

Elevating natural science learning results through music media and students' learning style

Mamik Suendarti, Indraprasta PGRI University, Mathematics and Cultural Science Postgraduate, Jakarta 12530, Indonesia, <https://orcid.org/0000-0001-5465-5369>

Virgana Virgana *, Indraprasta PGRI University, Mathematics and Cultural Science Postgraduate, Jakarta 12530, Indonesia, <https://orcid.org/0000-0003-1329-3319>

Suggested Citation:

Suendarti, M. & Virgana, V. (2022). Elevating natural science learning results through music media and students' learning style. *Cypriot Journal of Educational Science*. 17(11), 4133-4147. <https://doi.org/10.18844/cjes.v17i11.7560>

Received from July 18, 2022; revised from October 13, 2022; accepted from November 24, 2022.

©2022 by the authors. Licensee Birlesik Dunya Yenilik Arastirma ve Yayıncılık Merkezi, North Nicosia, Cyprus. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract

Understanding the environment of the younger generation is very important for the sustainability of human life in the future. This study was an experiment that aimed to improve the understanding of environmental concepts of upper secondary school students through music learning models and learning styles. The sample of the research was 60 students in secondary education; data analysis was carried out using the analysis of factorial research variance design 2×3 ; all the test distributions were normal on Lilliefors significance correction. The analysis results discovered that there was a significant influence of the musical medium on the mastery of environmental concepts; there was a significant influence of students' learning styles on the ability of ecological concepts; and there was a significant interactive influence together with music media and learning styles on the mastery of environmental concepts. The use of the music media model is highly recommended for other subject.

Keywords: Environments, learning styles, music media, secondary education .

1. Introduction

Currently, environmental damage is increasingly worrying, such as some cases of illegal mining and air and water pollution due to natural exploitation to increase industrial production. Mining can negatively affect the environment (Haddaway et al., 2019). Students in schools as a young generation must understand the concept of the environment for the preservation of nature, and it correlates that the environment is part of the subject matter of science in school that students must understand. In everyday life, for example, littering behaviour will result in environmental pollution, as will the use of motorcycle bikes without air filters. In another case, used wrappers of consumer goods must be made of objects that are easily destroyed naturally; it is a behaviour of loving the environment (Soomro et al., 2020).

Several factors affect the mastery of the concept of the student's environment, namely the competence of teachers in managing learning by applying suitable methods and the way that students use in the learning process. Teachers' pedagogical competence in education largely determines academic progress (Imms & Byers, 2017; Oduor et al., 2017). Variations in learning models give students a learning spirit (Ereje & Ambag, 2020). Pedagogical competencies relate to the subject, learning process and understanding of the curriculum (Odumosu et al., 2018). Pedagogical competence is the ability to design student learning using appropriate learning models and knowledge of student characteristics and develop the potential of students (Lestari & Purwanti, 2018).

Learning methods are generally monotonous as a routine of learning activities, so work becomes a very saturated job for teachers and students. The boring atmosphere can be overcome through fun learning, such as the use of music media. The selection of learning media must pay attention to the learning style of learners and the technology and culture that is developing in society. The right learning media for high school learners is a medium that contains subject matter and contains elements of entertainment (edutainment). The primary purpose of edutainment is to increase the spirit of learning in a new atmosphere. Learners explore, interact, dabble and repeat (repetition) the subject of the material in a happy atmosphere (Pasawano, 2015). Edutainment is a learning medium to improve learning outcomes (Bilotta et al., 2009). The purpose of learning attainment with music is to focus students' attention on the learning atmosphere (Aksakal, 2015). Students do not like all-natural science; for example, they consider materials in the environment to be boring. Therefore, teachers must use learning media in conveying knowledge to students so that students are involved in learning where every student has a disparate learning mode. In the learning process, teachers can combine methods and complement certain media, including music. Music is a lingo that crosses the boundaries of age, gender, race, religion and nationality. Music appears at income, social class and educational achievement levels. With the kinds of music and multimodal stimulus, music is easily accepted by everyone's sense of hearing, especially the younger generation. Music can excite life and create new ideas (Sacks, 2006). Humans have had a talent in terms of music since infancy and, basically, children like to sing (Ilari & Sundara, 2009).

1.1. Theoretical framework

Implementing learning models with various metacognitive strategies is an essential determinant of success in understanding the concept of learning materials (Hattie & Donoghue, 2016). Students will learn better with the use of media that suits students' tastes (Çeken & Taşkın, 2022). Understanding learning media is anything that can convey or channel messages from a source to students in a planned manner so that there is an enabling learning environment where recipients can carry out the learning process efficiently and effectively (Hany & Setyaningsih, 2021). Music is an effective medium

for stimulating the auditory cortex and other brain parts (Seinfeld et al., 2013). In a song album, a large selection of songs are present that students like, and it is possible to choose the appropriate pieces to create a learning situation (Lehmann & Seufert, 2017). There are two ways in the learning process: how to present the material and with what media students process the material (OD & EI, 2014).

