

The Effectiveness of Using Interactive Multimedia Based on Motion Graphic in Concept Mastering Enhancement and Fashion Designing Skill in Digital Format

<https://doi.org/10.3991/ijet.v13i02.7830>

Winwin Wiana[✉], M. Syaom Barliana, Arifah A.Riyanto
Indonesia University of Education, Bandung, Indonesia
winwinwiana@upi.edu

Abstract—This This research is related to the effort to design a more representative learning system to improve the learning result of digital fashion design, through the development of interactive multimedia based on motion graphic. This research is aimed to know the effect of interactive multimedia application based on motion graphic to increase the mastery of the concept and skill of the students to making fashion designing in digital format. The research method used is quasi experiment with research design of Nonequivalent Control Group Design. The lectures are conducted in two different classes, namely class A as the Experimental Class and class B as the Control Class. From the calculation result after interpreted using Normalize Gain, there is an increase of higher learning result in student with interactive learning based on motion graphic, compared with student achievement on conventional learning. In this research, interactive multimedia learning based on motion graphic is effective toward the improvement of student learning in concept mastering indicator and on the aspect of making fashion design in digital format.

Keywords—interactive multimedia, motion graphic, fashion design in digital format

1 Introduction

One of the indicators of the modern system of learning in the second millennium era today is by making innovations that emphasize change [15], and the most rational form of change to adopt is to integrate the various components of learning both in the managerial system and learning techniques that develop the principle of modernity and technology with principles and theories of learning. However, the exploration of conventional teaching skills in the form of one-way-transfer of knowledge from teacher to students is still the choice of most teachers in teaching. Another weakness in fulfilling its competence, is that many teachers are not oriented to the development of technology in developing the subject matter [3]. These conditions resulted in less developed learning results obtained by students, because the materials that should be facilitated by technology like computer devices such in fashion design subject, still running conventional system in the implementation.

Currently, the development of information and communication media, both hardware and software occur rapidly, so that conditions have resulted in shifting the role of teachers, where currently teachers can no longer serve as the only source of information for learning activities of the students. Relate with it, then the teacher needs a media that can be utilized as an alternative source of information. One of the technology products that can be used as an innovative media in the learning process is the computer. The existence of today's computers has helped teachers in various interests related to their duties in designing, implementing and evaluating learning. Computers have been widely used in the teaching and learning process, with one goal that the quality of education going one step ahead with advances in technology. With computer-based learning, it is expected to help learners who have a slower learning speed (slow learner) in order to learn effectively, because computer can display the information that need to be repeat again and again, while for faster learners (fast learner) can stimulate learning activities [23].

Fashion Design like other design field, in its making is oriented by using computer technology (Computer Aided Design / CAD), so as to produce characterize fashion design in digital format and effective to be applied in the process of making of fashion product [16]. In this regard, the rational step needs to be taken in order for the learning process to succeed effectively, is to develop a learning program that optimizes all components of the teaching and learning process. An innovation is needed in the learning process that can motivate students to actively construct a knowledge so that the learning process it self becomes more meaningful. Meaningful learning will make students more master the material or concept given and will last longer in the memory of the brain. Such capability will be helpful in facilitating learning the concepts and skills in a lecture, especially in practical class. One component of education that can be developed in the learning process and assumed to have a pretty good influence in efforts to implement the achievement of teaching objectives on the fashion design in digital format, is to develop effective and efficient learning media, so the students have certain competence accordance with the purpose to be achieved [16].

Now Learning media is more diverse, ranging from conventional media such as books or traditional props to modern media audio visual form in cassettes, videos, and other modern visual device. Learning media used to optimize the teaching and learning process, strived to be able to grow creativity and motivation in learning activities to improve the quality of education [14]. One of the media used in learning and believed to be more exciting students interest in lectures is interactive multimedia learning. Learning media is also one of the alternative means that can optimize learning activities based on computer technology [13]. This interactive multimedia application is conditioned to present learning materials with a more interesting and informative display, so it is expected to facilitate and increase student interest to learn [6].

Efforts are made to obtain maximum results on the learning of making fashion design in digital format needs to be designed and developed by optimizing the use of innovative learning media and related directly in the mechanism of computer-based learning [11]. Efforts are made is expected to improve the quality of learning and can motivate students to actively constructed knowledge and skills in the making of fash-

ion design in digital format, so that the learning process in students becomes more meaningful. The use of multimedia in addition is assumed to increase the mastery of the concept of the fashion design process, is also expected to develop students skills in making fashion design in digital format.

