learning experience that is more concrete than verbal greeting or delivery, image or audio (Asyhar, 2010: 56). It can also be seen in the picture below which shows where the position of audio visual (video) in a continuum of learning activities. The learning process is basically located in a series of learning activities ranging from the nature of concrete, real experience to experience a very abstract (Smaldino, 2008: 8).

Multimedia that is developed in this study is a video about the models of learning. Joyce, Weil and Calhoun (2009: 25) classifies learning model into four groups: (1) Group model of process information (the information-processing family), (2) Group's social model (the social family), (3) the model group personal (the personal family), and (4) group of system models of behavior (the behavioral systems family).

Models of information processing emphasizes ways to improve the natural urge of man to establish the meaning of the world (sense of the world) to acquire and process data, solve problems and produce solutions that are appropriate, and develop concepts and language to transfer solutions / data. Models of this group exists to provide information and concepts on the learners, some are emphasizing the arrangement of concepts and hypothesis testing, and there are designing creative thinking. Social model group (the social family) didutujukan to build a community of learning (learning community). The learning management strived to develop relations kooepatif to generate the collective energy of the so-called synergy.

Group personal learning model (personal models of learning) starts from the perspective of individuals. These models are trying how we can memehami ourselves better, responsible and learn to reach or even surpass our development to make it more robust, more sensitive, and more creative in finding a more prosperous life. Carl Rogers (1961, 1982) offers a model of teaching without direction (nondirective teaching) who developed the theory of counseling that puts the teacher as a counselor / advisor, so the pressure on the relationship between students and teachers. Seistem group behavior developed based on social learning theory (social learning theory), and is also known as behavior modification (behavior modifikasi), behavior therapy (behavior therapy), or cybernetics (cybernetics). The principle is that human beings developed a system of communication repair themselves (self-correcting communication system) that can change their behavior in response to information about how successfully the tasks they perform. By utilizing the knowledge of the human response to the task and feedback, the task structure and feedback needs to be managed so that learners can correct themselves and their abilities.

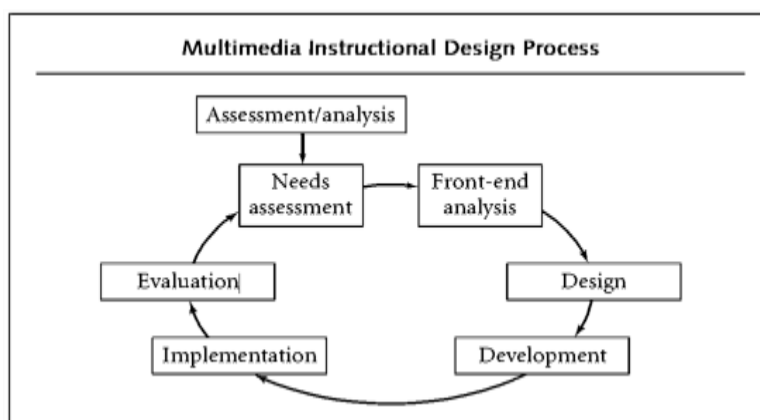
Currently it has developed a wide variety of learning models, from simple models to models rather complex and complicated because it requires a lot of tools in its application. According to Dell Olio And Donk (2007: 16) There are 10 models of classic and contemporary learning, namely; (1) Direct Instruction, (2) Concept Attainment, (3) The Inductive Model, (4) Reciprocal Teaching, (5) Quistion-Answer Relationship, (6) Jigsaw (in the context of cooperative learning structures), (7) role Playing, (8) Inquiry-Based Learning, (9) Synectics, and (10) Advance Organizers. In order to implement the Curriculum College in accordance with the National Qualifications Framework Indonesia (KKNI), Directorate for Education and Student Affairs Directorate General of Higher Kemdikbud (2014) recommends using the models of learning with the approach of the Student Center Learning (SCL), namely: (1) Small Group Discussion, (2) Role-Play & Simulation, (3) Case Study, (4) Discovery Learning (DL), (5) Self-Directed Learning (SDL), (6) Cooperative Learning (CL), (7) Collaborative Learning (CBL), (8) Contextual Instruction (CI), (9) Project Based Learning (PPA), and (10) Inquiry and Problem Based Learning (PBL).

