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Investigating the effect of learning multimedia and thinking style preference on learning achievement on anatomy at *Universitas Kristen Indonesia*

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Abstract. This study is aimed to investigate the effect of learning multimedia and thinking style preference on the learning achievement of anatomy, and it was done at Medical Faculty of Universitas Kristen Indonesia. It was quantitative research with the quasi-experimental design. The population were the students batch 2017 and 2018, and the sample was chosen randomly. Test (consisted of 37 test items) and non-test (a set of the questionnaire consisted of 15 items) were used as the instruments in this study. The data which was obtained through the instruments of the study were analyzed using descriptive statistics and inferential analysis through anava test 2x2. The results were; a) the student's learning achievement average when they were taught using multimedia (video) was 27.37, while student learning achievement average when they were taught using multimedia (powerpoint) was 23.6, means that H_0 was rejected and H_a was accepted; b) the student learning achievement average with abstract thinking style preference was 30.89 and student learning achievement average with concrete thinking style preference was 21.01, means that H_0 was rejected and H_a was accepted. As a conclusion that there is no interaction between learning multimedia and thinking style and the effect on students' learning achievement of Anatomy.

1. Introduction

Anatomy is a course that should be mastered well by medical students because it is the basic subjects for most of the medical courses. Nadeak and Naibaho [1] said that Anatomy as the basis of all subjects for medical students do relate to the fields of sciences in health department as; the physiology and the pathology, the pharmacology, the microbiology, histology and the surgery, paediatrician, obstetric and gynaecology, ophthalmology, etc. Besides, the Anatomy also becomes a fundamental course to all of the health-related courses.

Further, it is said that Anatomy is a prerequisite course. It means that before a medical student would like to continue to the next courses, he or she should have past the Anatomy first. The Anatomy course is usually taught within 1st to the 7th semester at *Universitas Kristen Indonesia*, complete with laboratory practice which is incorporated in whole semesters. From the above elaboration on Anatomy, it can be synthesized that medical students should have mastered Anatomy well in order to be able to pass the other courses. In line with Sturges and Maurer [2] opinion that said, in order to be a success in the future profession, so the students are expected to master the Anatomy course well. It is proven by the previous researcher that students whose achievement is good in Anatomy must have a bright future



in health program [3,4,5]. Of course, the achievement gained by the medical students' Anatomy must be done through the learning process.

According to Schunk [6], the learning process consists of three stages, namely assimilation, accommodation, and equilibration. The process of assimilation is the process of integrating new information into cognitive structures that already exist in the minds of students. The accommodation process is adjusting the cognitive structure into a new situation. The process of equilibration is a continuous adjustment between assimilation and accommodation.

But the fact found at medical faculty of *Universitas Kristen Indonesia*, that during the teaching and learning process or classroom teaching, the lectures only use printed books and do not use learning media, this is shown when the teaching and learning process is still conventionally done and makes the learning process monotonous, then students finally become bored and the learning becomes less interesting. Furthermore, some students find it hard still to digest and to understand learning topics taught because of the differences in students' thinking style preferences in the classroom. This difference in students' thinking styles creates different abilities or understanding of the material being taught so that student learning outcomes are different.

According to Bloom [7] learning outcomes are divided into three domains: a) cognitive, affective and psychomotor domain. Cognitive domain relates to students' intellectual learning achievement, consist of seven aspects such as the knowledge, the memory, the understanding, the application, the analysis, and the synthesis and evaluation; b) affective domain relates to the students' attitudes, consist of five aspects, such as: the acceptance, the answer or reaction, the research, the organization, and the internalization; c) psychomotor domain relates to the learning skills achievement and the students' ability to act. The psychomotor domain consists of some aspects, such as reflex movements, students' skill on basic movement, students' perceptual ability, the students' harmony, the students' complex skill movements, and the students' expressive and interpretive movements.

