THE INFLUENCE OF STUDENT LEARNING STYLE ON HIGHER ORDER THINKING SKILL (HOTS) OF CELL STRUCTURE AND FUNCTION TOPIC

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INFO ARTIKEL

ABSTRACT

This research aims to determine the relationship and contribution of visual, auditory and kinesthetic learning styles toward Higher Order Thinking Skills (HOTS) of cell structure and function topic in grade XI Science SMAN 1 Lubuk Pakam with academic year 2017/2018. The population for this research were all students in grade XI Science SMAN 1 Lubuk Pakam was 246 students with sample of research as many as 152 students. This research is an ex-post facto. The data was collected by using questionnaires with Likert scale for learning styles and multiple choices questions for HOTS of cell structure and function topic. Then, the data was analyzed by using linear regression. The results of this research showed that: (1) There was a positive influence and significant of visual learning style towards Higher Order Thinking Skills (HOTS) of students as evidenced by Fcount=11.016 with its contribution was 6.8%; (2) There was a positive influence and significant of auditory learning style towards Higher Order Thinking Skills (HOTS) of students as evidenced by Fcount=6.570 with its contribution was 4.2%; (3) There was a positive influence and significant of kinesthetic learning style towards Higher Order Thinking Skills (HOTS) as evidenced by Fcount=4.464 with its contribution was 2.9% and (4) There was positive influence and significant of visual, auditory and kinesthetic learning style as together towards Higher Order Thinking Skills (HOTS) of students as evidenced by Fcount=8.061 with its contribution was 14%.

How To Cite:
Pantas, A.A, & Hasruddin. (2020). The Influence of Student Learning Style on Higher Order Thinking Skill (HOTS) of Cell Structure and Function Topic. *Jurnal Pelita Pendidikan, 8*(1), 071-079.

INTRODUCTION

Education devoid of teaching and learning of thinking skills and discontextualized learning environments has mainly weakened students ability to acquire the core 21st Century skills of high order thinking, communication, creativity and innovation, problem solving and confidence (Warnera & Kaurb, 2017). From Karakoc (2016) suggests that one of the aims of education should be developing students thinking skills as well as cognitive skills, which is basic goal of contemporary approaches in education. Thinking as a skill are reffering to higher order activities, such as analysing, evaluating and explaning and to challanges such as problem solving and evaluating complex argument.

Related activities the cognitive domain, Taxonomy bloom identifies two categories of thinking lower order thinking and higher order thinking. Meanwhile, higher order thinking is generally has always been associated with more complex and abstract thinking skills such as capability belongs to, analyze (C4),evaluating (C5) and create (C6) (Anderson and Krathwohl, 2015).

Consequently, teaching and learning in the 21st century should focus more on student-centered and independent learning, project-based learning and collaborative learning, as well as authenthic assessment. These approaches promote the use of higher order thinking skills as well as cognitive development. Among others, teachers could apply various strategies, such as questioning techniques, problem solving activities, project-based learning, thinking tools, simulations, discussions, role play and gradual increment of the level of difficulties of tasks (Sulaiman et.al., 2017). So that, higher order thinking skills (HOTS) should be an integral part of teaching and learning especially at the higher education level and also thinking skills lessons should be part of the curriculum if students are to solve problems individually, cooperatively and also creatively (Chinedu and Kamin,2015).

The achievement of students high order thinking skills are influenced by many factors. One of the obvious and important factors which affects it is how students get or process of information or learning knowledge obtained in the classroom. According to Zhou (2014) explain students preferentially take in and process information in different ways: by seeing and hearing, reflecting and acting, reasoning logically and intuitively, analyzing and visualizing.

Learning style is an internal aspect for students that becomes the initial foundation in obtaining information or knowledge and also manage it during the learning process in the classroom. So that, learning style is the way the nature of the individual is involved in them acquiring and absorbing information in student environment and also learning styles affect the students' learning process so that it can be used as a consideration in design of learning (Rahman and Ahmar,2017).