Music media is an intermediary to convey messages, provide concrete experiences, motivate learning and heighten the absorption and retention of education (Bottiroli et al., 2014). Listening to pleasant musical sounds and improving status in a relaxed state reduce the amount of cortisol in the bloodstream and increases the production of specific antibodies that strengthen the immune system and protect the body against infections and diseases (Mills, 2001). If the positive feelings and learners are relaxed and open, then learning will increase in the neocortex area (learning brain). Subsequently, negative emotions and feeling depressed tend to drop levels in the brain, which should be refilled (Meier, 2000). Waterhouse highlighted the lack of empirical evidence to support the idea that Mozart's music as a learning background could improve learning outcomes for spatial skills and recommended that future researchers consider potential mechanisms and contextual factors when studying the effects of music environment on spatial skills (de la Mora Velasco & Hirumi, 2020).

Learning style is a unique characteristic of the student's way of learning that can affect the understanding of learning materials, the types of learning styles in general consist of: visual, auditoria and kinaesthetic. A person's learning style is based on personality variables, including the cognitive and psychological composition of sociocultural background and educational experiences. Learning styles are behaviours that relate to the psychological, cognitive and affective areas of interaction with the learning environment (Baherimoghadam et al., 2021; Çakiroğlu, 2014). Learning, in particular, is a process of knowledge formation that requires a synergy between social and personal knowledge (Dantas & Cunha, 2020).

Every student has all three learning styles, and it is just that one style that is usually more domineering (Priya et al., 2020). A teacher must inform each student about their learning style so that they can help use the right learning media for teaching and learning activities (Albeta et al., 2021; Li et al., 2016). In the activities of the learning process in the classroom there are some students who prefer the teacher to explain the material by writing everything in detail on the blackboard so that they can read it and then process it to understand it. Some students like it when teachers teach by giving orally, and they listen to understand it. In the meantime, some students prefer to form small groups to discuss questions related to teaching. Another way that many students like is a learning model that does not distinguish the teacher from the speaker. The teacher is expected to talk in detail about different theories with many illustrations. At the same time, students listen while describing the content of the lecture in a form that only they understand. However students choose how to learn, the differences in learning styles indicate the fastest and best way for each individual to absorb information from outside themselves. Therefore, as a teacher who can understand how different learning styles of his students are and strives to make his students aware of these differences, it may be easier for teachers to convey information more effectively and efficiently. Effective learning strategies can overcome obstacles to creating learning that suits the learner, and recognising learning styles can lead to effective learning (Apipah et al., 2018; Cabual, 2021).

1.2. Mastery of the concept of the environment

Biology subjects have environmental learning materials in the high school curriculum in Indonesia. It shows the government's concern for the environment. Environmental learning goals shape students'

behaviour by developing habits of respecting the living environment (Ferdyan et al., 2021). Countries in the world develop ecological education for students or the general public (Rogayan & Nebrida, 2019). On the other hand, environmental learning and student awareness of the environment have not been maximal (Mukani & Sumarsono, 2017). Individual environmental concerns and environmentally friendly behaviour of individuals correlate with the student's understanding of the environment (Mkumbachi et al., 2020). The environment provides all the needs of living things; therefore, teachers should educate their students to maintain the environment (Lualhati, 2019). Increased environmental awareness will avoid the misuse of natural resources (Omoogun et al., 2016). Therefore, the importance of environmental education materials in schools allows a person to be aware of the preservation of nature; for example, in everyday life, the pattern of waste disposal must be orderly and the vehicle must be tested. Indonesia is already notorious for severe environmental problems, such as garbage on the streets and in rivers and poor air quality (Parker, 2018).

1.3. Related research

Like this study, there are several similar studies, but there are different research results. Some researchers found that the use of music media is still debated, whether music media can improve verbal memory (Ferreri et al., 2013). There was no influence on learning outcomes that use music media because the concentration of students will be divided into two, namely music and learning materials (Lehmann & Seufert, 2017). There is an exception that music does not affect people with a specific disorder (Christopher & Shelton, 2017). But the results of other studies state that music has better learning outcomes in and outside the classroom (Kraus et al., 2014). Neuromusical research shows that music involves the right, left, front and back brain to improve memory. Music can also be used as a therapy for sick people, such with neuropsychiatric disorders (Trimble & Hesdoeffler, 2017). Fun music can stimulate a significant influence on improved task alignment performance (Lesiuk, 2005).

1.4. Purpose of the study

Based on the background and theory, this research's title, 'Elevating natural science learning results through music media and students' learning style', is the purpose of study through the research question: Do music learning models and learning styles influence environmental concepts? Is there an influence of music learning models and learning styles interaction on the understanding of ecological concepts? For answering the research questions, the following hypotheses were established:

H-1: Music learning media significantly effects understanding the concept of the environment.

H-2: Learning style positively influences understanding the concept of the environment.

H-3: Music media and learning styles have interaction effect on understanding the concept of the environment.

2. Research methodology

2.1. Research model

This study was experimental using the multiple comparisons method. Some comparisons determine appeasement and estimate the extent of the difference (Nanda et al., 2021). This study uses three variables: music media, learning style as free variables and understanding of the concept of the environment as a dependent variable. At the end of the activity, the experimental and control classes are given a test with the same evaluation question, and then the results are analysed and compared.