Finally, Clark and Mayer (2003: 30) warns that one of the challenges of project multimedia learning "is to build a lesson in a way that is compatible with human learning. To be effective, teaching model should support this process. That is, they should foster psychological events needed to learn. Mayer put forward six principles of cognitive theory of multimedia learning (1. Multimedia, 2. Contiguity, 3. Coherence, Modality 4., 5. Redundancy and 6. Personalization) can be applied to most of the multimedia project so as to guide the development of effective learning. the reason it is important to pay attention to these principles with regard to an important difference between "delivery of information theory" and "cognitive theory of multimedia learning."

III. Research Methods

Draft Conceptual Model

The method used is a research & development (research and development). The design of the model refers to a model konsequal Lee and Owens (2004: 31). This model includes the procedural model in which the steps that should be followed is descriptive and consists of five steps or stages, namely: (1) Assessment / Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation (ADDIE). Product development model Lee and Owens who have used the concept ADDIE researchers, as it strives to develop a learning multimedia products capable of creating a learning environment that allows learners permeates the message to be delivered. Branch (2009: 2) argues "The educational philosophy of ADDIE for this application is that intentional learning should be student centered, innovative, authentic and inspirational". Model William W. Lee and Diana L. Owens (2004: 31) are presented in the following figure.



(Source: Lee and Owen, 2004:31)

Figure 1:The process of learning multimedia design

According to Martin, et al (2013: 6) ADDIE process (analysis, design, development, implementation, and evaluation) is a generic model of instructional design with templates that help users in the creation of learning materials for all types of learning, such as print and web-based. This model is a set of dynamic, flexible guideline for building effective learning materials. The different phases of the ADDIE process provides a road map for the entire instructional design process. That process begins with what should be learned and end when we find out if they learn what is needed.

During the analysis phase, the designers developed a clear understanding of the existing gap between the desired results and existing knowledge and skills of learners. In the design phase the designer describes the instructional objectives, the specific learning objectives, teaching materials, practice and feedback activities, instructional strategies, media, and assessment. The design stage is an advanced stage of the analysis, and information obtained from the analysis phase plan translated into learning programs. For multimedia projects result from the design stage is the storyboard that contains specific instructions for developing teaching materials. In the case of computer-based learning modules, storyboard should include detailed information on the content to be communicated, the desired layout, and function modules.

In the development phase, a prototype was developed directly from the design specifications. As part of this phase, the materials are developed should be evaluated to ensure they are designed as intended and to verify that the content of learning has been designed and developed.

In the implementation phase, the learning content provided to the trial in stages. Lastly, in the evaluation phase, the implementation phase information collected, compiled, and analyzed. Evaluation stage shows mastery learning assessment was intended, as well as feedback from users and implementers in the delivery of learning materials. The survey is a popular tool for the evaluation, along with interviews in focus groups. The results of the evaluation phase is a report detailing the results of the implementation and evaluation, and contain any recommendations for future use of the product.

Instrument Data Collectors

The data necessary for the design of the instrument collected through a questionnaire and tests. Questionnaire using a Likert scale with four answer options (Very Good, Good, Fair, and Poor Good) is used to obtain data on entry behavior, expert assessment of the aspects of the media and learning materials, and student response aspects of the product produced. Multiple choice test with four answer options granted to students while testing the product and field tests to measure learning outcomes or achievement level of competence in accordance with the purpose of learning. Data analysis using techniques percentage and chi-square test. Multimedia stages of evaluation are presented in Table 1 below.

Table 1:Multimedia evaluation stage

PRODUCT DEVELOPMENT STAGE AND REVISION	INSTRUMENT COLLECTING DATA	TRIAL SUBJECTS
Prototipe 1	Questionnaire entry behavior	College student
Evaluation and Revision 1		
Prototipe 2	Questionnaire media expert Questionnaire items expert	media expert matter experts
Evaluation and Revision 2		
Prototipe 3	Questionnaire & Test in Small Groups and large groups	10 People Student, and 34 People Student
Evaluation and Revision 3		
The field trials	summative test	43 students of class experiment 40 students of the control class

IV. Results and Discussion

Research result

Based on the results of learner analysis, 83% of students participating in the course Models of Economic Studies stated that the grain subjects learning models economy have so far never used the help of instructional media. 100% said that they liked the way of learning that presents audio and visual. And 100% of the students have a positive attitude, considering that the subject of learning economic models is very important to support a successful career in the future. The results of the analysis of the pre-requisite skills indicate that students who follow the course of economic development learning model presented in semester V, has had the competence of some subjects more or less 80 credits. However, prior to attending lectures teaching models this economy, only 45% of the students have had sufficient knowledge about the learning economy models. After the course syllabus learning models given the economy, 83% of new students understand the material scope of these courses. 90% of students have a strong motivation to achieve competence and / or learning outcomes of courses realized with achievement of the maximum value of the learning outcomes of this course.

