Application Design Of Interactive Multimedia Development Based Motion Graphic On Making Fashion Design Learning In Digital Format

Winwin Wiana

Abstract: This study is a research and development aimed at developing multimedia interactive learning based animation as an effort to improve student learning motivation in learning Fashion Design Technology, apart from this study also aims to design a learning program courses Fashion Design Technology with a focus on optimizing the use of interactive media in learning process. From this study showed: 1) A preliminary study found that, the problems faced by students when studying Fashion Design Technology is: the student is not optimal when learning designing clothes based computer technology both in terms of learning content, learning mechanisms that still uses a linear media, and limitations of highly structured learning time. 2) Animation multimedia has the following characteristics: a media of learning is convergent, interactive, self-contained in the sense of giving convenience to users without the guidance of others, as multimedia applications can present the material to see more interesting and informative. 3) Design of multimedia learning software developed include: the creation of flowcharts, storyboards and drafting manuscript of interactive multimedia based animation. 4) Based on the results of validation by multimedia experts obtained an average percentage of 85.55% viability, of the material experts obtained an average percentage of 90.84% viability and by students as users gained an average percentage of 96.38% eligibility , so it can be said that the standard of the feasibility of interactive multimedia based animation developed is included in the category of Very High or Very Good. Furthermore, experts agree that the development of interactive multimedia based animation on learning Fashion Design Technology can be used with some aspects that need to be improved to obtain higher levels of feasibility / more optimal.

Index Terms: Interactive Multimedia, Animation, Fashion Design Technology.

————————————————◆————————————————

1 PRELIMINARY

The teacher's role which is vital as the spearhead in determining the quality of education, has implications for the expectations of the ideal figure of a qualified teacher competence. However, empirically still found weaknesses of teacher at the time of the learning process. Exploration of teaching skills is a weakness that is still prevalent in the learning process. Teaching methods conventionally form a one-way transfer of knowledge from teacher to student is still the choice of most teachers in teaching. Another weakness in fulfilling its competence, is that many vocation teachers are not oriented technology development in developing lesson material, so that the materials should be facilitated by means of technology such as the computer device, for example on the subjects of fashion design, is still running the old system in learning. Along with the rapid development of information and communication media, both hardware and software, has resulted in the shifting role of the teacher. Teachers can no longer serve as the sole source of information for the learning activities of the students, so teachers need media that can be used as alternative sources of information. One of the products of technology that can be used as a media of learning is the computer. The existence of computers have helped teachers of various interests related to its work in designing, implementing and evaluating learning. Computers have been widely used in teaching and learning, with the goal of quality education would be a step forward in line with advances in technology.

Computer based learning is expected to help learners who have a slower learning pace (slow learner) in order to learn effectively, because the computer can resume the necessary information, while for learners faster (fast learner) can spur learning activities (Bambang Warsita, 2008). Fashion design as one of the areas of expertise developed as the field of designing more, the manufacturing process today is oriented using computer technology (Computer Aided Design / CAD), resulting in fashion design digital format with character and effective to be applied in the production of clothing products. In this regard, a rational step to be taken one of which is to develop learning programs that optimize all components of the learning process. One educational component that can be developed in the learning process and are assumed to have a considerable influence both in efforts to implement the achievement of learning goals in the manufacturing of fashion design digital format, is to develop instructional media effectively and efficiently, in order to obtain a change in behavior of students in accordance with the purpose to be achieved. During this learning activity is still dominated by the conventional lecture method, namely in the form of lectures or demonstrations, discussions and assignments. The condition causes a student experiencing burnout, so the motivation of students to participate in active learning process and record the material presented is low. Apart from that with the limited time has been segmented by hour lesson, provide limits for students to explore in absorbing the material, especially the students who have a low capture rates. This has implications on the outcome of the learning process to be not optimal, seen from the low level of mastery of the material and is usually measured through achievement or test scores of subjects concerned. Required an innovation in the learning process that can motivate students to actively construct a knowledge so that the learning process on students become more meaningful. Meaningful learning will make more students master the material or the concept given and will last longer in the memory of the brain. Such capabilities will greatly assist in facilitating learn the concepts and skills of a lecture, especially in the practice lesson. One of the innovations