The researchers conducted the study from January to June 2022. This study uses a 2 × 3 factorial research design with experimental treatments by level illustrates the conceptual framework and the influence of media music and learning styles on the understanding of environmental concepts (Table 1).

Table 1 Research Design

| Learning style | Music media | | $(\sum B)$ |
|--------------------------------|----------------------------------|-----------------------------------|--------------|
| | Lyric music (A ₁) | Instrumental (A ₂) | |
| Visual (B ₁) | A1B1 | A2B1 | $\sum B_1$ |
| Auditory (B ₂) | A1B2 | A2B2 | $\sum B_2$ |
| Kinaesthetic (B ₃) | A2B3 | A2B3 | $\sum B_3$ |
| $\sum A$ | $\sum A_1$ | $\sum A_2$ | $A \times B$ |

A₁: Student groups with lyrical music learning media.

A₂: Student groups with instrumental music learning media.

B₁: Student groups with visual learning styles.

B₂: Student groups with auditory learning styles.

B₃: Student groups with kinaesthetic learning styles.

A1B1: Mastery of the environment concept with visual learning style and music media lyrics.

A1B2: Mastery of the concept of environment with auditory learning style and music media lyrics.

A1B3: Environment concept mastery with kinaesthetic learning style and lyrical music media.

A2B1: Mastery of environment concepts with visual learning style and instrumental music media.

A2B2: Mastery of environment concepts with auditory learning style and instrumental music media.

A2B3: Mastery of environment concepts with kinaesthetic learning style and instrumental music media.

2.2. Participants

The population of this study were students in high school in South Jakarta. The researchers determined the research sample size of 60 respondents in second-grade secondary schools by purposive sampling. Purposive sampling strategies determine specific types of cases on the sample in research studies (Campbell et al., 2020). A technique for determining students' learning styles using research tools that use questionnaires using the Likert scale. The researchers distributed tools to assess learning styles to 100 respondents. Then the researchers randomly selected 60 respondents: 20 respondents with visual learning manner; 20 auditory learning manner; and 20 respondents with kinaesthetic learning styles. So that the experimental and control classes, each consisting of 30 respondents with 10 visual, auditory and kinaesthetic lessons. Regarding the understanding of environmental concepts, an objective test is carried out with 30 multiple-choice questions and an essay question on ecological topics.

2.3. Data collection tools

This research uses two instruments. Firstly, learning style improvement instruments and, secondly, evaluation questions about the environment. To prepare learning style instruments using indicators developed by Sreenidhi and Tay Chinyi (2017), i.e., visual has properties, namely writing, drawing and picture; auditory nature of listening, speeches, the oral session on; and kinaesthetic is learning by doing, touching, experiencing and moving. Instruments to determine students' learning styles based on these indicators, the total items questionnaire of student learning styles is 45. While the tool for understanding environmental concepts uses multiple-choice questions and essays about environmental materials following the high school curriculum.

2.4. Data collection process

There are two steps in the process of obtaining this research data, namely how to determine student learning styles and the results of the environmental material test. First, for the determination of students' learning style using instruments, every 15 notifications are grouped with visual, auditory and kinaesthetic categories on a Likert scale with scores of 1 (strongly differ), 2 (differ), 3 (neutral), 4 (coincide) and 5 (strongly coincide). The total 45 items the questionnaire consists of 15 items each for three categories: visual, auditory and kinaesthetic. Suppose the respondents got the highest score test on visual categories. In this case, they are declared to have a visual learning style or the highest score on kinaesthetic means they have a kinaesthetic learning style (Pasina et al., 2019). There is a possibility that respondents get the same score in two categories, so the respondent is not selected as a research sample. Respondents fill out the learning style instrument, and there are instructions on how to answer within a time of 30 minutes. Second, to obtain the score of the results of the environmental material test, using the instrument test consists of 30 multiple-choice questions with four options, with a score of two on each correct question. On two essay questions, the full answer is each given a maximum value of 20; the top total score is 100 points; and the time to answer the questions is 45 minutes.

2.5. Data analysis

This quantitative research uses experimental methods by treating two student study groups differently. A first group is an experimental group, which is given environmental learning treatment by applying a modified glassy music media (song) with the lyrics of environmental concepts as experimental material, in the lyrics of the song replaced with lyrics of environmental material concepts. The song chosen is young people, a popular song that is trending. A second group is a control group with environmental learning that applies instrumental music media, and students learn while accompanied by music instrumental that sounds loud. Statistical analysis is a two-way analysis of variance (ANOVA); data analysis was carried out using analysis of factorial research variance design 2×3 ; all the test distribution were normal on Lilliefors significance correction at sig. > 0.05 using Statistical Package for the Social Sciences (SPSS) 24 software. The study used treatment (music media) and attribute variables (learning styles). Each of these groups is then divided into three classifications student groups based on the type of visual, auditory and kinaesthetic. \

3. Results and discussion

Before conducting hypothesis testing, first the precondition test of data analysis is carried out, namely the data normality test and the homogeneity of the population variance. In testing using Lilliefors significance correction, all components of the data test distribution are normal, with a sig. > 0.05 . Likewise, the Levene test homogeneity makes all components of the sig. data normal.