How much a student can learn is also determined by the compatibility of the student's learning styles and the teacher's teaching styles. It is important for teachers to know their learners' preferred learning styles because this knowledge will help teachers to plan their lessons to match or adapt their teaching and to provide the most appropriate and meaningful activities or tasks to suit a particular learner group. Likewise, if students are aware of their preferred learning styles they will be able to recognise their strengths and weaknesses, by doing this, they can then develop strategies for effective learning (Brady,2013).

Many other experts categorize learning styles that based on cognitive preference, intelligence profiles and sensory preferences.In this research, wish to emphasize using sensory preference. The reason for the use of sensory preferences because in the process of learning activities by students in the form of absorption, management and delivery of formation toward the brain tends to pass through the sense apparatus (organ) in the student as well as it is becomes easier to be directly observed. In this case based on sensory preferences De Porter & Hernacki (2013) explain there are three learning styles that are visual (tend to learn through what they see), auditorial (learn through what they hear) and kinesthetic (learning through motion and touch).

The topic of cell structure and function almost become the learning material that difficulties for students. Based on Ingrid Waldron (2015) from Department of Biology, University of Pennsylvania explains students often think of a cell as a static structure consisting of multiple independent parts. Students often do not understand how the parts of the cell work together to accomplish the multiple functions of a dynamic living cell both prokaryotic

and eukaryotic. Students also often confuse different levels of organization such as molecules, organelles and cells.

From the observation in the school of SMA 1 Lubuk Pakam, the teacher give material from the topic of structure and function of cell with presentation and discussion in classroom besides doing experiment after activity in class.

And also from interviews process with teacher and students, the topic is considered difficult to understand because of such topic is not just requires memorization and understanding but also the necessary analysis and evaluation. Besides, students have not recognize of their learning style when teacher give learning in the classroom. The objective of this research to understand the influence of student learning style on Higher Order Thinking Skill (HOTS) of cell structure and function topic in grade XI science SMAN 1 Lubuk Pakam from academic year 2017/2018.

RESEARCH METHOD

This research was conducted in SMAN 1 Lubuk Pakam which addressed at Dr.Wahidin Street No.1, Tj.Gabus Satu, Lubuk Pakam, Deli Serdang District, North Sumatera 20512 and time of this research was conducted in July until August 2018. The population of grade XI Science in SMAN 1 Lubuk Pakam with academic year 2017/2018 which amount was 246 students with number of sample research as many as 152 students. Then, Sampling techniques in the reseacrh used probability random sampling. The research design is *Ex Post Facto*. The instrument of research using questionnaires with *Likert scale* and multiple choice question.

The explanation of research procedure are formulate the issues that will be studied from doing observations of school that related high order thinking skill beside direct question interview about topic that difficult to understand by student and also the learning style that usually found in clasroom. Then make of instruments that must be validated first by validator for construct and content by experts as a lecture were Halim Simatupang, S.Pd.,M.Pd and Dra.Meida Nugharia, M.Sc. besides also doing another judgement of instument like reliability, difficulty level and discrimination power. So that

researcher formulated 30 number of multiple choice questions and 16 number of each learning style items. Then, after student given answers from instruments. The researcher make determine of hypothesis test both of variables by using a liniear regression from SPPS Program

RESULT AND DISCUSSION

The first result in this research was give description data from variables. In visual learning style describe the maximum score was 53.00, the minimum score was 37.00, mean (M) was 45.12, median (Me) was 45.00, mode (M) was 43.00 and the standard deviation (SD) was 3,18. In auditory learning style describe the maximum scores was 52.00, the minimum score was 37.00, mean (M) was 44.86, median (Me) was 45.00, mode (M) was 43.00 and the standard deviation (SD) was 3,08. In kinesthetic learning style describe the maximum scores was 49.00, the minimum score was 34.00, mean (M) was 42.97, median (Me) was 43.50, mode (M) was 45.00 and the standard deviation (SD) was 3.45. Then, for HOTS test describe the maximum scores was 54.17, the minimum score was 33.33, mean (M) was 43.01, median (Me) was 41.67, mode (M) was 45.83 and the standard deviation (SD) was 4.42. Then, next analyzed of data was find out the results of the specified hypothesis with liniear regression formula.