---

- *Winwin Wiana is currently pursuing masters degree program in Technical dan Vocational in Indonesia University of Education, Indonesia, NIDN-0010017106. E-mail: iqmazulhij@gmail.com*

that can be done is innovation in developing learning media. Learning media is increasingly diverse, ranging from the conventional media like books or traditional teaching devices to modern audio-visual media such as tapes, videos, and other modern teaching devices. Learning media that are used to facilitate communication in the learning process, pursued optimally in order to foster creativity and motivation in learning activities to improve the quality of education. One of the media used in learning and is believed to be more exciting interest of students in lectures are interactive multimedia learning. This learning media is also one of the alternative means that can optimize an activity-based learning computer technology. Interactive multimedia applications is conditioned to present learning materials with a more attractive and informative, which is expected to facilitate and increase the interest of students to learn. Efforts are made to obtain the maximum results in learning fashion design making digital format needs to be designed and developed to optimize the use of innovative instructional media and directly related to the mechanisms of computer-based learning. Efforts are underway are expected to improve the quality of learning and motivate students to actively construct knowledge and skills in fashion design making digital format, so that the learning process of the students become more meaningful. The use of multimedia in addition assumed to be increasing mastery of concepts about the process of designing clothes, are also expected to develop students' skills in making fashion design digital format. This research was specifically conducted to develop improved concepts and skills of designing clothes digital format which is strongly associated with the ability to optimize the use of computer equipment, no one has done. This study is considered to have a high enough urgency, associated with the demands of a clothing industry is now turning towards digitization parameters in the product development process, one of them in the design area. Digital logic assessed richer because it contains a program with a range of facilities that can help designers to produce a more complex design idea and accurate. That condition has implications for the demands of technological mastery competence of vocational students who will fill the job opportunities as a practitioner of design in the fashion industry, first entering an era that demands MEA qualifications and competencies are more global. Students of Fashion Design as a prospective teacher in SMK, need to master well the concepts and skills of fashion design making digital format, as a preparation for transforming the learners. The difficulties experienced by students in understanding the concept of designing clothes that are often assumed to be a subjective understanding, can be helped by showing simulations applied to minimize the subjective understanding of the concept. Apart from that display varied and elements of the controller in interactive multimedia software enables students to more freely choose, synthesize, and elaborate knowledge and techniques taught, so that it can help to ease in understanding the material and mastered the skill of designing clothes digital format. Based on the description of the problems in the background, it is necessary to do some research on the development of interactive multimedia-based motion graphics in an effort to improve the mastery of concepts and skills of fashion design making digital format.