Furthermore, based on the task or goal the analysis of data obtained as follows: (1) 100% of the students want to not only know about the types of learning models of economy, but how the implementation of each model is far more important, (2) 88% of the students found the evaluation of learning outcomes (UTS and UAS) courses teaching models economy not only measure the cognitive and attitude alone, but should also measure skills such as classroom practices, (3) 98% of the students stated that the lecture teaching models economy must always be complemented by the use video media learning model implementation.

At the design stage dillakukan media activities are; (1) determine the performance outcomes, (2) assign topics or units of learning, (3) to set goals or competencies that should be possessed by students after attending lectures, (4) develop lesson plans, (5) develop Content Outline Media Video (GBIMP), and (6) making the design treatment manuscript Video (DTNV). Design treatments Video Script is the end of the design phase activities that produce a prototype-1 audio-visual media (video) models of the learning economy.

At the development stage (development) treatment design manuscript Video (DTNV) are translated into Shooting Script / Storyboard used as guidelines by the crew picture taker, and the cast. The next activity was shooting, where the master video produces a product called prototype-2 were prepared in the validation. Validation is done by two experts, namely subject matter experts, and media experts.

Diminita media expert to assess the five (5) indicators include; (1) Design (Media Design), (2) Reaction (reaction), (3) Knowledge (knowledge), (4) Performance (performance / performance), and (5) Impact (impact). The mean scores given by expert Media is $64:20 = 3.25$, which means the media product prototype-2 rated in the categories of "good". Note the revision given by media experts, among others (a) of activities of investigation and discussion plus duration, and (b) the volume of the background music must be harmonized with the volume that portray faculty and students from getting too high or too low. Then validation by subject matter experts include four (4) indicators, namely: (1) effectiveness, (2) Efficiency, (3) Ease of Use (implementation), and (4) the attractiveness of the (appealing). The mean scores given by expert Matter is $53:14 = 3.26$, which means the media product prototype-2 rated in the categories of "good". Note the revision given by subject matter experts, among others, (a) the ease student access video via ICT should be noted, and (b) an

illustration background music needs to be stabilized. Based on the advice of experts team of media and subject matter experts, product prototype-2 revised again, and the result is called a prototype-3 media products.

Media product prototype-3 subsequently be evaluated by testing small groups, large groups and field tests. Small group trial involving 10 students were selected randomly for viewing audio-visual media (video) learning media in the form of a product prototype-3 and then to determine the impact on the improvement of student learning outcomes do pre test and post test. The results of the test Pree small group test is an average of 50.5 and the post-test average of 75.5 which means an increase of 50% of learning outcomes. Large group trial conducted to students who follow the activities pemvelajaran economic models of learning that is Class-A totaled 34 students. The mean scores of pre-test is 50, and the average value of post test rose to 77, which means an increase in the average learning outcomes by 54%.

Summary results of expert and user validation are presented in Table 2 below:

Table 2: Summary results of expert and user validation

No.	Indicator	Expert Content	Expert Media	College Student
1.	Effectiveness	3,50		3,40
2.	Efficiency	3,00		3,30
3.	Ease of Use	3,20		3,26
4.	the attractiveness	3,34		3,14
5.	Media design		3,00	3,14
6.	Reaction		3,00	3,13
7.	Knowledge		3,20	3,28
8.	Work method		3,34	3,30
9.	Impact		3,67	3,34
	Average	3,26	3,25	3,26

To view the multimedia effectiveness that have been developed to increase student learning outcomes conducted field trials. Field test conducted on the experimental class (N = 44) and control group (N = 40). After six (6) times the treatment, then given a summative test. Summative test results showing Mean Values experimental class was 3.74 (SD = 0.274), and the mean value of the control class was 3.03 (SD = 0.479), which means an increase learning outcomes 23.43%. Chi-square test results showed that there are significant differences learning outcome experimental class control class as shown in Table 3. This shows that the multimedia (video) developed learning has a positive impact on the improvement of student learning outcomes.

