

STUDENT LEARNING OUTCOMES BASED ON LEARNING STYLES THROUGH ONLINE LEARNING DURING THE COVID-19 PANDEMIC

Nurlaili,

Mulawarman University.
nurlaili@fkip.unmul.ac.id

Bulan Natalinda,

Mulawarman University.
[Bulanatalinda@gmail.com](mailto:bulanatalinda@gmail.com)

Mukhamad Nurhadi,

Mulawarman University.
nurhadi1969@yahoo.co.id

Abstract

This study aims to determine student learning outcomes based on student learning styles through online learning during the Covid-19 pandemic. The population in this study was all class X MIA SMAN 16 Samarinda, amounting to 2 classes. The sample in this study was 33 students of class X MIA 1, which were selected by random cluster sampling. The subject matter used is chemistry learning on the subject of Atomic Structure. The data collection technique was carried out through a test of learning outcomes and a questionnaire for student learning styles. This study concludes that through online learning, the learning outcomes of students who have visual and kinesthetic learning styles are in a good category, while students who have auditory learning styles are in the sufficient category

Keywords: *Learning Outcomes, Student Learning Styles*

1. Introduction

The learning process is a very important stage in achieving learning objectives. In the learning process, teachers are expected to be able to convey material well through good approaches, models, and learning media, so that the learning objectives are achieved. Learning can also be viewed as a process that is directed towards goals and the process of acting through various experiences [1].

One of the factors that influence the low student learning outcomes is the mismatch of the learning process with student learning styles. Student learning styles are the easiest way students have in absorbing, organizing, and processing the information received [2]. There are three types of learning styles based on the modalities that individuals use in processing information, namely visual, auditory, and kinesthetic (VAK). A teacher must pay attention to student learning styles. If the teacher recognizes student learning styles, the teacher will prepare a learning process strategy that can accommodate student learning styles, so that students can obtain optimal information conveyed by the teacher.

During the Covid-19 Pandemic, teachers had no other choice but to carry out the learning process online, so that the learning process continued. Can online learning accommodate all student learning styles, so that learning materials can be absorbed by students properly? Research needs to be done so that this question gets an accurate answer and becomes material for teacher evaluation.

Previous research related to learning styles and learning outcomes concluded that learning styles affected learning outcomes [3] - [5]. Meanwhile, other studies have compared student learning outcomes based on learning styles in face-to-face learning and online learning. Online learning is carried out unsynchronously, namely online learning, where teachers and students do not interact at the same time, but by providing modules. Students learn independently. This study concludes that 1) In online learning the better scores are students who have auditory and visual learning styles than those who have kinesthetic learning styles. 2) In face-to-face learning, students who have a kinesthetic learning style score better than those who have visual and auditory learning styles [6].

Research has also been conducted on the learning styles and academic achievement of students in nursing colleges. It was explained that, if the lecturer recognizes the student's learning style, it will make it easier for the lecturer to determine the learning method used. The research objective was to evaluate nursing student achievement based on student learning styles. The result of the research is that teaching methods that are suitable for student learning styles can improve student academic achievement and the professional satisfaction of lecturers [7].

In this study, there is a novelty from previous research. In previous studies discussing 1) the effect of learning styles on learning outcomes in offline learning, and 2) comparing learning outcomes between offline and online learning, but online learning is carried out unsynchronously by providing modules to students. In this study, online learning was carried out synchronously with the

Google Meet application. Besides, online learning is carried out through several online application media, namely using google Forms and whatApps group class.

Google Meet is an application in the form of a video communication service that can contain 30 or more participants. Researchers use google media meet because in the online learning process students are expected to still have direct interaction with the teacher. Google forms make it easier for students to carry out post-tests and daily tests, as well as whatapps group classes used to make it easier for teachers to direct students in online learning.

The subject matter applied is chemistry, especially in the atomic structure material. Different student learning styles are closely related to student success in the learning process. Therefore, researchers describe student learning outcomes based on student learning styles through online learning on atomic structure material.