Hypothesis testing of this study was carried out with a two-way ANOVA technique with the help of the SPSS programme. After calculations are made, if an interaction is found, it is continued with the Tukey's test (Table 2).

Table 2
Analysis Results: Tests of Between-Subjects Effects

Dependent variable: Environment concept

| Source | Type III sum of squares | Df | Mean square | F | Sig. |
|-----------------|-------------------------|----|-------------|-----------|-------|
| Corrected model | 942.933 ^a | 5 | 188.587 | 4.343 | 0.002 |
| Intercept | 358,208.267 | 1 | 358,208.267 | 8,249.423 | 0.000 |
| A | 333.733 | 2 | 166.867 | 3.843 | 0.028 |
| B | 209.067 | 1 | 209.067 | 4.815 | 0.033 |
| A × B | 400.133 | 2 | 200.067 | 4.607 | 0.014 |
| Error | 2,344.800 | 54 | 43.422 | | |
| Total | 361,496.000 | 60 | | | |
| Corrected total | 3,287.733 | 59 | | | |

^aR square : $R^2 = 0.287$ (adjusted $R^2 = 0.221$).

The testing results show that the influence of music media on mastery of the environment concept of public high school students in Jakarta. Based on the test results in Table 2, the main table that presents the research results is submitted by the researcher. Testing the effects of H1 and H2 answers the first study question: the effect of student learnedness styles on mastering the environment concept for public high school students in Jakarta. Table 2 shows that the p -value for category A (music media) is 0.033 (< 0.05); so it can be interpreted that there is a positive difference in the mastery of the environment concept in learning using music media (music with the idea of environment and instrumental). It is concluded that the music media's significant influence in learning on mastering the environmental concept of public high school students in Jakarta. And for category B (learning style) is 0.028 (< 0.05), it can be interpreted that there is a significant difference in student learnedness style towards mastering the concept of environment. So it is concluded that there is a considerable influence of student learnedness styles on getting the picture of the environment for public high school students in Jakarta.

The finding corresponds with ANOVA research presented by Hariadi (2015) and Virgana (2019), who found learning style affected student learning results. Learning styles and gender have a positive and significant relationship with learnedness consequences Eliezer et al., (2022); and learning style by using media music can improve academic activity and learning outcomes (Kumar et al., 2016). Vilés-lópez and Obando-paz (2022) show that various music favoured by students can be used as a learning model in improving academic achievement.

The H3 test answers the second research question: the influence of music media interaction and student learning styles on mastering the environment concept of public high school pupils in Jakarta. Based on the test results in Table 2, the test of between-subject effects, the p -value for the music media category and learning style was 0.014 (< 0.05). So the analysis results conclude that there is a significant influence on the interaction of music media and student learning styles on mastering the concept of environment for public high school pupils in Jakarta. According to the significant results of the H3 analysis, the research requires further tests in the form of *post-hoc* or Tukey tests on variables

with groups of more than two. The calculation results of the Tukey test with SPSS 24 are shown in Table 3.

Table 3 Post-hoc or Advanced Test of Tukey: Multiple Comparisons

Dependent variable: Natural science test result

Tukey HSD

| (I) | (J) | Mean | Std | | 95% confidence interval | |
|-------------|-------------|------------|-------|-------|-------------------------|-------------|
| Interaction | Interaction | difference | error | Sig. | Lower bound | Upper bound |
| A1B1 | A1B2 | 9.40* | 2.947 | 0.027 | 0.69 | 18.11 |
| | A1B3 | 11.20* | 2.947 | 0.005 | 2.49 | 19.91 |
| | A2B1 | 10.80* | 2.947 | 0.007 | 2.09 | 19.51 |
| | A2B2 | 11.20* | 2.947 | 0.005 | 2.49 | 19.91 |
| | A2B3 | 9.80* | 2.947 | 0.019 | 1.09 | 18.51 |
| A1B2 | A1B1 | -9.40* | 2.947 | 0.027 | -18.11 | -0.69 |
| | A1B3 | 1.8 | 2.947 | 0.99 | -6.91 | 10.51 |
| | A2B1 | 1.4 | 2.947 | 0.997 | -7.31 | 10.11 |
| | A2B2 | 1.8 | 2.947 | 0.99 | -6.91 | 10.51 |
| | A2B3 | 0.4 | 2.947 | 1 | -8.31 | 9.11 |
| A1B3 | A1B1 | -11.20* | 2.947 | 0.005 | -19.91 | -2.49 |
| | A1B2 | -1.8 | 2.947 | 0.99 | -10.51 | 6.91 |
| | A2B1 | -0.4 | 2.947 | 1 | -9.11 | 8.31 |
| | A2B2 | 0 | 2.947 | 1 | -8.71 | 8.71 |
| | A2B3 | -1.4 | 2.947 | 0.997 | -10.11 | 7.31 |
| A2B1 | A1B1 | -10.80* | 2.947 | 0.007 | -19.51 | -2.09 |
| | A1B2 | -1.4 | 2.947 | 0.997 | -10.11 | 7.31 |
| | A1B3 | 0.4 | 2.947 | 1 | -8.31 | 9.11 |
| | A2B2 | 0.4 | 2.947 | 1 | -8.31 | 9.11 |
| | A2B3 | -1 | 2.947 | 0.999 | -9.71 | 7.71 |
| A2B2 | A1B1 | -11.20* | 2.947 | 0.005 | -19.91 | -2.49 |
| | A1B2 | -1.8 | 2.947 | 0.99 | -10.51 | 6.91 |
| | A1B3 | 0 | 2.947 | 1 | -8.71 | 8.71 |
| | A2B1 | -0.4 | 2.947 | 1 | -9.11 | 8.31 |
| | A2B3 | -1.4 | 2.947 | 0.997 | -10.11 | 7.31 |
| A2B3 | A1B1 | -9.80* | 2.947 | 0.019 | -18.51 | -1.09 |
| | A1B2 | -0.4 | 2.947 | 1 | -9.11 | 8.31 |
| | A1B3 | 1.4 | 2.947 | 0.997 | -7.31 | 10.11 |
| | A2B1 | 1 | 2.947 | 0.999 | -7.71 | 9.71 |
| | A2B2 | 1.4 | 2.947 | 0.997 | -7.31 | 10.11 |