2 LITERATURE REVIEW

2.1 Interactive Multimedia Learning

Media is the plural of medium which is defined as communication channels, intermediaries or introduction, carrier of information between source and receiver. If the media that carry messages or information which aimed at instructional or containing teaching purposes then that media called a learning media. The media word evolved into a multimedia which is defined as a computer system which consisting of hardware and software that makes it easy to combine images, video, photography, graphics and animation with sound, text and voice data interactively which controlled by a computer program. In this regard, the interaction in computer-based learning environment generally include three elements: (1) instructional sequences that can be adjusted, (2) the answer / response or the student's work, (3) feedback can be adjusted The use of media in learning provides many benefits to the learning process. Judging from the benefits, the use of learning media in teaching and learning can generate new passions and interests, raise motivation and stimulation of learning activities, and even bring psychological effects on students. Besides being able to raise the motivation and interests of students, the selection of appropriate media will be able to help students improve understanding of learning, can present the data in an interesting and reliable, facilitate the interpretation of data, and can condense the information submitted. Kemp and Dayton in Sigit Prasetyo (2007) described the use of media in learning has benefits that are very positive, as follows: a) Submission of materials can be made uniform, b) The learning process becomes more vivid and interesting, c) The learning process becomes more interactive, d) Efficiency of time and energy, e) Improving the quality of student learning outcomes, f) Media allows the learning process can be done anywhere and anytime, g) the media can foster a positive attitude of students to the material and the process of learning, h) Changing the role of teacher direction more positive and productive. Interactive learning media based animation is one of the alternative means that can optimize the computer technology-based learning activities. Hofstteter in Rusman (2011) reveal the specifics that: Multimedia is the use of computers to create and combine text, graphics, audio, moving images (video and animation) by combining links and tools that allow users to navigate, interact, create and communicate. Multimedia is generally divided into two categories: a) linear Multimedia is a multimedia that is not equipped with any control device that can be operated by the user. Multimedia is running sequential (sequential) .Example: TV and movies. b) Interactive multimedia is a multimedia equipped with a controller that can be operated by the user, so the user can choose what you want for the next process. Examples of interactive multimedia are: Application games and interactive CD. As one component of learning systems, selection and use of multimedia learning must pay attention to the characteristics of other components, such as: objectives, materials, strategies and evaluation. Learning multimedia characteristics are: 1) Having more than one convergent media, such as audio and combines elements visual.2) interactive Characteristically, in the sense of having the ability to accommodate a user response. 3) independent Characteristically, in the sense of giving the ease and completeness of the content such that the user can use without the guidance of others. In addition to meeting these three characteristics, multimedia learning should fulfill the following

functions: 1) Ability to strengthen the user response as soon as possible and as often as possible. 2) Able to give students the chance to control their own rapidity learning. 3) Noting that the students follow a coherent sequence and control. 4) Being able to provide opportunities for the participation of users in the form of response, either in the form of answers, election, decision, trial and others.The most important thing from the use of interactive multimedia in teaching is characteristic of the display interactive multimedia directing students not only pay attention to media or objects, but also required to interact during the learning for interactive multimedia combine and synergize all media consisting text, graphics, audio and interactivity.

2.2 Motion Graphic
Motion graphics is a term used to describe a wide range of professional graphic design solutions in creating a dynamic and effective communication design for film, television and the Internet. According to Agnew and Kellerman (cited in Munir: 2012). Motion graphic is a combination of pieces of elements of design / animation which based on visual media which combines film language with graphic design, by incorporating different elements such as 2D or 3D. Incorporated media in the form of still image, the bitmap and vector formats, and video or audio data. In a motion graphics application, can create a composition that included a timeline, resolution, count the number of frames per second and size. At the time of making the composition, may include one or more media, and then appeared in the window composition and timeline.

2.3 Fashion Design in Digital Format
Design definition by Arifah (2003) is a design something that can be realized on a real object or human behavior that can be felt, seen, heard and touched. Application of design will be linked with various objects associated with human needs such as architectural design, product design, interior design, fashion design and so on. Fashion design as a form of design to fulfill human needs for products and clothing, today has been transformed from the conventional parameters of the design basis, in digital format parameter. Aside from the fashion design as one of the manifestations of the creative process, it is empirically demonstrated changes format (visual display) a revolutionary. The manual design parameter in the previous decade still widely explored on the various interests of its design, is starting to shift and change the format to the digital format design (made by the process of computerization). Manufacture of computer-based fashion design, providing a visual and tangible image characteristics, so the details that exist on the clothing can be visualized with more expressive.

3 RESEARCH METHODS
This research use research and development method. Stages of the process of research and development in this study is a modification of the ten steps of research and development which put forward by the Borg and Gall (in Sukmadinata: 2008). Broadly speaking, there are six stages of research and development, the preliminary study consisted of the analysis of basic competencies and reference collection, preparation or media development, media review that aims to analyze the look and the truth of the concept of media content, the revision of learning media, applications or trials media, and evaluation. The general stages of the research is as follows:
1. Collect a variety of information (preliminary studies) related to the study Fashion Design, especially in the use