Several factors led to the low learning outcomes of students' achievement on Anatomy were: a) learning in the classroom still uses conventional learning models (lectures), less involving students in learning and being one-way. This learning model will harm students who have a concrete thinking style preferences, because the students who prefer concrete thinking style find it difficult to accept verbal learning; b) learning emphasizes reading rather than communication competencies will also affect those students who prefers abstract thinking style in learning the Anatomy; c) the learning process and practice of Anatomy only takes place in class. The Anatomy skills can be achieved not only in the classroom and laboratory but also out of the classroom and laboratory. Simply can be said that theoretically or the learning material can be obtained in the classroom. But in everyday life, the material obtained in the classroom and laboratory can be practised together in their respective environments. It means that all of the students should not study Anatomy only in the classroom and laboratory but also have to study and practice it where ever they are. When the students have done it, it can be guaranteed that they will be better in other courses of medical students and in the future profession they are going to have; d) the use of learning multimedia: the use of learning multimedia will affect the learning-teaching process and makes it become a more joyful learning. At medical faculty of *Universitas Kristen Indonesia*, the curriculum and classes are supported by the use of learning multimedia, but the lecturers prefer traditional methods in teaching. Learning Anatomy in a monotonous way does not give students the opportunity observed more and even to interact with other students, and e) there are differences among students' thinking styles preferences in the classroom, so it makes the students are a different one to another in accepting the teaching given by the lecturer. Learning should be able to transfer material to all students who have different thinking styles.

From those factors, it is going to be proved out whether learning multimedia and thinking style preference affect the students' learning achievement on Anatomy. The use of multimedia in learning Anatomy is expected to help students in receiving and understanding the material delivered by the lecturer in the classroom. Thinking as the formation of ideas, reorganization and one's experience in organizing information into a distinctive form. Disalvo [8] defines thinking as a potential psychological activity and occurs when someone saves a problem (problem) that must be solved. Thinking is a process of addressing as knowledge, both knowledge in the form of sound or taste originating in memory. This view is also relevant to those raised by Rose [9], that thinking is a process of classification, comparison and assessment of knowledge based on beliefs, beliefs and values that are organized, then changes into

a form of strategy that results in language or action conversations. This study is limited to the use of video and powerpoint as the types of learning media used by the lecturer, to the students thinking style preferences and to the students' achievement on Anatomy.

Berk [10] states "Learning is a change in the individual due to an instruction of the individual and his environment, which fills a need and makes him more capable of dealing adequately with his environment". In this sense, there is the word change or "change" which means that someone after experiencing the learning process, will experience changes in behaviour, both aspects of his knowledge, skills and aspects of his attitude. For example, from not knowing at all to know, be smart and even proficient. According to Smyrni & Nikopoulus [11], students' learning achievement, in essence, changes in behaviour that have occurred through the learning process. The change in behaviour is in the form of students' abilities after learning activities that are the result of learning achievement. Thus learning achievement is changes that occur in individuals after experiencing learning.

From these definitions, it can be synthesized that learning achievement is the result gained by the students after finishing learning. The result not only means by the achievement gained by the students in the form of a score but also behavioural changes.

Mayer [12], defines multimedia as a material presentation by using words as well as images that are meant by words here, the material is presented with verbal forms or verbal forms, for example using the text of printed or spoken words. It means that multimedia is the combination of image, video, audio, image, graphics and the way to deliver it interactively so that it creates or give the students experiences as in real life. Multimedia can be functioned as a system because it is a collection of objects that are related and work together to produce the desired result. In the use of multimedia requires hardware (hardware) that serves to facilitate the delivery of material and software (software) that contains programs that will be delivered. In the teaching and learning process, the presence of media has quite important meanings. In these activities, the lack of clarity of the material delivered can be helped by presenting the media as an intermediary for the complexity of the material to be delivered. The progress of information and communication technology affects many sectors of life of lecturers who are struggling in the field of education and teaching are also not immune to these influences.

A video is a recording of images or real objects accompanied by sound. There are several advantages to using video in learning such as; 1) video is a tool that can facilitate students to experience something, so that students can do something by imitating what has been recorded in the video; b) with video media, something that is impossible to show (real objects) because of some limitations in resources, funding, location and other factors, so it can be displayed [13]; c) with videos can provide experience to students to feel something [14]; and d) with videos, learning can be more effective and more interesting so students can be motivated in learning [15,16,17]. It is these reasons that encourage the use of video in the teaching and learning process at school and in college. Formulation of the problem in this study: (1) Are students' achievement of Anatomy taught by using video is higher than students taught by using PowerPoint?, (2) How are students' achievement on Anatomy with abstract thinking style preference compared to students who have concrete thinking styles preference?, (3) Is there an interaction between the use of multimedia and thinking styles preferences towards students' learning achievement on Anatomy?

2. Method

The population in this study were the whole medical students at *Universitas Kristen Indonesia* from the first semester to the eighth semester. The sampling technique used is cluster random sampling which is a sample taken based on groups (classes) randomly, the selected classes were the first and the third-semester students. The method of the research used was quasi-experimental and the design used was a 2x2 factorial design.