*The mean difference is significant at the .05 level

According on the statistical consequence in Table 3: first group shows there was music with lyrics and a visual (A1B1), an auditory (A1B2) and (A1B1) and a kinaesthetic (A1B3) group. The mean difference was 9.40 and 11.20, and the difference scores between A1B1 and A1B2 sig. at < 0.05 and also the difference score between A1B1 and A1B3, with a sig. at > 0.05 . This implies a difference between A1B1, A1B2 and A1B3. This shows that students studying melodic music with a visual learning style score highest in auditory and kinaesthetic learning. Learning achievements of visual students' learning styles have the highest auditory and kinaesthetic scores at a high school in Padang, West Sumatra (Rambe & Yarni, 2019). Visual learning styles have the highest mathematics learning outcomes (Apipah et al., 2018).

In the second group, there was music with lyrics and a visual learning group (A1B1) and an instrumental music visual (A2B1), an auditory (A2B2) and a kinaesthetic (A2B3) group. The mean difference analysis result for A1B1 and A2B1 was 10.80, A2B2 was 11.20 and A2B3 was 9.80, with a sig. < 0.05 . This shows that the comparison of learning achievements using music media and learning styles has a higher score than the achievement of learning instrumental music media and learning styles.

In the third group, there was a music instrument and a visual learning (A2B1), an auditory (A2B2) and a kinaesthetic (A2B3) group. The mean difference scores show that A2B1 and A2B2 was -1.4 , A2B1 and A2B3 was 0.4 , with a sig > 0.05 . This implies that there is no difference between A2B1, A2B2 and A2B3. The analysis results mean that students learn with instrumental music with a learning style. There is no difference in learning achievement.

In the fourth group, there was a music instrument and a visual learning group (A2B1, A1B2 and A1B3). The mean difference was 0.4 and -1 . The difference scores between A2B1 and A1B2 had a sig. > 0.05 ; A2B1 and A1B3 had sig > 0.05 . This implies that there is no difference score between A2B1, A1B2 and A1B3. The analysis results mean that students learn with instrumental and lyric music with a learning style; i.e., there is no difference in learning achievement.

Further discussion of the implementation of the use of music media with lyric modifications is explained below.

First, music media significantly influences the mastery of the environment concept, with a value of sig $0.00 < 0.05$. That music media has influence substantially on the ability of environmental ideas, in this study by modifying the lyrics of the environment concept material, and based on better test results from the use of instrumental music. That is supported by acquiring an average mastery score of material concepts with music media with an environment concept of 79.13, which is higher than the use of instrumental music media of 75.40. This phenomenon shows that the use of music as a learning medium affects the mastery of concepts in learning.

If the teacher has the creativity to change the lyrics of a song that is currently popular with the lyrics of the concept of the lesson to be learned, then in the hope that students can more easily absorb the learning concept spontaneously. Because something that is heard repeatedly will make it easier for students to remember and understand a learning concept, teachers can use music media in any learning method and the application of any learning model. The use of music media with this learning concept also helps students focus more on learning not only at school, but wherever students are, they can remember it because there is an element of entertainment (edutainment). Even the understanding will be more enduring because it can repeat at any time. The primary purpose of edutainment is to increase the enthusiasm for learning. Learners explore, interact, dabble and repeat (repetition) the subject of the material in a happy atmosphere (Zorica, 2014). Furthermore, empirical

results about music media show a high influence on the use of music media on interest in learning (Rigas & Ayad, 2010). Students who listen to music will increase academic performance, self-confidence and learning motivation (Vilés-lópez & Obando-paz, 2022). The conclusion is that the concept of the subject matter was initially considered difficult for students to master, making a learning environment more accessible and more enjoyable by using music media in their learning.