Visual Learning Style (X_1) with HOTS of Cell Structure and Function Topic (Y)

Then, for analysis of linier regression liniear obtained the significant value of 0.001 < 0.05. In the Table 1. obtained the F_{count} > F_{table} (11.016 > 3.91). This known that variable of visual learning style have significant and positive influence with HOTS of cell structure and function topic. On the other hand from Table 2. described the regression equation between visual learning style variable (X_1) and HOTS Test (Y) obtained of Y= 26.605+0.364X_1. Because the regression equation was positive with coefficient 0.364 for X_1 (This means that if the visual learning style increases 1 point, then HOTS test will increase amount to 0.364). Then from Table 3. the size of contribution was finding with coefficients determination (KP) = r^2 x100% = 6.8%.

Table 1. The Results of Regression Analysis From ANOVA Between Visual Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	203.304	1	203.304	11.016	.001[b]
	Residual	2768.291	150	18.455		
	Total	2971.595	151			

a. Dependent Variable: HOTS Test
b. Predictors: (Constant), Visual Learning Style

Table 2. The Results of Coefficients Regression Analysis Between Visual Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	26.605	4.955		5.369	.000
	Visual Learning Style	.364	.110	.262	3.319	.001

a. Dependent Variable: HOTS Test

Table 3. Results of Product Moment Correlation Analysis Between Visual Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.262[a]	.068	.062	4.29596

a. Predictors: (Constant), Visual Learning Style

Auditory Learning Style (X_2) with HOTS of Cell Structure and Function Topic (Y)

Then, for analysis of linier regression liniear obtained the significant value of 0.011 < 0.05. In the Table 4. obtained the $F_{count} > F_{table}$ (6.570 > 3.91). This known that variable of audtitory learning style have significant and positive influence with HOTS of cell structure and function topic. On the other hand from Table 5.

described the regression equation between auditory learning style variable (X_1) and HOTS Test (Y) obtained of Y= 29.896+0.292X_2. Because the regression equation was positive with coefficient 0.292 for X_2 (This means that if the auditory learning style increases 1 point, then HOTS test will increase amount to 0.292). Then from Table 6. the size of contribution was finding with coefficients determination (KP) = r^2 x100% = 4.2%.

Table 4. The Results of Regression Analysis From ANOVA Between Auditory Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	124.692	1	124.692	6.570	.011[b]
	Residual	2846.903	150	18.979		
	Total	2971.595	151			

a. Dependent Variable: HOTS Test
b. Predictors: (Constant), Auditory Learning Style

Table 5. The Results of Regression Analysis Between Auditory Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	29.896	5.128		5.830	.000
	Auditory Learning Style	.292	.114	.205	2.563	.011

a. Dependent Variable: HOTS Test

Table 6. Results of Product Moment Correlation Analysis Between Auditory Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.205[a]	.042	.036	4.35653

a. Predictors: (Constant), Auditory Learning Style

Kinesthetic Learning Style (X_3) with HOTS of Cell Structure and Function Topic (Y)

Then, for analysis of linier regression liniear obtained the significant value of 0.036 < 0.05. In the Table 7. obtained the $F_{count} > F_{table}$ (4.464 > 3.91). This known that variable of kinesthetic learning style have significant and positive influence with HOTS of cell structure and function topic. On the other hand from Table 8. described the regression equation between kinesthetic learning style variable (X_3) and HOTS Test (Y) obtained of Y= 33.653+0.218X_3. Because the regression equation was positive with coefficient 0.218 for X_3 (This means that if the kinesthetic learning style increases 1 point, then HOTS test will increase amount to 0.218). Then from Table 9.

the size of contribution was finding with coefficients determination (KP) = r^2 x100% = 2.9%.