Data analysis techniques used to test the research hypothesis used data analysis techniques using analysis of variance (ANOVA) with two paths (2x2 factorial design) with a significant level of 0.05. Before the hypothesis is tested first, the requirements test for the data collected is done by using; (1) normality test (2) homogeneity test. As a test of the analysis requirements normality, testing is carried out, using the Lilifors test. After the normality test, the homogeneity test was carried out using the F test and Barlett test. The further test used was the Scheffe test.

Table 1. Factorial Design 2 x 2

Thinking Style Preferences	Learning Strategy	
	Video (A ₁)	Power-point (A ₂)
Abstract (B ₁)	A ₁ B ₁	A ₂ B ₁
Concrete (B ₂)	A ₁ B ₂	A ₂ B ₂

The instrument used in this study were test and non-test (questionnaire), these instruments were used to collect the data of the students' learning achievement and the students' thinking style preferences.

3. Results and Discussion

A summary of the results of the normality test for all sample groups is shown in the following table:

Table 2. Summary of Normality Test

No	Sample Groups	N	L _{count}	L _{table}	Explanation
1	Students' learning achievement on Anatomy with video	25	0.082	0.174	normal
2	Students' learning achievement on Anatomy with power point	24	0.084	0.174	normal
3	Students' learning achievement on Anatomy with abstract thinking style preference taught using video	11	0.090	0.250	normal
4	Students' learning achievement on Anatomy with concrete thinking style preference taught using video	14	0.118	0.228	normal
5	Students' learning achievement on Anatomy with abstract thinking style preference taught using power point	11	0.090	0.250	normal
6	Students' learning achievement on Anatomy with concrete thinking style preference taught using power point	13	0.114	0.235	normal

A summary of the results of homogeneity calculations (F_{Test}) for groups of data can be seen as follows:

Table 3. Homogeneity Test

No	Learning Media	Variants	F _{count}	F _{table}	Explanation
1	Learning with video	35.165	1.08	4.1	homogenous
2	Learning with powerpoint	38.169	6	0	

After the data is processed, the hypotheses were tested using analysis of variance (Anava 2x2), and the result was as follows.

Table 4. Summary of Factorial 2x2 Calculations

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1016.579 ^a	3	338.860	17.180	.000
Intercept		1	29929.055	1517.314	.000
think		1	833.939	42.279	.000
method		1	194.907	9.882	.003

think				
*method	1	.002	.000	.994
Error	45	19.726		
Total	49			
Corrected Total	48			

Students' Anatomy learning achievement taught using video are higher than students Anatomy learning achievement taught by using PowerPoint.

The statistical hypothesis testing for learning Anatomy using video and powerpoint are as follows: The hypothesis statement is:

$$H_0: \mu A_1 = \mu A_2; H_a: \mu A_1 \neq \mu A_2$$

H_0 : Students' Anatomy learning achievement taught using video is lower than Students' Anatomy learning achievement taught using power point.

H_a : Students' Anatomy learning achievement taught using video is higher than Students' Anatomy learning achievement taught using power point.

from the results of the calculations obtained was found that the average students' learning achievement taught using video was 26.37, while the average students' learning achievement taught using power point was 22.5. The analysis of variance results indicates a significant difference between students' learning achievement taught by using video and students' learning achievement taught by using power point. This can be seen from the F_{count} and the F_{table} where the $F_{count} = 9,881 > F_{table} = 4.00$, so H_0 is rejected and H_a is accepted. Therefore, it is concluded that the learning achievement of the students taught using video is higher than students' learning achievement taught by using power point.

Students' learning achievement with abstract thinking style preferences is higher than the students' learning achievement with concrete thinking style. The statistical hypothesis testing for students with abstract thinking preference and students with concrete thinking preference is as follows.

The hypothesis statement is:

$$H_0: \mu A_1 = \mu A_2; H_a: \mu A_1 \neq \mu A_2$$

H_0 : Students' learning achievement with abstract thinking preference is lower than students' learning achievement with concrete thinking preference.

H_a : Students' learning achievement with abstract thinking preference is higher than students' learning achievement concrete thinking preference.

from calculations result obtained in this study was found the average students' learning achievement with abstract thinking preference was 29.95, while the average of students' learning achievement with concrete thinking preference style was 20.00. The variance analysis result shows a significant difference between students' learning achievement with an abstract thinking preference and students' learning achievement with a concrete thinking preference. It can be seen from the ANOVA test, result, where the $F_{count} = 42,279$, while $F_{table} = 4.00$. It means that $F_{counts} > F_{table}$ then H_0 is rejected.