Second, there is a positive effect of pupils' learning styles on mastery of environmental concepts. Learning styles affect mastery of the environment concept with a sig. of $0.00 < 0.05$. In this study, students with a background in visual, auditoria, and kinaesthetic learning styles improved their mastery of the environment concept. The average number of students with an auditory learning style is greater than those with visual and kinaesthetic, students with a kinaesthetic in the second order, and a third visual, namely 80.60, 75.70 and 75.50. However, differences in learning styles do not significantly affect students' ability to master the concept of the environment. Looking at the Tukey or *post hoc* test result from SPSS 24, it appears that differences in learning styles do not significantly affect learning, with a sig. > 0.050 . Learning styles influence learning result, but differences in learning techniques in students do not significantly affect mastery of learning concepts, learning styles simultaneously or separately can affect students learning achievement (Albeta et al., 2021). Furthermore, the results of other studies show that the more following the learning style with the personality of the learners, the higher the achievement of students (Chetty et al., 2019; Cimermanová, 2018; Nurmalasary, 2018).

Third, music media and learning styles significantly impact mastery of environmental concepts, with a sig. values < 0.05 . Learning media that follows the psychologist of a child's soul development will give birth to enthusiasm and interest in learning, which is constructive in the learning process. The learning media is music (Džanić & Pejić, 2016; Schäfer et al., 2013). In general, learners like to have fun in enjoy their lives. For the sake of also in the learning atmosphere, they want pleasant learning, even though a small number do not talk about pleasure, and it is with that pleasure that they are eager to complete the learning task (Lucardie, 2014).

4. Conclusion

The results of the research on the use of music media and student learning styles on the concept of natural science show that learning media in the form of music with environmental pictures is more influential in mastering students' environmental concepts than instrumental music media. Meanwhile, differences in learning styles among students did not have a significant effect. Even though in the classroom there are differences in learning techniques for each student, the application of learning media in the form of music with an environmental concept can be used as an effort to improve mastery of ecological concepts in environmental learning. The most important thing in the use of learning media is to make a deep impression on students; provide a pleasant learning atmosphere; and improving learning outcomes and recommendations.

This study has some limitations. First, this study does not cover broadly the factors that can influence learning outcomes, for example, gender, cultural or other variable factors that are not discussed in this study; second, the limitations of sample size and population only from the upper middle level. However, the study results and their contributions to the international literature, so those other researchers can use other factors or variables that have not been shared here.

Some of the implications of the results of this study are as follows. First, it advocates that teachers can make music media an alternative to improving student learning outcomes with the music of choice that students like. Second, teachers' creativity and ability to understand student learning

styles are essential for the learning process and to create an atmosphere in planning, organising, delivering and evaluating learning student learning styles as moderator variables that can predict affecting the understanding of material concepts in other subjects. For the sake of schooling, it will be a pleasant place for teachers, students and all parties involved.

References

- Aksakal, N. (2015). Theoretical view to the approach of the edutainment. *Procedia - Social and Behavioral Sciences*, 186(2015), 1232–1239. <https://doi.org/10.1016/j.sbspro.2015.04.081>
- Albeta, S. W., Haryati, S., Futra, D., Aisyah, R., & Siregar, A. D. (2021). The effect of learning style on students' learning performance during the COVID-19 pandemic. *JTK (Jurnal Tadris Kimiya)*, 6(1), 115–123. <https://doi.org/10.15575/jtk.v6i1.12603>
- Apipah, S., Kartono, & Isnarto. (2018). An analysis of mathematical connection ability based on student learning style on visualization auditory kinesthetic (VAK) learning model with self-assessment. *Journal of Physics: Conference Series*, 983(1). <https://doi.org/10.1088/1742-6596/983/1/012138>
- Baherimoghadam, T., Hamedani, S., Mehrabi, M., Naseri, N., & Marzban, N. (2021). The effect of learning style and general self-efficacy on satisfaction of e-Learning in dental students. *BMC Medical Education*, 21(1), 1–7. <https://doi.org/10.1186/s12909-021-02903-5>
- Bilotta, E., Gabriele, L., Servidio, R., & Tavernise, A. (2009). Edutainment robotics as learning tool. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 186(2015), 25–35. https://doi.org/10.1007/978-3-642-11245-4_3
- Bottiroli, S., Rosi, A., Russo, R., Vecchi, T., & Cavallini, E. (2014). The cognitive effects of listening to background music on older adults: Processing speed improves with upbeat music, while memory seems to benefit from both upbeat and downbeat music. *Frontiers in Aging Neuroscience*, 6(OCT), 1–7. <https://doi.org/10.3389/fnagi.2014.00284>
- Cabual, R. A. (2021). Learning styles and preferred learning modalities in the new normal. *OALib*, 08(04), 1–14. <https://doi.org/10.4236/oalib.1107305>
- Çakıroğlu, Ü. (2014). Analyzing the effect of learning styles and study habits of distance learners on learning performances: A case of an introductory programming course. *International Review of Research in Open and Distance Learning*, 15(4), 161–185. <https://doi.org/10.19173/irrodl.v15i4.1840>
- Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: Complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8), 652–661. <https://doi.org/DOI: 10.1177/1744987120927206>
- Çeken, B., & Taşkın, N. (2022). Multimedia learning principles in different learning environments: a systematic review. *Smart Learning Environments*, 9(1), 1–22. <https://doi.org/10.1186/s40561-022-00200-2>
- Chetty, N. D. S., Handayani, L., Sahabudin, N. A., Ali, Z., Hamzah, N., Rahman, N. S. A., & Kasim, S. (2019). Learning styles and teaching styles determine students' academic performances.