of computer-based learning media and learning tools.
2. Make a learning design of Fashion Design digital format by focusing on optimizing the use of interactive media in the learning process, by making learning software includes: flowcharts, storyboard creation and manufacture of the manuscript.
3. Develop initial draft interactive multimedia models based motion graphic by processing elements of the design principal media of learning in a visual composition that is interesting and informative learning Fashion Design digital format.
4. Conduct an assessment model of software development based interactive multimedia learning motion graphics in Fashion Design through expert judgment.
5. Improving (revision) against primary products such as device model development based interactive multimedia learning animation in Fashion Design.
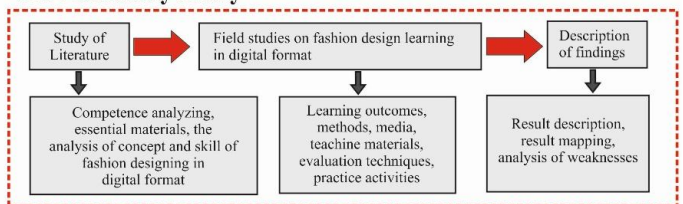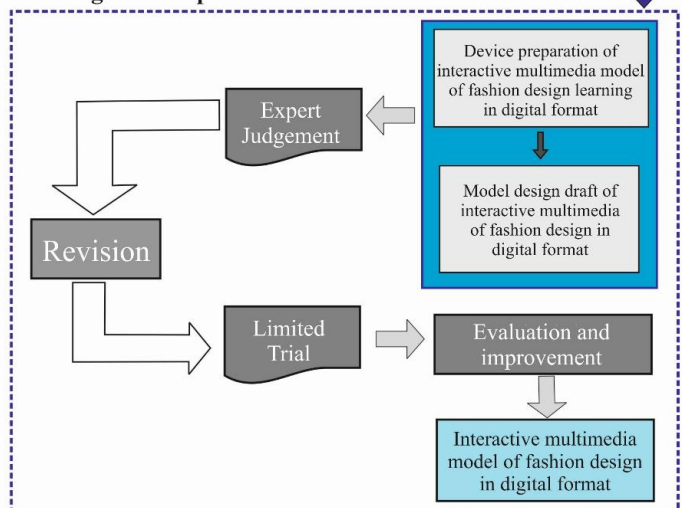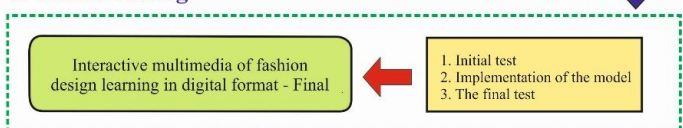

4 RESULT AND DISCUSSION
From research and development has been done, the results obtained at each stage in accordance with the procedures of research and development are described as follows:

4.1 Phase of Analysis
In this analysis phase, starting with the research literature concerning the theory relating to inteactive learning multimedia based animation, to get a general overview of the multimedia format that will developed and implemented in the learning process Fashion Design. From the results of the literature

study obtained information on the characteristic of interactive multimedia based animation, among others: that the interactive multimedia-based motion graphics have a rule, competition, their specific objectives to be achieved, have an activity and an interesting shape, the presence of the value of learning, precisely the skills special needs, have the properties to motivate, have a structure and their interest in the use of the five senses with images, animation, and sound. Apart from that, from the literature study also found that there are things that must be considered in developing a multimedia, interactive multimedia, particularly based motion graphics are as follows:
a) Ease of navigation, so it can be operated by all learners by minimizing the difficulties that may be encountered when operating it.
b) The content of cognition, such as lecture programs that can provide the experience cognitive (knowledge) that students need.
c) Media integration. Media should integrate some aspects and other skills that must be learned. Such as language skills, listening, speaking, writing and reading.
d) The aesthetic aspect is applied is intended to attract the interest of students, so the media should have an artistic and attractive appearance.
e) The overall functionality of the developed program must provide learning to students, so that by the time students finish the run / operate the program, they would have felt had had a depth of knowledge and skills about the material being taught.