Table 3: Class * Quality , Crosstabulation and Chi-Square Tests

Count		Quality			Total
		enough	good	very good	
Class	experiment	0	22	22	44
	control	17	23	0	40
Total		17	45	22	84

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40,802 ^a	3	,000
Likelihood Ratio	55,902	3	,000
Linear-by-Linear Association	38,692	1	,000
N of Valid Cases	84		

a. 2 cells (25,0%) have expected count less than 5. The minimum expected count is 2,38.

Discussion

Development research has produced findings that; (1) using the model of Lee and Owens (2004) with appropriate principles can produce interesting learning media and effective, (2) media are well developed will have a positive impact by increasing learning outcomes. Learning Media is a tool used to demonstrate the facts, concepts, principles or specific procedures in order to seem more real / concrete. Aids was intended to provide more concrete experiences, motivate and increase the absorption and memory of students in learning. The media can foster a positive attitude toward the material and the student learning process. The learning process becomes more interesting when using the right media so that students are motivated to love science that is being studied. A lecturer can be effective and efficient in menyajikan if the subject matter can use the media well and on. Use of media in learning will impact the efficiency of the time that the lecturer has enough time to give attention in assisting student learning difficulties, the formation of personality, and motivates learning (Sudjoko, 2013: 71).

The researchers have applied in the context of educational multimedia and found that it allows them to choose from a variety of media elements to convey a specific message (Cairncross & Mannion, 1999: 100).

Various forms of multimedia, such as video cassettes (Mutharasan et al., 1997: 1175), multimedia materials on CD-ROM (Boman & Olsson, 1996: 229), a digital audio stream (Nortcliffe & Middleton, 2008: 45), software instructional multimedia (Kikuchi & Kenjo, 1996: 349); Schodorf, Yoder, & McClellan, 1996: 336), multimedia materials web-based (Kartam & Al-Reshaid, 2002: 682; Raju, Sankar, & Xue, 2004: 437), multimedia courseware (Giannotti & Galletti, 1996: 229), and even multimedia system programmable (Höhne & Henkel, 2004: 87), can meet different requirements in practice.

Previous research has also shown that learning using multimedia has helped teachers build a mental representation that is coherent from the material presented (Mutharasan et al, 1997: 1176), describes the spatial relationships, and present information appropriate for different types of learners (Cairncross & Mannion, 1999: 101). It can also increase the depth of students' learning of specific issues (Höhne & Henkel, 2004: 88; Cairncross & Mannion, 1999: 101; Yueh and Sheen, 2009: 712), and engage students dynamically (Cairncross & Mannion 1999 : 101).

The results of this research complements studies looking at the effect of the use of a medium of learning in the areas of Social Sciences (IPS), which indicates that the learning media influence on learning outcomes geography, the contribution of the effect of 30 percent (Mulya Sari, Sumadi, and Zulkarnain, 2014: 7). Student learning outcomes that learned using interactive learning media (experimental group) is higher than student learning outcomes that learned by using learning media textbook (control group) (Siagian, 2011: 28). Learning history using the medium of learning through multimedia interactive learning history can increase students' interest towards the subjects of history, thus improving student achievement (Son, 2013: 24). There is a positive and significant impact on the Use of Media Education Learning Achievement in Accounting with rx1y value (0.638) (Kurniawati, 2013: 15).

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Developments in information technology and computers have given pengaruh very significant in the development of instructional media (learning media), because of the presence of this technology has been able to integrate many different types of media into a learning model, called computer aided instructional (CAI). Various models of computer-based learning evolve with the passage of the development of computer technology itself, such as CAL (computer aided learning), CBT / L (computer-based training / learning), MBL (Multimedia-based learning), WBT / L (web-based training / learning), and studies of online learning and e-learning. Of the various terms mentioned above, basically have the same basic concepts that utilize computer technology as the basis of multimedia technology in the development of teaching media model (Hasrul, 2010: 5).

V. Conclusion

Based on the findings of research this development, it can be conclusion as follows: (a) audio-visual media (video) learning course on learning models developed economy based models of Lee and Owens (2004) carried out by five stages: analysis (needs assessment and Front-end analysis), design, development, implementation, and evaluation with the appropriate principles can produce interesting learning media and effective, (b) the media developed already having a real positive impact of increased student learning outcomes.

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