Information technology in education is applied in the form of interactive multimedia in the form of software (software), which provides facilities to students to learn a material. The use of interactive multimedia applications in learning will improve the efficiency, motivation, and facilitate the active learning, experimental, consistent learning, with student-centered learning [3]. The use of interactive multimedia in learning is also very possible to improve the thinking ability that expected. In general, the benefits that can be gained through the use of interactive multimedia is the learning process can run more interesting, more interactive, the amount of teaching time can be reduced, the quality of student learning can be improved and the learning process can be done anywhere and anytime, and can improve students logic ability [17].

Wiyono [26], with research on interactive multimedia found that the improvement of mastering the concept of students who follow the learning using cooperative learning group with help from interactive multimedia is significantly higher than the students who follow the conventional learning. Sutarno [17], found that the improvement of mastery of the concept and critical thinking skills of students who follow the magnetic plate learning using online interactive multimedia is significantly higher than the students who follow the conventional learning.

This research is specifically done to develop the improvement of the concept and skill of fashion designing in digital format that is closely related to the ability to optimize the use of computer. This research is considered to have a high urgency, related to the demands of the world of fashion industry that is currently beginning to switch to the parameters of digitization in the process of product development, one of them is in the design area. Digital logic is considered richer because it contains programs with various facilities that can help the designers in generating more accurate and complex design ideas.

1.1 Fashion Design in Digital Format

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 [24].

Entering the early 1990s there was a shift in the parameters of the fashion design process, which at that time the process of designing fashion began to be directed using a computer device. With computer technology a designer can freely explore and experiment in creating innovative fashion designs and can accommodate market demand. Computer design is a network of technological devices that are capable and versatile, so that a designer who has mastered computer technology in fashion design process, in general will be able to generate and realize ideas faster than when done in other ways. This is very supportive in realizing the production targets and efficiency that must be fulfilled by fashion industry [18]. Digital logic is often judged to be richer as it contains software programs from world-class “libraries” of thinkers. For example, when a designer will design a certain type of clothing, then a collection of Clipart or Art Work such as facilities of fiber type, textures, motifs, colors, model line and models detail of clothing parts can be utilized. Designers have the opportunity to create several variations, modifications and various creation from designs that have been made earlier as needed. With the expertise of its maker, the design computer has been equipped with various facilities to help designers produce a more complex and can be re-formulated (edit), so designers do not have to repeat from scratch when the image is not exact with their desire [18]

Regarding to the criteria in the design element description and accuracy, then the computer medium is ideal in providing a real advantage on speed and flexibility. So many advantages that can be displayed from digital technology in the design area of fashion. However, design computers can't create images spontaneously/instantly, because these systems contain a number of very complex programs, so that every software program must be understood and mastered, then the device is linked to create an interaction pattern between its functions [18]. The mastery of the computer system in fashion design is a process that is not simple to understand, and it is inevitable that the condition should be anticipated through a set of specific learning process, in order to obtain a set of competencies in processing the design of fashion in digital format.

A digital image is a representation of a two dimensional image with a series of limited number of image or pixel element values. Pixel values typically represent color levels, gray scale, altitude, image sharpness, etc. Each pixel is a number represented as a DN (Digital number) that describes the average capacity of light in a relatively small space in a working area. The range of DN values is usually 0 to 255. The size of this area affects the reproduction of details within a working area [8]. Regarding to digital formulations in fashion design, there are several advantages that can be captured visually from the appearance, namely:

	Fashion Design Manual Format	Fashion Design Digital Format
Creation Techniques	Design made manually using drawing tools	Design made using computer
Generated Effect	<ul style="list-style-type: none"> ➤ Artistic ➤ Show designers personal design style ➤ Flat drawing (2D) 	<ul style="list-style-type: none"> ➤ Modern ➤ Shows the arrangement of character's element/material in more real way ➤ More expressive, because it can visualize designs model character more real ➤ Image have more volume on it (3D)
Product Diversification	<ul style="list-style-type: none"> ➤ Difficult: Need repeating process from beginning ➤ Accuracy level is low 	<ul style="list-style-type: none"> ➤ Easy: Process can be done faster ➤ Accuracy level high
Design Form		



Fig. 1. Diversification fashion design product in digital format

Another advantage of this fashion design in digital format is its ability to be made in various variations with relatively little time to make it happen. These conditions provide many advantages when its developed on the design process in the fashion manufacture industry field, because it can increase productivity with unlimited creations. Therefore it is advisable for students who study the field of fashion design study around the world to master the technology of making design using computer.

Fashion designs are presented in digital format, in the manufacturing process involving aesthetic design, technical aspects and mathematical calculations, meaning that the design of clothing format digital format is not limited to theoretical graphics creation, but also need support practically. In traditional teaching, the effects of images and graphic structures can't be displayed visually, as are the printed books they serve as references, providing only a few of the required expressions, so they both exert an unfavorable effect on improving students understanding of material design subject [22]. In such situations it is urgent to develop multimedia learning devices to help students understand the teaching of digital format fashion design, thereby increasing the mastery of their concepts and skills in designing fashion in digital format.