Thus it can be concluded that students' learning achievement with an abstract thinking preference is higher than students' learning achievement with concrete thinking preference.

There is an interaction between the use of multimedia and thinking styles preference and the effect on students' learning achievement on Anatomy. The statistical testing hypothesis for students' learning achievement on Anatomy using multimedia and thinking style preferences was as follows.

The hypothesis statement is:

$$H_0: \mu A_1 = \mu A_2; H_a: \mu A_1 \neq \mu A_2$$

H_0 : There is no interaction between students' learning achievement on Anatomy taught using multimedia and thinking style preference with abstract thinking preference.

H_a There is an interaction between students' learning achievement on Anatomy taught using multimedia and thinking style preference with abstract thinking preference.

from the results of the calculations obtained in this study was found that students' learning achievement taught using video was 26.36, while the average students' learning achievement taught using power point was 22.5. The average of students' learning achievement with an abstract thinking style preference was 29.95, while the average of students' learning achievement with a concrete thinking style preference was 20.00. Students learning taught using power point and students learning taught using video have a significant effect on students learning achievement on Anatomy. It is shown in the following figure:

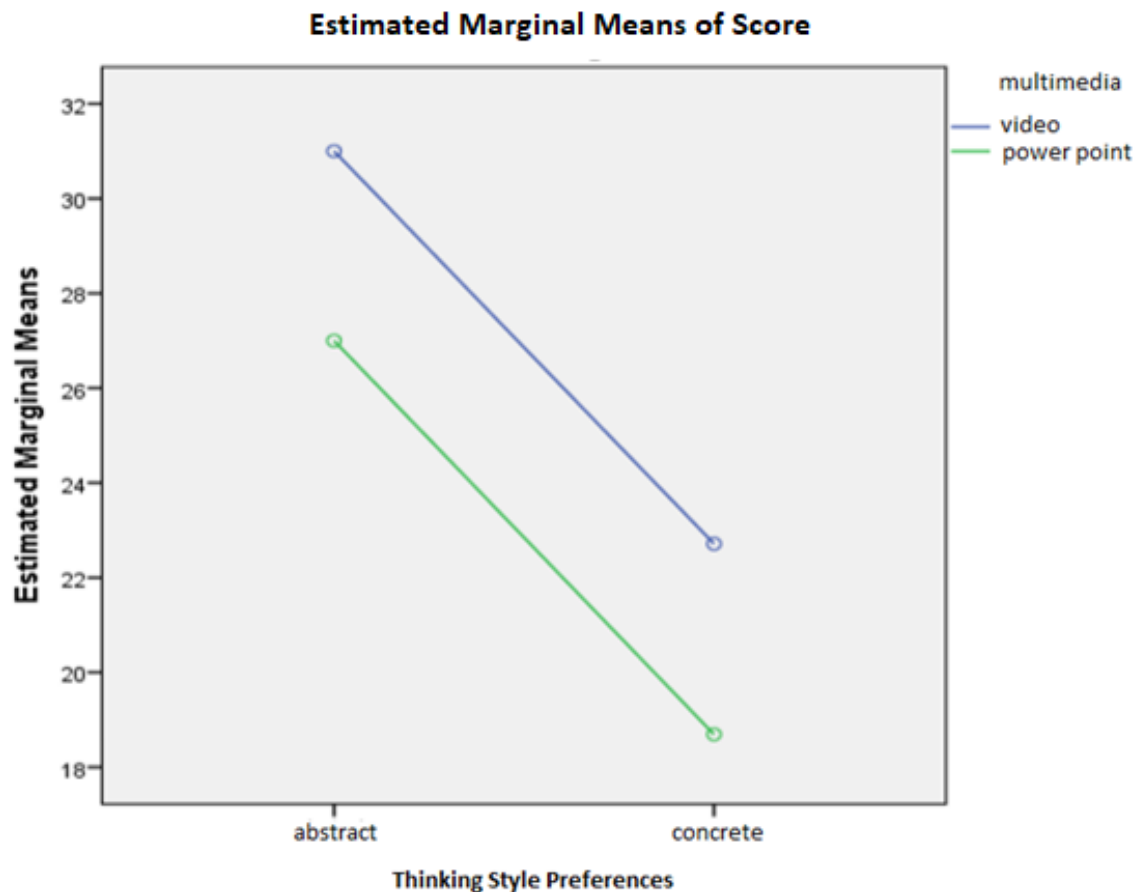


Figure 1. The Interaction between the Students' Learning Taught by Using Learning Multimedia and Thinking Style Preference on Students' Learning Achievement on Anatomy