- International Journal of Evaluation and Research in Education*, 8(4), 610–615. <https://doi.org/10.11591/ijere.v8i3.20345>
- Christopher, E. A., & Shelton, J. T. (2017). Music on student performance. *Journal of Applied Research in Memory and Cognition*, 1–7. <http://dx.doi.org/10.1016/j.jarmac.2017.01.012>
- Cimermanová, I. (2018). The effect of learning styles on academic achievement in different forms of teaching. *International Journal of Instruction*, 11(3), 219–232. <https://doi.org/10.12973/iji.2018.11316a>
- Dantas, L. A., & Cunha, A. (2020). An integrative debate on learning styles and the learning process. *Social Sciences & Humanities Open*, 2(1), 100017. <https://doi.org/10.1016/j.ssaho.2020.100017>
- de la Mora Velasco, E., & Hirumi, A. (2020). The effects of background music on learning: a systematic review of literature to guide future research and practice. *Educational Technology Research and Development*, 68(6), 2817–2837. <https://doi.org/10.1007/s11423-020-09783-4>
- Džanić, N. D., & Pejić, A. (2016). The effect of using songs on young learners and their motivation for learning English. *NETSOL: New Trends in Social and Liberal Sciences*, 1(2), 40–54. <https://doi.org/10.24819/netsol2016.8>
- Ereje, B. R., & Ambag, S. C. (2020). Teachers' performance and students' learning outcome in the division of Cavite Province, Philippines. *International Journal of Theory and Application in Elementary and Secondary School Education*, 2(2), 143–158. <https://doi.org/10.31098/ijtaese.v2i2.388>
- Ferdyan, R., Vauzia, Zulyusuri, Santosa, T. A., & Razak, A. (2021). Environmental education model: Learning activities in students as part of the environment in the new normal era. *Natural Science: Jurnal Penelitian Bidang IPA Dan Pendidikan IPA*, 7(1), 51–61. <https://ejournal.uinib.ac.id/jurnal/index.php/naturalscience/article/view/2453>
- Ferreri, L., Aucouturier, J. J., Muthalib, M., Bigand, E., & Bugaiska, A. (2013). Music improves verbal memory encoding while decreasing prefrontal cortex activity: An fNIRS study. *Frontiers in Human Neuroscience*, 7(NOV), 1–9. <https://doi.org/10.3389/fnhum.2013.00779>
- Haddaway, N. R., Cooke, S. J., Lesser, P., Macura, B., Nilsson, A. E., Taylor, J. J., & Raito, K. (2019). Evidence of the impacts of metal mining and the effectiveness of mining mitigation measures on social-ecological systems in Arctic and boreal regions: A systematic map protocol. *Environmental Evidence*, 8(1), 1–11. <https://doi.org/10.1186/s13750-019-0152-8>
- Hany, B. A., & Setyaningsih, N. (2021). The influence of learning media, learning motivation and mathematics communication on mathematics learning outcomes. *Journal of Mathematics and Mathematics Education*, 11(2), 50. <https://doi.org/10.20961/jmme.v11i2.58715>
- Hariadi, B. (2015). Web-based cooperative learning, learning styles, and student's learning outcomes. *Cakrawala*, 34(2), 153–164. https://www.academia.edu/es/62364103/Web_Based_Cooperative_Learning_Learning_Styles_and_Student_s_Learning_Outcomes
- Hattie, J. A. C., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. *Npj Science of Learning*, 1(1), 1–13. <https://doi.org/10.1038/npjscilearn.2016.13>
- Ilari, B., & Sundara, M. (2009). Music listening preferences in early life: Infants' responses to accompanied versus unaccompanied singing. *Journal of Research in Music Education*, 56(4), 357–