In connection with the qualifying criteria a representative multimedia, field survey was also conducted for students to analyze multimedia needs to be developed in terms of users. Based on the field survey, obtained the following results:
a) Multimedia should be interactive in the sense that students are directly involved in learning with multimedia, not only rendering is active.
b) The material contained in multimedia learning to use language that is easily understandable and understood learners, as well as providing illustrations or images commonly seen in everyday life.
c) Development of the multimedia navigation is expected to provide a simple link or a link to facilitate students see the desired material and is responsive to commands / operations undertaken by learners.
d) Multimedia packaging is made with emphasis on the interactive aspect, not boring, using language that is easily understood, and provide intelligent solutions to solve a problem that is contained in the material.
e) Multimedia visualization is expected to appear in the form of the many popular and loved by students.
f) In connection with the desired experience of students, this multimedia is expected to provide learning experience becomes easier to understand a material.

Moreover, also conducted field surveys to study Fashion Design process to select the materials that will be appointed on a interactive learning multimedia based animation with consideration of the material has not been delivered and are in the on-going curriculum. Results of the review of the learning activities of the course, ultimately selected material on Tracing using Adobe Illustrator Software, Editing by using Software Adobe Photoshop CS 5 as a material to be lifted into this

interactive learning multimedia-based animation. Meanwhile, to measure feasibility level of multimedia, is oriented to conduct field trials early.

4.2 Design Phase
Design stage is the stage of drafting a interactive learning multimedia with reference to the results of a needs analysis before. Based on the stage analysis has been developed, obtained a concept of "simple desktop". In this concept, multimedia display designed with a simple, easy to use, as well as attractive by the application of simple animation (motion graphics). With a picture of such a concept as well as to facilitate the process of multimedia development at the stage of manufacture, it is at the design stage is made thorough design of the interactive multimedia.

4.3 Development Phase
Once the design or planning phase is completed, the next stage which is the develop the multimedia. This stage is to be done to prepare the subject matter that has been prepared and included on each page / frame by using software that has been determined. At this stage also did merger and synergize all multimedia elements, ie text, graphics, images, video, animation, music, and narration, into an interactive multimedia learning media.

a. Development of User Interface
Some examples of learning multimedia interface that has been developed is as follows:

b. Encoding

At this stage given the code to objects such as buttons or movie clip that has been made before on the interface, so that these objects function as we want. Code in Adobe Flash called ActionScript and in the development of this multimedia use ActionScript 3.0, to produce a multimedia interactive and dynamic, such as providing ActionScript on the button to give the function switch on the other display and ActionScript to create simple animations.

c. Test Movie

the aim of this test movie is to see whether the multimedia objects that have been given ActionScript can perform its functions as expected. If there is a function that is not appropriate, then held both at the interfaces and improvements in Action Script objects concerned. These steps are performed repeatedly to obtain the corresponding function.

d. Publishing

In the previous stages have been generated SWF file. To run this SWF file requires a Flash Player must be installed on the computer that will run it. Because of the possibility that the computer that will run this multimedia has not been found a Flash Player, which means this multimedia will not be executed, then needed another alternative to allow all computers to run this multimedia without having to install Flash Player first.

e. Packaging

This stage is the stage of multimedia packaging that has been created. At this stage, swf files and other files associated, bundled into an installer to allow for multimedia installation on another computer. Packaging is done by using a MDM Zinc program that has the build installer.

5 VALIDATION PHASE

5.1 Validation by Media Experts

Validation of interactive multimedia-based motion graphic is done by lecturers who have areas of study related to multimedia. The aspects in this validation is the existence of Button Navigation, Multimedia Display and Ease of Use Multimedia. The results of the validation of multimedia by media experts obtained an average percentage of 85.55% which eligibility can be categorized as Very Good. Multimedia validation results by media experts can be seen in the following table:

No	Aspect	Item Number	Creation Score	Total of Validator	Acquisition of Score (Average)	%
1	ENK*	12	48	3	40.3	83.95
2	MD**	12	48	3	40	80.20
3	EUM***	2	13	3	11	92.50
Average						85.55

Caption:
* Existence of Navigation Key ** Multimedia Display *** Ease of Use Multimedia

Multimedia validation results by the media experts obtained an average percentage of 85.55% worthiness which could be categorized as Very Good.