2. Research Method

This research method is descriptive quantitative because the research conducted aims to determine the value of the variable independently without making a comparison or connecting with other variables [8]. This research was conducted at SMAN 16 Samarinda. The instrument used was a student learning style questionnaire, post-test questions, and daily test questions. The learning style questionnaire consisted of 30 items, the post-test amounted to 5 items in the essay and the daily test consisted of 6 items in multiple-choice. The value of learning outcomes was obtained from 30% of the post-test of the first meeting, 30% of the *post-test* of the second meeting, and 40% of the daily test scores.

A student learning style questionnaire is used to determine student learning styles. The learning style questionnaire uses a Likert scale, wherein each statement there are four answer choices, namely strongly agree, agree, disagree, and strongly disagree. The formula for knowing the percentage of students' dominant learning styles is as follows:

$$\% (V \text{ or } A \text{ or } K) = \frac{n}{N (V, A \text{ dan } K)} \times 100$$

Student learning outcomes are categorized based on the ability category scale with five categories, namely very good, good, adequate, lacking, and very poor. As for the ability category scale [9].

Table 1. Category Scale Student learning outcomes student

No	Value (Scale 100)	Information
1	85-100	Very Good
2	75-84	Good
3	60-74	Enough
4	40-59	Less
5	0-39	Very Less

3. Discussion

Learning style is the easiest way to owned by someone to absorb, organize and then process the information received. Each child's learning style is different, this causes every teacher to have an obligation to know the learning styles of each student. Besides, teachers must have the creativity to provide facilities in the form of learning media or learning models that are suitable for students to make it easier for students to learn.

According to Bobby De Porter and M. Hernacki, three learning styles are commonly used, namely visual, auditory and kinesthetic [2].

Visual Learning Styles

Students who have a visual learning style prioritizes vision so that the eye is a very sensitive tool in capturing stimuli for learning. Students with this learning style usually like to see the teacher's body language and expressions to make it easier for students to understand the subject matter. They usually have a harder time thinking with their imaginations and are quicker to learn to use visual displays, such as diagrams, textbooks that have lots of pictures, and videos.

Auditory Learning Styles

Students who have this auditory learning style learn predominantly through their sense of hearing. Students with this learning style easily learn, perceive stimuli or stimuli given through their sense of hearing (ears). Individuals with this learning style tend to have a strong hearing. This individual can repeat the information heard and can imitate the tone and color of the voice he hears. Students will learn faster to listen to what the teacher has to say. Students can remember well the explanation of the material discussed by the group. However, they tend to have difficulty absorbing the information conveyed in writing directly.

Kinesthetic Learning Styles

Style this learning style prioritizes the sense of taste and physical movement. Someone with this learning style can easily grasp the lessons conveyed when accompanied by moving, feeling, or taking an action. The lack of this learning style is difficult to keep silent because you always want to move to do something. Like doing anything that allows his hands to be active. One example is when a teacher delivers a lesson, students with this learning style listen while engrossed in the drawing. Students with this learning style like hands-on practice, games, or physical activity.

The three learning styles have their respective advantages. In the visual learning style, students prefer to learn with an emphasis on the sense of sight so that the cooperation between the eyes and hands is very good. Auditorial learning style, students prefer learning with an emphasis on the sense of hearing so that students can absorb the material conveyed through sound well. Kinesthetic learning style, students prefer learning with an emphasis on physical activity, it helps students in the learning process so that it will affect student learning outcomes.

The results showed that the types of student learning styles varied. Of the 33 students, 12 students or 36.36% of the students with the dominant visual learning style, 6 students or 18.18% of the auditory dominant learning style, and 15 kinesthetic dominant students with a percentage of 45.45%. Students with kinesthetic learning styles outnumber students with visual and auditory learning styles.

Table 2, describes the average value of posttest 1, posttest 2, and daily tests for each learning style.