Students' learning achievement based on the above data can be concluded that the improvement of students' learning achievement taught by video was higher than students' learning achievement taught by using power point. It is in line with Schunk that constructivism theory is a learning theory that emphasizes that students' ability to build their own knowledge so that students tend to understand and analyze the knowledge they have. This opinion does support the finding of this study that says "students' learning achievement on Anatomy taught by using video is higher than the students' learning achievement taught by using power point.

The results of this study are in line with the opinion of Greenberg and Zanetis [18] that provides some benefits of video used in the teaching and learning process, such as a) Interactivity with content (the learner relates to visual content, whether verbally, by note-taking or thinking, or by applying concepts); b) Engagement (the learner connects to the visual content, becoming drawn in by video, whether on-demand or real-time); c) Knowledge transfer and memory (the learner may remember and retain concepts better than with other instructional media). These statements are also supported by Berk that says "there are 20 advantages of using video in teaching and learning process, they are: a) grabbing the attention of the students; b) focusing the concentration's of the student; c) generating the interest in

classroom; c) creating the anticipation's sense; e) energizing or relaxing the students for exercise learning; f) drawing the students' imagination; g) improving students' attitudes toward content and learning; h) building a relationship among other student's and instructor; i) increasing the memory of students on the content; j) increasing the students' understanding; k) fostering the students' creativity; l) stimulating the ideas' flow; m) fostering deeper students' experiences on learning; n) providing an opportunity to have freedom of expression; o) serving as a vehicle to collaborate; p) inspiring and motivating the students; q) making a fun learning; r) setting students mood appropriately; s) decreasing students anxiety and tension when learning; and t). creating students' visual images memory.

The same result on research conducted by Hulopi [19], it was found that the mathematical reasoning abilities of students who were taught using interactive learning multimedia were higher compared to students who were taught using powerpoint media. Then is again strengthened by the result of the study conducted by Gilead, Liberman and Maril [20], the reality for those with abstract thinking style preferences is the world of metaphysics theory and abstract thinking. People who prefer to think abstractly like to think in concepts and analyze information. This kind of person will appreciate people and events that are orderly and neat. It is easy for them to look at important things such as key points and important details. Their process of thinking is logical, rational and intellectual.

Lectures are expected to be able to direct the students in learning activities, able to motivate students to be active and involved. In learning, the ability of a lecturer greatly determines the success of student learning, for that learning applied by the lecturers, must vary. By implementing appropriate learning allows students who have an abstract Thinking style preferences to have better achievement. According to Skinner [21]; Nadeak [22] and Tyas, E. H., Sunarto, S., & Naibaho [23], if the students' response is good then it must be immediately given positive reinforcement. While thinking style preferences is a person's ability to create new things, it can provide success and satisfaction that can improve the quality of life of physical and mental well-being of a person and others. In the learning process, thinking styles include internal factors or part of the characteristics of students who are considered in achieving students learning achievement.

The results showed that there was no significant interaction between the use of video and thinking styles preferences on students' learning achievement on Anatomy. In other words, the difference in the average score of students' learning achievement and the average score of thinking styles preferences taught by the use of powerpoint is not significantly different from those taught with video. Although learning using video and learning using power point may commodify the students found between teaching with multimedia and students thinking style preferences on students learning achievement.

The results of this study are in line with the results of research conducted by Angesti Nugraheni (2012), it was found that there is no interaction between learning media and students' learning styles towards students' learning achievement. It is also in line with results of a study conducted by Hikmawati (2013), it was found that there was no significant interaction between the use of instructional media and cognitive styles on students' learning outcomes. The insignificance difference of the average values of student learning outcomes may be due to an increase in understanding of the concept of cognitive independent style is not sufficient for transfer.

4. Conclusion

Based on the results and the discussion of the study, some conclusions were drawn as follows: a) students' learning achievement taught using video is higher than students' learning achievement using power point; b) students' learning achievement who have an abstract thinking style preferences was higher than students' learning achievement concrete thinking style preference; c) there is no interaction between the use of multimedia and thinking styles on improving the students' learning achievement on Anatomy.

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