5.2 Validation by Material Experts

Validation of Interactive Multimedia materials based motion graphic is done by lecturers whose area of study is Fashion Design. Aspects seen in validation are general aspects, aspects of learning, and aspects of the material substance. The results of the validation by material experts, obtained an average percentage of 90.84% which eligibility can be categorized as Very Good. Multimedia validation results by media experts can be seen in the following table:

No	Aspect	Item Number	The Criterion Score	Total of Validator	Acquisition of Score (Average)	%
1	GA*	4	16	2	14.5	90.63
2	AL**	10	40	2	37.7	84.98
3	AMS***	4	16	2	15.5	96.88
Average						90.84

Caption:
* General Aspects ** Aspects of Learning *** Aspects of Material Substance

The results of the validation by subject matter experts, obtained an average percentage of 90.84% worthiness which could be categorized as Very Good.

5.3 Validation by Users

Validation by the user is done in the form of a test device, to determine the assessment of the feasibility level of interactive multimedia based animation in Fashion Design Technology learning, before the product is implemented in the field. And obtained the following data:

Aspects of Assessment	Total of Validator	Score (Average)	The Criterion Score	%
NBM*	4	3.95	4	98.75
DML**	4	3.91	4	97.75
EM***	4	3.92	4	98.24
MI****	4	3.71	4	90.76
Total		3.87	32	96.38

Caption:
* Navigation Buttons in Multimedia ** Display of Multimedia Learning *** Ease of Use Multimedia **** Multimedia Interactivity

The results of the validation by subject Users, obtained an average percentage of 96.38% worthiness which could be categorized as Very Good.

6 MULTIMEDIA REVISION PHASE

There are some improvements to be made to the interactive multimedia-based animations that have been developed for this Fashion Design Technology course, including the following:
a) Specifications formulation of the title on the start screen interface, preferably depicting multimedia content optimally.
b) Aspects of the instructions for use on the display interface should be complete, and contains all the technical

aspects, so that it is more informative and easier to understand, so it will be easier to be operated by learners.

c) Introductions of the purpose of the course need to be displayed.

d) One validator multimedia experts advise to be added back sound on each display multimedia tutorial, but the students as the validator give the opinion that the addition backsound will interfere with concentration at the time of this multimedia device operate.

7 ASSESSMENT PHASE

Having passed all the stages, then the next assessment to determine the feasibility of interactive multimedia based animation, based on the results of the validation performed by multimedia experts, subject matter experts and students as multimedia users.

7.1 Feasibility Assessment of Validator Experts

Based on the validation conducted by experts to determine the feasibility of multimedia who performed on the stage of development of multimedia, the interactive multimedia based motion graphics that have been developed rated Very Good and decent use seen from the assessment given by media experts and material experts with an average percentage given each ie 85.55% of media experts and 90.84% of material experts.

7.2 Feasibility Assessment of Validator User

Based on the evaluation of students to multimedia performed on the trial phase of multimedia, percentage obtained by 96.38%, Which means that interactive multimedia-based animations that have been developed rated Very Good by almost all respondents, from the aspect of completeness of navigation devices in the multimedia, multimedia display, ease of use of multimedia and multimedia interactivity.

8 CONCLUSION

Conclusions can be drawn based on the stages of research and development that have been passed, are as follows:

1. Based on the preliminary study, it was found that the teaching method of learning linearly in Fashion Design digital format still has some weaknesses and not optimal in achieving the goal of digital based learning, mainly because the learning process is limited by time allocation.

2. The use of interactive multimedia-based motion graphic (simple animation) equipped with a control device, has various advantages: can be responded quickly, learners can control the rate and speed capacity own learning, so that students can attend learning programs in a coherent sequence and controlled , thus designed program can provide an opportunity for participation of users in various forms of response, either in the form of computer operation as a core part in the learning process, discover a variety of editing and layouting and various other independent learning activities.

3. Interactive learning multimedia designed draw will be motivating and stimulation of learning activities of students, help students to improve their understanding of the learning material and fostering creativity in learning so that will have an impact on improving the quality of learning.