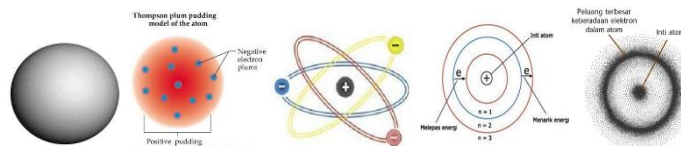
Table 2. Students' Average Score

Learning Styles	Post-test 1	Post-test 2	UH
Visual	75 Good	81 Good	80 Good
Auditory	70 Quite	82 Good	72 Enough
Kinesthetic	77 Good	82 Good	80 Good

The learning process is carried out synchronously, using the google meet media application, so that teachers and students can interact directly. Teachers try to accommodate all learning styles that students have, with the hope that the subject matter can be absorbed by students well. The description of the implementation of learning at the first and second follows:

First Meeting

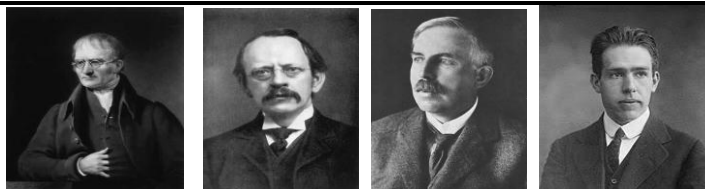
Each meeting, the teacher prepares learning materials in the form of videos and powerpoints. Before implementing learning, the teacher communicates through the WhatsApp group class to facilitate the implementation of online learning. At the first meeting, the material presented was the development of atomic theory. The PowerPoint shows pictures of atomic models according to the experts, as in Figure 1. Then the teacher provides a video showing the experiments conducted by the experts. In atomic theory, JJ Thomson presented a cathode ray tube experiment that discovered electron particles. Ernest Rutherford's atomic theory, performed experiments on alpha-ray scattering on a thin gold plate, and experiments on the atomic spectrum of hydrogen by Neils Bohr. In this learning, it is hoped that students can absorb learning material according to their learning style.



(a) Atom J. Dalton, (b) Atomic JJ Thomson, (c) Atom E. Rutherford, (d) Atom Neils Bohr, and (e) AtomModern

Figure 1. Atom Model

Students who have a visual learning style, score the average post-test 1 was 75 categorized as good. Students with a visual learning style make learning easier with the powerpoints and videos displayed by the teacher. Visual students will also be very interested in learning using media that is visually appealing or visually appealing. Moreover, during the first meeting, the teacher presented pictures of atomic models and pictures of the experts who discovered atomic theory (Figure 2), sparking students' enthusiasm for learning.



(a) J. Dalton (b) JJ Thomson (c) E. Rutherford (d) Neils Bohr
Figure 2. Inventor of Atomic Theory

Students with auditory learning styles have learning styles that are dominated by hearing. At the first meeting, the auditory students had an average score of 70 which was categorized as sufficient (Table 2). The auditory student's post-test 1 score was the lowest compared to the scores of students whose learning styles were visual and kinesthetic. In the learning process, the teacher explains the material through audio scores directly so that auditory students can understand the material presented by the teacher. The teacher also delivers material by inviting students to discuss in the whatApps group class. Because auditory students tend to learn by listening some things can be an obstacle to why auditory students' scores are lower than visual and kinesthetic. Some of the obstacles are when studying, auditory students, their concentration is easily broken and easily disturbed by noise [10] - [12]. During the current pandemic, students learn from home. Without realizing it, family members were chatting not far from the students. For auditory students, this conversation interferes with their learning concentration. Besides, what hinders auditory student learning is the internet network that is not strong enough, causing the voice to sound intermittent, so it cannot be heard properly.

Students who have kinesthetic in post-test 1, have an average value of 77 are categorized as good. The teacher provides a video containing experiments by experts in atomic discovery. The teacher invites students to briefly explain the video given so that kinesthetic students are directly involved in learning because kinesthetic students can remember things that were experienced directly [13]. This can also be caused because, in online learning, kinesthetic students are free to express themselves, students with kinesthetic learning styles cannot sit for hours in a chair like learning in school directly.

Second Meeting

In the second meeting of the learning process, the material discussed is the particles that make up atoms, isotopes, isotones, isobars, quantum numbers, and electron configurations. As in the first meeting, the teacher also provided PowerPoint and video media. At the second meeting, students are expected to be able to accept learning well by their respective learning styles.