Table 7. The Results of Regression Analysis From ANOVA Between Kinesthetic Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85.873	1	85.873	4.464	.036[b]
	Residual	2885.721	150	19.238		
	Total	2971.595	151			

a. Dependent Variable: HOTS Test
b. Predictors: (Constant), Kinesthetic Learning Style

Table 8. The Results of Regression Analysis Between Kinesthetic Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	33.653	4.443		7.574	.000
	Kinesthetic Learning Style	.218	.103	.170	2.113	.036

a. Dependent Variable: HOTS Test

Table 9. Results of Product Moment Correlation Analysis Between Kinesthetic Learning Style And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.170[a]	.029	.022	4.38613

a. Predictors: (Constant), Kinesthetic Learning Style

Visual,Auditory and Kinesthetic Learning Styles as Together (X) with HOTS of Cell Structure and Function Topic (Y)

Then, for analysis of linier regression liniear obtained the significant value of 0.000 < 0.05. In the Table 10. obtained the $F_{count} > F_{table}$ (8.061 > 3.91). This known that variable visual, auditory and kinesthetic learning style as together   have significant and positive influence with HOTS of cell structure and function topic. On the other hand from Table 11. described the regression equation between kinesthetic learning style variable (X) and HOTS Test (Y) obtained of Y=3.554+8.113*X.* Because the regression equation was positive with coefficient 8.113 for X (This means that if the kinesthetic learning style increases 1 point, then HOTS test will increase amount to 8.113). Then from

Table 12. the size of contribution was finding with coefficients determination (KP) = r^2 x100% = 14%.

The meaning results of the regression and correlation analysis showed the higher of student visual,auditory and kinesthetic learning style, so more good the HOTS of cell structure and function topic. Means there was a positive influence and significant of learning style towards HOTS of student. Therefore it can be said that the higher of learning style possessed by students will have a significant influence on increased from HOTS of cell structure and function topic.

Based on a statement from Kathrine and Kratzig (2015) that learning more should be prioritize the active participation of students in interacting with the learning situation through the five senses either through sight, hearing, touch,

smell and taste. Widely recommended across all levels of education from kindergarten to university. Learning associated with teaching focused on sensory learning styles to encourage educators to adopt more all methods to enhance effective instruction. It will assist them to be prepared to meet the diverse needs of all students in concept of learning.

Table 10. The Results of Regression Analysis From ANOVA Between Visual,Auditory And Kinesthetic Learning Style as Together with HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

ANOVAᵃ

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	417.355	3	139.118	8.061	.000[b]
	Residual	2554.239	148	17.258		
	Total	2971.595	151			

a. Dependent Variable: HOTS Test

b. Predictors: (Constant), Kinesthetic Learning Style, Visual Learning Style, Auditory Learning Style

Table 11. The Results of Regression Analysis Between Visual,Auditory And Kinesthetic Learning Style as Together And HOTS of Cell Structure and Function Topic

Coefficientsᵃ

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.554	8.113		.438	.662
	Visual Learning Style	.349	.106	.251	3.295	.001
	Auditory Learning Style	.307	.109	.215	2.816	.006
	Kinesthetic Learning Style	.231	.098	.180	2.351	.020

a. Dependent Variable: HOTS Test

Table 12. Results of Product Moment Correlation Analysis Between Visual,Auditory And Kinesthetic Learning Style as Together And HOTS of Cell Structure and Function Topic In Grade XI Science SMA 1 Lubuk Pakam

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.375[a]	.140	.123	4.15432

a. Predictors: (Constant), Kinesthetic Learning Style, Visual Learning Style, Auditory Learning Style

In learning about cell structure and function in SMAN 1 Lubuk Pakam, the teacher focuses more on students by using visualization on the power point display provided. Besides the teacher also requires students to reading the textbooks used for these activities and invite students to complete the material by writing a book. Matters relating in learning structure and function also always display images such as images of organelles, diffusion and osmosis drawing processes and others included in the topic. Then also carried out that one of the methods taught by the teacher in giving explanation of the material, namely is lecture method in the classroom. Besides, the explanation of the image

from cell structure and function can still be accepted by students through the lecture method given by the teacher with the condition in the classroom must be conducive. Then after finish the topic, the teacher also invites students to conduct experiments in the laboratory room such as distinguishing animal and plant cells and the process of diffusion and osmosis when the discussion was over in the class.