1.2 Interactive Multimedia

The popularity of computer, network and multimedia technology is now believed to have opened various channels for students to enrich their knowledge, as well as to increase the competence of the field of science it is engaged in [22]. Through multimedia, teachers could present the information in an innovative manner and motivate

the students to learn quickly. Delivering the topic using multiple media could be more effective than doing it through a single medium [2]

Interactive multimedia is a multimedia equipped with user-operated controller tools, so users can choose what they want for the next process, like in interactive game and CD applications. The description in advance describes an important concept, that is, if the user gets the flexibility in controlling the multimedia, then the device is categorized as interactive multimedia. The most important characteristic of interactive multimedia is the students not only pay attention to media or object, but also required to interact during learning [10]. Diartono [2] describes that interactive multimedia combines and synergizes all media elements consisting of: a) text, b) graphs, c) audio, d) video, e) visual effect, f) sound effect, and g) interactivity.

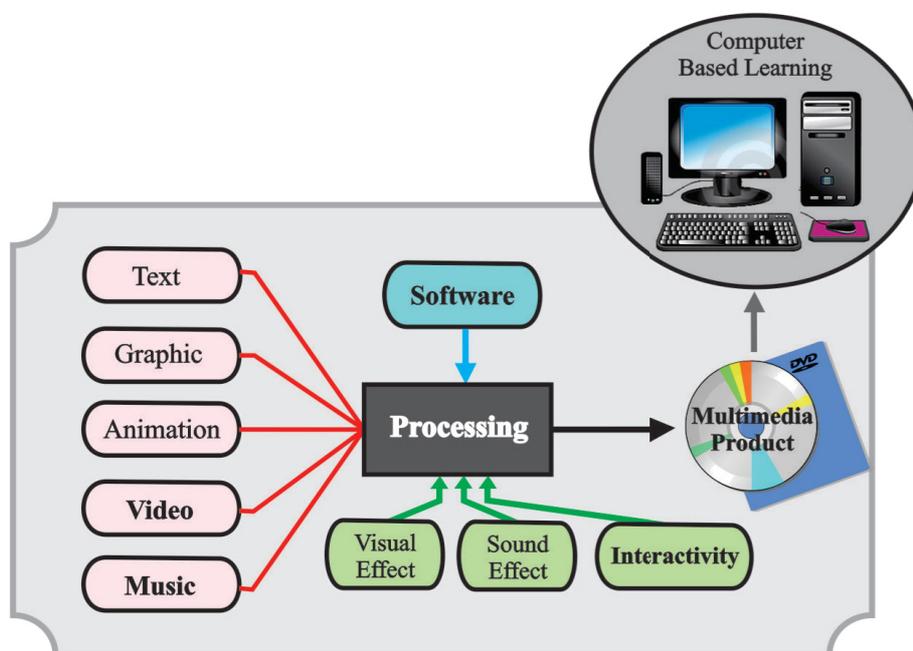


Fig. 2. The developing process in learning multimedia based on computer

Empirically interactive multimedia provides many benefits to the learning process, and those benefits are: (1) Interactive means that multimedia program is programmed or designed to be used by individual students (independent study), (2) Giving individual affective which mean more affective in a more individual way, never forgetting, never bored, very patient in performing instruction, as desired, (3) Increasing motivation to learn (4) Giving feedback (response), and (5) Because interactive multimedia is programmed for self-learning, its utilization controls are entirely within the user. However in some areas interactive multimedia has several deficiencies, that is: 1) Development requires a professional team and (2) Development takes a long time with a lot of money [12].

Utilization of multimedia technology as an interactive learning method, is one of the learning tools for students, has some basic strengths, namely: [6] a) Mixed. Media using multimedia technology, various existing conventional media can be integrated into one type of intermediate media, such as text media (whiteboard), audio, video, which if separated will require more media. b) User control. Interactive multimedia implementation technology (IMMI), allows users to browse the teaching materials, according to the ability and background knowledge he/she had, in addition to making users more comfortable in studying media content, repeatedly. c) Simulation and visualization. Simulation and visualization is a special function possessed by interactive multimedia, so with animation technology, simulation and visualization of computer, users will get more real information from an abstract information. In some curriculum requires a complex, abstract, dynamic and microscopic process, so that by simulating and visualizing the learner will be able to develop the mental model in its cognitive aspect. d) Different learning styles. Interactive multimedia has the potential to accommodate users with different learning styles.

Looking at the various advantages offered by interactive multimedia on design learning, it is believed that the software developed in guiding the design students to learn the making of design with computer technology will provide a positive impact in improving students understanding and skills in making digital format fashion design in design education institutions in different parts of the world.