4. The results of the validation of the multimedia experts on the development of interactive multimedia based motion graphic in teaching Fashion Design digital format indicates that the

experts agree on a device created can be used with a high degree of unanimity. The results of the validation by multimedia experts obtained an average percentage of 85.55% viability, by material experts obtained an average percentage of 90.84% viability and by students as users gained an average percentage of 96.38% feasibility, so it can be said that the eligibility standards of interactive multimedia based animation developed is included in the category of Very High or Very Good.

REFERENCES

[1] Arifah, Desain Busana, Bandung: YAPEMDO, pp. 6, 2003

[2] Azhar, A, Media Pembelajaran, Jakarta: PT. Raja Grafindo Persada, pp. 15-85, 2007.

[3] Dimyah, Belajar dan Pembelajaran, Jakarta: Rineka Cipta, pp. 3-5, 2006.

[4] Furqan, M, "Perguruan Tinggi Berbasiskan Media dan Teknologi", http://www.google.com. 2007.

[5] Gall, M.D., Gall, J.P., & Borg, W.R, Educational Research, An Introduction, Boston : Pearson Education, Inc, pp. 365-431, 2003.

[6] Hernawan, A.H, E-Learning, Planning and Learning (E-Learning, perencanaan dan pembelajaran), Disdik Propinsi Banten dan Jurusan Kurtek FIP UPI, 2002.

[7] Husein, S., Heryanti, L., Gunawan, "Pengaruh Penggunaan Multimedia Interaktif Terhadap Penguasaan Konsep dan Keterampilan Berfikir Kritis Siswa dan Materi Suhu dan Kalor", file:///E:/data%20hdd%20axio/HDD%20Lama/UPI/DISE RTASI/DISERTASI/multimedia%20meningkatkan%20pe nguasaan%20konsep.pdf, 2015.

[8] Kemp, J. E., Dayton, D. K., Planning and Producing Instructural Media New York Cambridge: Harper & Row Publisher, pp. 28, 1985.

[9] Mardika, N. "Pengembangan Multimedia Dalam Pembelajaran Kosakata Bahasa Inggris Di SD", http://mardikanyom.tripod.com/Multimedia.pdf, 2008.

[10] Munir, Kurikulum Berbasis Teknologi Informasi dan Komunikasi, Bandung: SPS Universitas Pendidikan Indonesia, pp. 20-234, 2008.

[11] Murphy C., Greenwood, L., Effective Integration of Information and Communications Technology in Teacher Education, 1998.

[12] Newby, T. J., Stepich D. A., & Russel J. D., Educational Technology for Teaching and Learning, Upper Saddle River, NJ: Pearson Merril Prentice Hall, 2006.

[13] Prasetyo, Sigit. Pengembangan Pembelajaran Dengan Menggunakan Multimedia Interaktif Untuk Pembelajaran Yang Berkualitas. Semarang : UNNES, pp. (2007)

[14] Rusman, K.D, Riyana. C, Pembelajaran Berbasis Teknologi Informasi dan Komunikasi: Mengembangkan Profesionalitas Guru, Jakarta: PT. Raja Grafindo Persada, pp. 92-295, 2011.

[15] Rusman, "Model-model Pembelajaran Berbasis Komputer", http://file.upi.edu/Direktori/A%20%20FIP/JUR.%20KURI KULUM%20DAN%20TEK.%20P ENDIDIKAN/197205051998021%20%20RUSMAN/Pem belajaran%20Bebasis%20Komputer/Mo del-model%20PBK-Rusman.pdf, 2010.

[16] Somekh, B. & Davis, N, Using Information Technology: Effectively in Teaching and Learning, Routledge: London, pp. 21-25, 1997.

[17] Sukmadinata, Nana Syaodih, Metode Penelitian Pendidikan, Bandung: PT. Remaja Rosdakarya, pp. 169, 2008.

[18] Warsita, Bambang, Teknologi Pembelajaran : Landasan dan Aplikasinya, Jakarta: Rineka, pp. 8, 2008.