According to Pritchard (2013) states that the visual learners learn by seeing. They have a high ability for visual recall. They prefer to learn using visual representations such as graphs, posters, maps, displays. They frequently use hand movements while talking and have a tendency to look upwards when thinking. Learners not disturbed by the commotion because the students with a visual learning styles more considering what seen than heard. Auditory learners learn by listening. They favor the audio and have a high ability for auditory recall. They pefer repetition, summaries and benefit from discussions, lectures, stories, Podcasts. These learners have a tendency to tilt their heads and use eye movements when concentrating or recalling information. Learners is easily disturbed by noise because students are sensitive to sounds that heard. Kinesthetic learners rely on doing to learn. They heavily depend on interactions within the learning environment and especially with their bodies. They will easily recall events or information attached to an experience or the feelings of a physical event. They learn best through field trips, physical activity, manipulating objects and touch. Kinesthetic learners tend to have high difficulty in sitting still and need frequent breaks when learning.

So, from the statement then relation with the activities from teaching method described that in learning about cell structure and function, the teacher give material from power point media and give explanation as a lecture beside also invites students to conduct experiments in the laboratory room such as distinguishing animal and plant cells and the process of diffusion and osmosis when the discussion is over in the class. In this case students learning styles (visual,auditory and kinesthetic) can do learning effectively because the learning process from topic of cell structure and function just not only need concept of material but also a practical.

The result of this research described that the variable of learning style that influence to HOTS obtained signinificat and positive level. This result have relevant with other research with the biology learning context from Grandistria (2016) conducted a research was "Higher Order Thinking Skill of Student on Environmental Pollution Material Based on Learning Style and Gender" that explains the results showed a significant relationship between higher order thinking skill of students on the material environmental pollution based on the learning style and gender.

Data analysis of this study also showed the contribution of learning style still low level. It mean that students have not realized their learning style so that they have not been able to optimize the learning style.To optimize student learning styles, a role is needed teacher to invite students to recognize and understand their learning style and can empower learning styles as much as possible. By knowing the learning style of the students it is expected that the teacher can designing learning that refers to optimizing student learning styles. If the teacher's teaching style matches the student's learning style, all the lessons will feel easy and fun. The teacher's teaching style is transfer strategy of information provided to students, while learning style is how information can be received with good by students. On the whole, from Fayombo (2015) explains that the teaching strategies and learning styles are very important in academic achievement and that matching both learning and teaching styles is achievable and rewarding for the learners.

CONCLUSION

Based on the results and discussion in above statements, the conclusions of this research are as follows. There is a positive and significant influence of the visual learning style towards High Order Thinking Skill (HOTS) of cell structure and function topic in grade XI Science SMA 1 Lubuk Pakam. The contribution for visual learning style towards the HOTS of cell structure and function topic is 6.8% with regression line equation is $Y= 26.605+0.364X_1$. There is a positive and significant influence of the auditory learning style towards High Order Thinking Skill (HOTS) of cell structure and function topic in grade XI Science SMA 1 Lubuk Pakam. The

contribution for visual learning style towards the HOTS of cell structure and function topic is 4.2% with regression line equation is Y= 29.896+0.292X_2. There is a positive and significant influence of the kinesthetic learning style towards High Order Thinking Skill (HOTS) of cell structure and function topic in grade XI Science SMA 1 Lubuk Pakam. The contribution forkinesthetic learning styles towards the HOTS of cell structure and function topic is 2.9% with regression line equation is Y= 33.653+0.218X_3. There is a positive and significant influence of learning styles as together (visual,auditory and kinesthetic) towards High Order Thinking Skill (HOTS) of cell structure and function topic in grade XI Science SMA 1 Lubuk Pakam. The contribution for kinesthetic learning styles towards the HOTS of cell structure and function topic is 14% with regression line equation is Y= 3.554+8.113X.

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