1.3 Motion Graphic

Motion graphics are actually part of animation techniques, where motion graphics is one of the categories of animation fields. Michael Betancourt, a film theorist, in an article titled *The Origins of Motion Graphics* reveals that motion Graphic is a graphics medium operated using video recording or animation technology to create the illusion of motion or rotation, and is usually combined with audio for use in multimedia projects for various purposes of publication, one of which is used as a medium of learning. Basically motion graphic means moving picture. Called a moving image because in the process of making it used many images sequentially and manipulated in such a way so it looks as if the image can move. The aim is to deceive the human eye into believing that there is movement. As an illustration can be found in a unmoving image, then the image is moved through changes made regularly and slowly, thus giving the impression of life [19]. Motion graphics are often used for television commercials, opening bumper, or for the purposes of visualizing various events.

The making of multimedia based in motion graphic is a continuous process, which is done through three stages of the process. Anwari [1] describes the process as follows: First, the pre-production stage, the making of concepts, scripts, and storyboards. Second, the stage of production, including the making of layout and character creation and key animation or key movement. Third, post production, which sometimes need to synergize with other production houses.

2 Methodology

The method developed in this research is Educational Research and Development (R & D), is a development of multi-media interactive learning on learning Fashion Design, to improve the understanding of concept and skill of fashion designing in digital format. Borg and Gall (1983) define R & D in education as "a process used to develop and validate education product", a process used to create, develop and validate research products. Borg further states that:... *our use of term product include not only material objects, such a text book, instructional films and so forth, but it also intended to refer to established procedures and processes, such as methods of teaching or methods organizing instruction.* [4]

The design of this study applied two groups of respondents, namely the Experimental Group and the Control Group. Both groups were pre-tested to determine the initial state of the respondents, whether there was a difference between the Experimental Group and the Control Group. The design pattern applied in this research refers to Pretest-posttest control group design concept proposed by Sugiyono [16], can be seen as follows:

Table 1. Design of Research Class Design Treatment

Class	Design	Treatment	Test	
			Begin	End
Experiment	O ₁ X ₁ O ₂	X ₁	Yes	Yes
Control	O ₃ X ₂ O ₄	X ₂	Yes	Yes

X₁ = Using Interactive Multimedia

X₂ = Using Conventional Learning

The difference test of two averages of two samples was conducted to determine whether between the Experimental Group and the Control Group there was a difference of N-gain (normalized gain) according to Hake (Widodo: 2010), were:

$$(N - gain) = \frac{\% \text{ actual gain}}{\% \text{ potential gain}} = \frac{\% \text{ skor postes} - \% \text{ pretes}}{\text{skor maksimum} - \% \text{ skor pretes}}$$

In this research, N-gain descriptive analysis using N-gain criterion according to Hake (Widodo: 2010) is shown in the following table:

Table 2. Category level of N-Gain

Limitation	Categori
$g > 0,7$	High
$0,3 \leq g \leq 0,7$	Medium
$g < 0,3$	Low

3 Result and Discussion

3.1 Result

The Development Result of Interactive Multimedia Design Based in Motion Graphic in the Digital Format of Fashion Design Learning. The development of multimedia based in motion graphic packed in learning software that can used to support the fashion design learning in digital. The following are some example of interactive multimedia based on motion graphic display in the making of fashion design learning that have been developed:

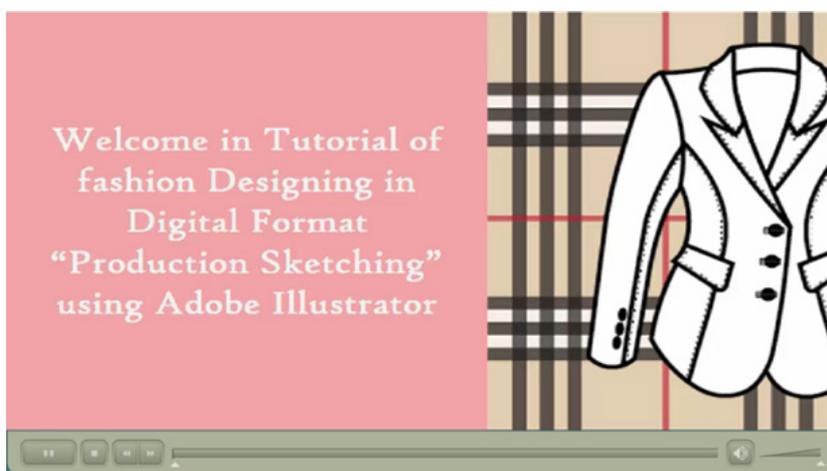


Fig. 3. Display interface of the making of production sketching design practice

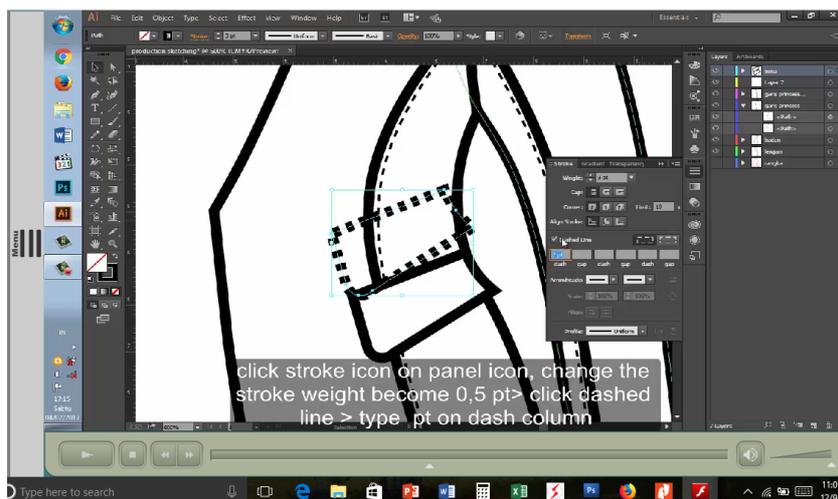


Fig. 4. The Tutorial of Making Production Sketching Design in Digital Format



Fig. 5. Display interface of the Tutorial of The Making of Fashion Illustration in Digital Format

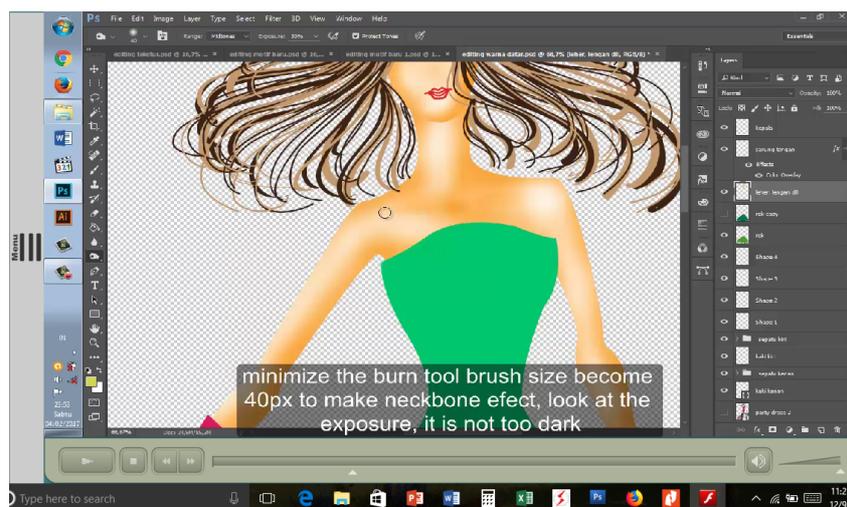


Fig. 6. Display of One of The Scene from Tutorial The Making of Fashion Illustration Design in Digital Format, to make 3D effect on its body

Data of Mastering the Fashion Design Concept. Based on the data processing of research results on the initial conditions of mastering the fashion design students showed: in the experimental group the average initial ability is 23.06 while in the control group 23.38.

In the next process, different treatments were given to the Experimental Group and Control Group. The Control Group was guided by the conventional method in the learning process, while in the Experimental Group applied the learning using interactive multimedia based on motion graphic.

Based on the calculation of the increase of learning result using Normalized Gain obtained the average increase of higher gain value in Experimental Class that is 71.31%, compared to average gain of gain value in Control Class equal to 65.24%, as illustrated in Figure 7.

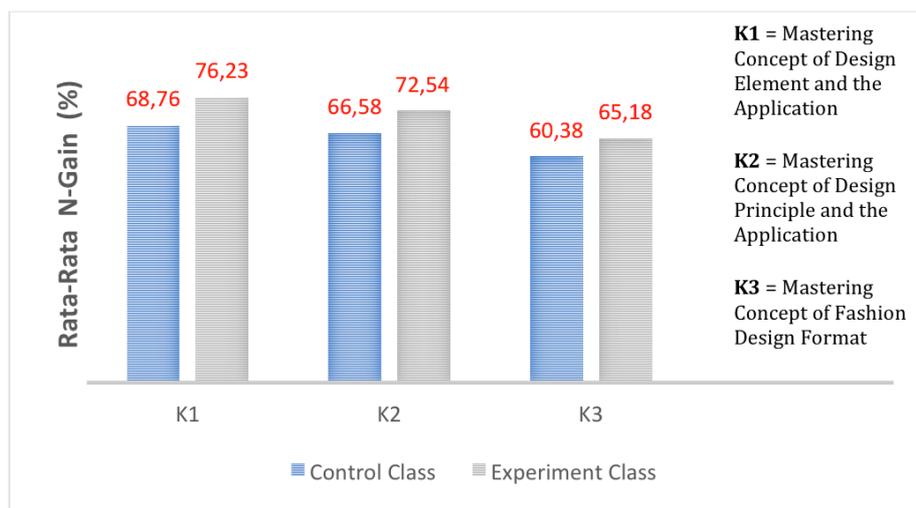


Fig. 7.