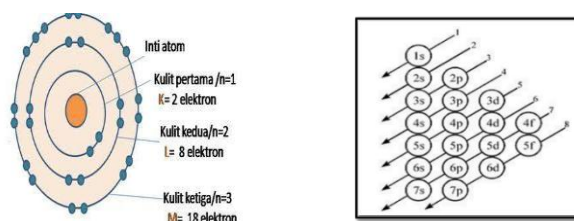


Figure 3. Rainfall Diagram in Electron Configuration

At this second meeting, the average score of students based on their respective learning styles has increased, as can be seen in Table 1. Students with visual learning styles have an average score of 81 categorized as good. This can happen because the teacher provides a PowerPoint with tables containing the particles that make up atoms and their contents, then tables on isotope, isotone, and isobar material. Besides, the PowerPoint contains a rainfall diagram on the electron configuration which can be seen in Figure 3, which will increase students' interest in paying attention to the teacher's explanation.

Auditory students have an average score of 82 which is categorized as good, this is an increase for auditory students because at the meeting of the two teachers they do a more direct question and answer process with students when material isotopes, isotones, and isobars. The teacher allows students to ask questions about material that is not understood. The teacher also allows students to read the results of their work and gives time to discuss the results of examples of quantum numbers and electron configurations because auditory students prefer to discuss and prefer to read aloud rather than read aloud by other people [10] - [12].

Students with kinesthetic learning styles have an average score of 82 which is categorized as good. In the second meeting, the teacher allowed students to work on examples of isotope, isobar, and isotone problems as well as electron configurations in their respective books. The teacher ensures that students take notes and work directly because kinesthetic students tend to learn by prioritizing physical movement [14]. Kinesthetic students can also remember what they did directly, such as speaking, listening, and doing something [10] - [12]. When learning online, kinesthetic

students can move their limbs more freely to determine their comfort while studying. In the online learning process, the teacher no longer controls student movements as when learning in the classroom.

Learning Outcomes

Students get different learning outcomes at each meeting, as well as for each student who has different learning styles. Student learning outcomes with auditory learning styles are lower than students with visual and kinesthetic learning styles. Students with kinesthetic learning styles have higher learning outcomes than students with visual learning styles (Figure 4). Students with visual learning styles have good learning outcomes in 79 categories, meaning that in PowerPoint and video-assisted learning, visual students can answer all test questions in good categories.

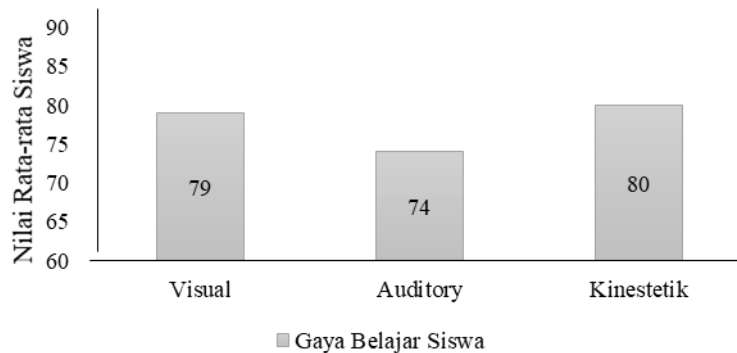


Figure 4. Student Learning Outcomes Based on Learning Style

Auditory students have the lowest learning outcomes, namely 74 which is categorized as sufficient. This means that auditory students can answer questions in a good category. The percentage of student ability can be seen in Figure 4. This can be due to auditory students easily forgetting and mistaking what the teacher explains, allowing students to ask questions and discuss students even being said to be passive.

Students with a kinesthetic style have the highest value of learning outcomes compared to visual and auditory students, namely 80 which is categorized as good (Figure 4). Learning using google meet media, students are freer to determine positions or gestures when learning takes place because the teacher cannot directly supervise student movements such as learning in school. Kinesthetic students prefer to use limbs in learning such as shaking their feet, head, hands, or occasionally playing with their hair on their head.