Data of Fashion Design Making Skill in Digital Format. Based on the result of data processing of the research on the initial condition of the students ability in the fashion designing in digital format shows: in the Experimental Group the average of the initial ability is 29.00 while in the Control Group 25.58.

In the next process, different treatments were given to the experimental group and control group. The control group was guided by the conventional method in the learning process, while in the experimental group applied the learning using interactive multimedia based on motion graphic.

Based on the calculation of the increase of learning result using Normalized Gain after the treatment, the average gain of higher gain in the experimental class is 77.16%, while the average gain of the gain value in the control class is only 55.07%, as illustrated in Figure 8.

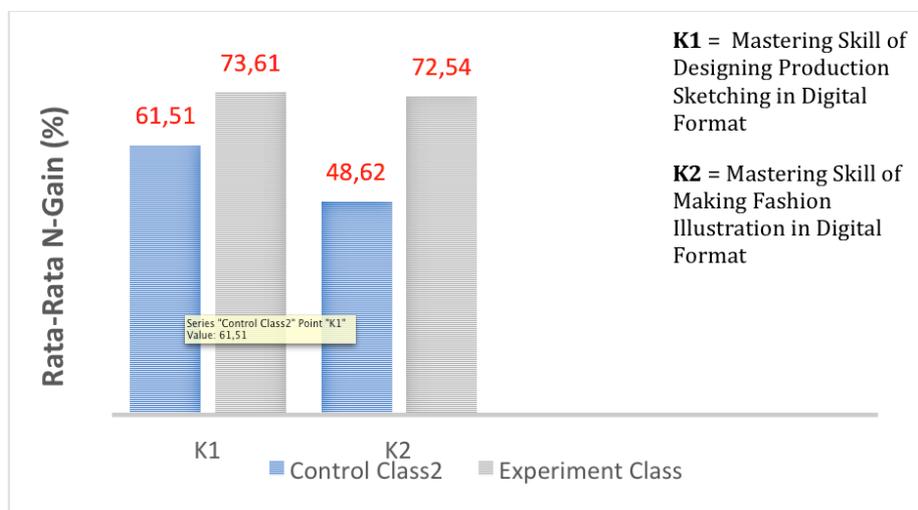


Fig. 8.

3.2 Discussion

In this study, the data collected is adapted to the needs of the analysis, namely the analysis of conceptual mastery and the skill of making the fashion design in digital format of the students of Fashion Design Education Program Study which is taught using interactive multimedia in the Experimental Class, and the learning without using interactive multimedia in the Control Class. Here are the results of research from the influence of the use of interactive multimedia to the mastery of the skills of making the fashion design in digital format:

The Influence of using Interactive Multimedia in Mastering the Concept. The material of the Fashion Design concepts discussed in this research consists of three sub-materials it's Fashion Design Elements, Fashion Design Principles and Fashion Design Format. The average gain of N-gain for the Experimental Class is 71.31% and the Control Class is 65.24%. The average N-gain for the Experimental Class is included in the high category, while in the Control Class included in the moderate category. Based on these data it can be seen that the average N-gain for the Experimental Class is higher than the average N-gain of the Control Class. The comparison result of the average of N-Gain in mastering the concept in the experimental class and control class for each sub material, obtained the largest N-Gain average in Fashion Design Element sub material, while the smallest N-gain of both classes is obtained in Fashion Design Format sub material. This is allegedly due to the characteristics of each sub-material that affects the delivery of the material in the interactive multimedia used. Format Design sub material has a high degree of difficulty in understanding, because the material contained very specific aspects of technical mastery of the fashion design, especially in Design Production Sketching, in the form of an understanding of 1) developing in the format/shape of fashion design,

2) the concept of the forming and accuracy of the parts of fashion products, 3) the material concepts in the manufacturing process of the garment industry, 4) the concept of the standard size of garment products, and 5) the concept of labeling of garment products. Different from the concept mastering of Fashion Design Elements and Principles which tend to be easier to understand because it more relate to daily life in the use of clothing, the concept mastering of fashion design formats need more detailed review and analysis, especially since this material is closely related to the manufacturing process of clothing products in the garment industry. The data acquisition shows that learning using interactive multimedia is able to provide a better learning experience to the learners, especially from the interesting display of material that presented and time to learn that is not limited by the segment of time in the classroom learning.

The Influence of Multimedia Interactive in the making of Fashion Design in Digital Format Mastering Skill. Psychomotor skills indicator is expressed by Sudrajat (2008) that psychomotor-related subjects are more movement-oriented subjects and emphasize physical reactions and hand skills. The skill itself shows a person's skill level in a particular task or set of tasks. The approach of motor skills to its implementation is related to the concept of process skills, which is a management of teaching and learning activities that focus on active and creative student involvement in the process of obtaining learning outcomes. This approach to process skills is seen as an approach that many experts best fit into the implementation of learning, in order to cope with the growth and development of science and technology. Process skill is the whole directed scientific skill (both cognitive and psychomotor) that can be used to find a concept, principle or theory to develop a pre-existing concept, or to denial an invention (Trianto, 2007). According to Mulyasa (2007), Approach Process Skills is a learning approach that emphasizes the learning, activities, and creativity of learners in acquiring knowledge, values and attitudes, and apply them in everyday life. Learning using a process skill approach is a learning process designed in such a way that students can find facts, build concepts and theories with students' own process skills and scientific attitudes.

Initial test and final skill tests results in the making of fashion design in digital format resulted in average N-gain of the Experimental Class at 77.16% and the Control Class at 55.07%. The average N-gain for the experimental class included in the high category, and the control class is the medium category. Based on these data it can be seen that the average N-gain for the experimental class is higher than the control class. The results of the data analysis show that the use of interactive multimedia on the learning of making fashion design in digital format effective in improving the skills of designing fashion in digital format, because the interesting display of this learning media can increase the interest and motivation of learners to learn. Apart from that learners can do the learning process wherever and whenever they want it, without the limited time of classes and classrooms. Indicator of the skill of making fashion design in digital format, divided into 2 qualifications 1) the qualification of production sketching design, which are: a) the overall fashion form accuracy; b) the accuracy of model detail; c) the ability to predict the size of clothing parts, d) the ability to create and visualize the critical point of the clothes part, e) the

ability to include standard sizes, f) the ability to analyze the use of the main material and supporting material, g) the ability to determine the type, material and label laying, and 2) the qualification to forming the design of fashion illustration: a) the ability to create structures/illustrative shape of designs that will be made, b) the ability to deform the anatomical parts of the design, c) the ability to display aesthetic aspects on the design format, d) the ability to perform color editing, pattern, textures and special effects on the design format created.

4 Conclusion

This paper describes the various advantages offered by interactive multimedia devices in teaching fashion design in digital format, and applied to learning activities in the design class. The system designed in this paper helps to enhance design student's understanding of technology, which is oriented towards the student's interactive learning process, by providing interactive learning resources supported by multimedia software. Through data processing research, it can be seen that the resulting software is able to stimulate interest and encourage students to learn, able to guide the learning process of students and help in improving student learning outcomes in the form of mastery of concepts and skills to fashion design in digital format

5 Closing

Based on the results of research and discussion shows that the use of interactive multimedia based on motion graphics significantly influence the improvement of learning outcomes in making fashion design in digital format, the real implementation of the learning process of fashion design becomes urgent to be done immediately. In addition to the conclusion above, to obtain better results expected time planning in learning is one thing that must be carefully set by the next researcher, because many unexpected things that can arise in the learning activities.

6 References

- [1] Anwari. (2011). Produksi Animasi [Animation Production]. August 10th, 2017. <https://paujack.files.wordpress.com>.
- [2] Diartono, D.A. (2008), Media Pembelajaran Desain Grafis Menggunakan Photoshop Berbasis Multimedia [Learning Media of Graphic Design Using Photoshop Based Multimedia], Technology and Information Journal DINAMIK 8(2): pp. 155-167
- [3] Exline. (2004). Workshop: Inquiry-based Learning. http://www.thirteen.org/edonline/concept222class/inquiry/index_sub2.html, accessed August 21st, 2017
- [4] Gall, M D.; Gall, J P.; and Borg, W R. (2003). Educational Research, An Introduction. Boston: Pearson Education. Inc.
- [5] Gordon, Stephen P. (2004). Professional Development for School Improvement: Empowering Learning Communities. Boston: Pearson Education