Conclusion

In this study, it is concluded that students with a kinesthetic learning style have an average value of 80 in the good category of learning outcomes, and students with a visual learning style have an average value of 79 learning outcomes categorized as good while students with an auditory learning style have an average value of results. learning 74 was categorized as sufficient. This means that students who have kinesthetic and visual learning styles have good abilities in online learning on atomic structure material while students with auditory learning styles have an average value of 74 learning outcomes that are categorized sufficient, meaning that students with auditory learning styles have sufficient abilities in online learning on atomic structure.

References

1. N. Sudjana, "Assessment of teaching and learning outcomes," *Bandung: rosda Karya*, 2011.
2. MS Prihatin, "The influence of learning facilities, learning styles and interest in learning on learning outcomes of economic subjects in class X IIS SMA Negeri 1 Seyegan," *J. Educator. and Ekon.*, vol. 6, no. 5, pp. 443–452, 2017.
3. Christine, S. Putri, R. Malik, M. Bobbi, and D. Poter, "The effect of auditory and visual learning styles on the graduation of the Biomedical block theory exam 2 students of the Tarumanagara University Faculty of Medicine semester odd 2018," *Tarumanagara Med. J.*, vol. 2, no. 2, pp. 213–217, 2020, [Online]. Available: <https://journal.untar.ac.id/index.php/tmj/article/viewFile/7830/5233>.
4. Suyono, "The Effect of Learning Styles on Learning Outcomes in Accounting Subjects in Class XI IPS SMA N 3 Tapung Academic Year 2017/2018," *J. Educators. Econ. Account.*, vol. 6, no. 1, pp. 1–10, 2018, [Online]. Available: <https://journal.uir.ac.id/index.php/Peka/article/view/1858>.
5. Hasanah, S. Kantun, and S. Djaja, "The influence of learning styles on learning outcomes of students in class xi majoring in accounting on the basic competencies of special journals at SMK Negeri 1 Jember even semester of the 2017/2018 school year," *J. Educator . Econ. J. Ilm. Educational Sciences, Econ Sciences. and Science Sos.*, vol. 12, no. 2, pp. 277–282, 2018, doi: 10.19184 / jpe.v12i2.8572.

6. Anggrawan, "Descriptive Analysis of Face-to-Face Learning and Online Learning Outcomes According to Student Learning Styles," *MATRIK J. Management, Tek. Inform. and Computer Engineering.*, vol. 18, no. 2, pp. 339–346, 2019, doi: 10.30812 / matrik.v18i2.411.
7. F. Vizeshfir and C. Torabizadeh, "The effect of teaching based on dominant learning style on nursing students' academic achievement," *Nurse Educ. Pract.*, vol. 28, no. October, pp. 103–108, 2018, doi: 10.1016 / j.nepr.2017.10.013.
8. P. Sugiyono, "Qualitative quantitative research methodology and R&D," *Alfabeta, Bandung*, 2011.
9. S. Arikunto, "Basics of Educational Evaluation (revised edition)," 2009.
10. Y. Wahyuni, "Identification of Learning Styles (Visual, Auditorial, Kinesthetic) Students of Bung Hatta University Mathematics Education," *JPPM (Journal of Research and Learning Mat.*, Vol. 10, no. 2, 2017.
11. AS Setiawan and S. Alimah, " The Influence of Visual Auditory Kinesthetic Learning Model (VAK) on Student Activeness," *Basic Educator Profession*, vol. 6, no. 1, pp. 81–90, 2019.
12. MM Zagoto, N. Yarni, and O. Dakhi, "Individual Differences from Learning Styles and Their Implications in Learning," *J. Rev. Educators and Teaching*, vol. 2, no. 2, pp. 259–265, 2019.
13. M. Haviz, "The relationship between learning styles and outcomes student learning in biology class X SMAN 2 Sungai Tarab Tanah Datar Regency," 2020.
14. JO Papilaya and N. Huliselan, " Identification of student learning styles," *J. Psikol.*, vol. 15, no. 1, pp.56–63, 2016.

Author's curriculum vitae

My name is Nurlaili. I am a lecturer at the Teaching Faculty of Education, Mulawarman University. I teach in the undergraduate and master programs of chemical education, in the master and doctoral programs of educational management, at Mulawarman University. I thank **Prof. Dr. Abdul Rahmad, S.Sos.I., M.Pd.** which has allowed us to write in this book chapter.