- [6] Hasrul. (2010). Langkah-Langkah Pengembangan Pembelajaran Multimedia Interaktif [The Developing Steps of Interactive Multimedia Learning]. *MEDTEK Journal* 2(1): pp. 1-7
- [7] Heinich, R.; Molenda, M.; Russell, J.; and Smaldino, S. (2005). *Instructional Media And Technologies For Learning* (8th ed.). USA: Merrill/Prentice Hall
- [8] Ingale, N; Borkar, A. (2013). Digital Image Processing. *International Journal of Scientific & Engineering Research* 4(6): pp. 85-88
- [9] Mahardhika, S.; and Fathoni. C.A. (2013). Storyboard dalam Pembuatan Motion Graphics [Storyboard in Motion Graphics Making], *HUMANIORA* 4(2). http://research-dash-board.binus.ac.id/uploads/paper/document/publication/Proceeding/Humaniora/Vol.%204%20No.%202%20Oktober%202013/048_DKV_Satrya%20Mahardhika%3B%20AF%20Choiril%20Anam%20Fathoni.pdf, accessed October 2013.
- [10] Mayer, R.E. (2001). *Multimédia Learning*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139164603>
- [11] Mulyasa. (2007). *Menjadi Guru Profesional Menciptakan Pembelajaran Kreatif dan Menyenangkan* [Being a Professional Teacher Who Creates Creative and Fun Learning]. Bandung: PT Remaja Rosdakarya
- [12] Munadi, Y. (2012). *Media Pembelajaran* [Learning Media]. Jakarta: Gaung Persada (GP) press
- [13] Nazir, M I J; Rizvi, A H; Pujeri, R V. (2012). Skill development in Multimedia Based Learning Environment in Higher Education: An Operational Model. *International Journal of Information and Communication Technology Research*, 2 (11): pp. 820 - 828
- [14] Osamah; S F Fong; W Ziad. (2010). Effects of Multimedia-based Instructional Designs for Arabic Language Learning among Pupils of Different Achievement Levels. *International Journal of Human and Social Sciences*: pp. 311–317
- [15] Songkram, N. (2017). Online Course Design for Creativity and Innovative Skills in Virtual Cultural ASEAN Community: From Research to Empirical Practice. *International Journal of Emerging Technologies in Learning*, 12(1): pp. 4 - 20 <https://doi.org/10.3991/ijet.v12i01.6032>
- [16] Sugiyono. (2012). *Metode Penelitian Kombinasi* [Combination Research Method]. Bandung: Alfabeta
- [17] Sutarno. (2011). Penggunaan Multimedia Interaktif Pada Pembelajaran Medan Magnet Untuk Meningkatkan Keterampilan Berpikir Generic Sains Mahasiswa [The Use of Interactive Multimedia in the Magnetic Field Learning to Improve Students Generative Thinking Skills].*Exacta Journal* 7 (1); p. 6066
- [18] Taylor, P. (1990). *Computers in The Fashion Industry*. Heinemann Profesional Publishing Ltd – Halley Court, Jordan Hill, Oxford OX2 8EJ
- [19] TEOH; B.S.P: NEO, T.K. (2007). Interactive Multimedia Learning: Students’ Attitudes And Learning Impact In An Animation Course. *The Turkish Online Journal of Educational Technology* – TOJET, 6(4) Article 3
- [20] Trianto. (2007). *Model-Model Pembelajaran Inovatif Berorientasi Konstruktivistik* [Innovative Learning Models in Constructive Oriented]. Jakarta : Prestasi Pustaka.
- [21] Vaughan, T. (1994). *Multimedia: Making it Work* (2nd ed.). USA: McGraw-Hill
- [22] Wang, H. (2017). Construction of Xapi-Based Multimedia Interaction Technology in Architectural Design Teaching. *International Journal of Emerging Technologies in Learning*, 12(7): pp. 101-111 <https://doi.org/10.3991/ijet.v12i07.7220>
- [23] Warsita, B. (2008). *Teknologi Pembelajaran: Landasan dan Aplikasinya* [Learning Technology:Base and it’s Application]. Jakarta: Rineka

- [24] Wiana, W. (2015). Creativity Process In The Creating of New Format of Fashion Design. 1st International Seminar of Art, Design and Its Learning Proceeding September 2015
- [25] Widodo, W. (2010). Pengembangan Model Pembelajaran “Mikir” pada Perkuliahan Fisika Dasar untuk Meningkatkan Keterampilan Generik Sains dan Pemecahan Masalah Calon Guru SMK Program Keahlian Tata Boga [The Development of “Thinking” Learning Model in Basic Physics Class to Improve Generic Science Skill and Solving Problem of Culinary Vocational School Teacher Candidate]. Dissertation. Sekolah Pasca Sarjana UPI. Not Published.
- [26] Wiyono, K. (2012). Peningkatan Keterampilan Berpikir Kritis Mahasiswa Calon Guru Dengan Model Mia-Piza [Improved Critical Thinking Skill of Teacher Designate Student with Mia-Piza Model]. Forum MIPA Majalah Ilmiah Jurusan PMIPA FKIP UNSRI 14 (1): 10-16.

7 Authors

Winwin Wiana, M. Syaom Barliana, and Arifah A.Riyanto are with Indonesia University of Education, Bandung, Indonesia (winwinwiana@upi.edu).

Article submitted 13 October 2017. Resubmitted at 15 December 2017. Final acceptance 8 February 2018. Final version as submitted by the authors.