369. <https://doi.org/10.1177/0022429408329107>
- Imms, W., & Byers, T. (2017). Impact of classroom design on teacher pedagogy and student engagement and performance in mathematics. *Learning Environments Research*, 20(1), 139–152. <https://doi.org/10.1007/s10984-016-9210-0>
- Kraus, N., Slater, J., Thompson, E. C., Hornickel, J., Strait, D. L., Nicol, T., & White-Schwoch, T. (2014). Music enrichment programs improve the neural encoding of speech in at-risk children. *Journal of Neuroscience*, 34(36), 11913–11918. <https://doi.org/10.1523/JNEUROSCI.1881-14.2014>
- Kumar, N., Wajidi, M. A., Chian, Y. T., Vishroothi, S., Swamy Ravindra, S., & Ashwini Aithal, P. (2016). The effect of listening to music on concentration and academic performance of the student: Cross-sectional study on medical undergraduate students. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 7(6), 1190–1195. <https://manipal.pure.elsevier.com/en/publications/the-effect-of-listening-to-music-on-concentration-and-academic-pe>.
- Lehmann, J. A. M., & Seufert, T. (2017). The influence of background music on learning in the light of different theoretical perspectives and the role of working memory capacity. *Frontiers in Psychology*, 8(OCT), 1–11. <https://doi.org/10.3389/fpsyg.2017.01902>
- Lesiuk, T. (2005). The effect of music listening on work performance. *Psychology of Music*, 33(2), 173–191. <https://doi.org/10.1177/0305735605050650>
- Lestari, Y. A., & Purwanti, M. (2018). The inter-relation among pedagogic, professional, social, and personality competences in nonformal school teachers. *Jurnal Kependidikan*, 2(1), 197–208. <https://doi.org/10.21831/jk.v2i1>
- Li, Y., Medwell, J., Wray, D., Wang, L., & Xiaojing, L. (2016). Learning styles: A review of validity and usefulness. *Journal of Education and Training Studies*, 4(10), 90–94. <https://doi.org/10.11114/jets.v4i10.1680>
- Lualhati, G. P. (2019). Environmental awareness and participation of Filipino pre-service teachers. *Jurnal Pendidikan Biologi Indonesia*, 5(2), 345–352. <https://doi.org/10.22219/jpbi.v5i2.8524>
- Lucardie, D. (2014). The impact of fun and enjoyment on adult's learning. *Procedia - Social and Behavioral Sciences*, 142(2014), 439–446. <https://doi.org/10.1016/j.sbspro.2014.07.696>
- Marantika, J. E. R. (2022). The relationship between learning styles, gender and learning outcomes. *Cypriot Journal of Educational*, 17(1), 56–67. <https://doi.org/10.18844/cjes.v17i1.6681>
- Meier, D. (2000). *The accelerated learning handbook a creative guide to designing and delivering faster, more effective training programs* (pp. 10121–2298). McGraw-Hill. <https://www.amazon.com/Accelerated-Learning-Handbook-Designing-Delivering/dp/0071355472>
- Mills, S. W. (2001). The role of musical intelligence in a multiple intelligences focused elementary school. *International Journal of Education and the Arts*, 2(4), 1–29. https://libres.uncg.edu/ir/asu/f/Mills_Susan_2001_The_Role_of_Musical_Intelligence.pdf
- Mkumbachi, R. L., Astina, I. K., & Handoyo, B. (2020). Environmental awareness and pro-environmental behavior: A case of university students in Malang city. *Jurnal Pendidikan Geografi*, 25(2), 161–169. <https://doi.org/10.17977/um017v25i22020p161>

- Mukani, M., & Sumarsono, T. (2017). Adiwiyata-based environmental care character education on fiqh subjects at MTsN Tambakberas Jombang. *Jurnal Pendidikan Agama Islam (Journal of Islamic Education Studies)*, 5(2), 181. <https://doi.org/10.15642/jpai.2017.5.2.181-200>
- Nanda, A., Mohapatra, B. B., Mahapatra, A. P. K., Mahapatra, A. P. K., & Mahapatra, A. P. K. (2021). Multiple comparison test by Tukey's honestly significant difference (HSD): Do the confident level control type I error. *International Journal of Statistics and Applied Mathematics*, 6(1), 59–65. <https://doi.org/10.22271/math.2021.v6.i1a.636>
- Nurmalasary, N. (2018). The influence of learning styles and learning independence on mathematics learning achievement (Pengaruh Gaya Belajar dan Kemandirian Belajar terhadap Prestasi Belajar Matematika). *JKPM (Jurnal Kajian Pendidikan Matematika)*, 3(2), 189. <https://doi.org/10.30998/jkpm.v3i2.2767>
- OD, O., & El, A. (2014). Relevance of educational media and multimedia technology for effective service delivery in teaching and learning processes. *IOSR Journal of Research & Method in Education (IOSRJRME)*, 4(2), 48–51. <https://doi.org/10.9790/7388-04214851>
- Odumosu, M. O., Olisama, O. V., & Areelu, F. (2018). Teacher's content and pedagogical knowledge on students' achievement in algebra. *International Journal of Education and Research*, 6(3), 83–94. <https://ijern.com/journal/2018/March-2018/11.pdf>
- Oduor, D., Teygong, L., & Kapkiai, M. (2017). Influence of teacher pedagogical competencies on pupil's academic performance in public. *European Journal of Education Studies*, 3(2), 565–584. <https://doi.org/10.5281/zenodo.1156387>
- Omoogun, A. C., Egbonyi, E. E., & Onnoghen, U. N. (2016). From environmental awareness to environmental responsibility: Towards a stewardship curriculum. *Journal of Educational Issues*, 2(2), 60. <https://doi.org/10.5296/jei.v2i2.9265>
- Parker, L. (2018). Environmentalism and education for sustainability in Indonesia. *Indonesia and the Malay World*, 46(136), 235–240. <https://doi.org/10.1080/13639811.2018.1519994>
- Pasawano, T. (2015). Results of enhanced learning with the edutainment format. *Procedia - Social and Behavioral Sciences*, 176(2015), 946–951. <https://doi.org/10.1016/j.sbspro.2015.01.563>
- Pasina, I., Bayram, G., Labib, W., Abdelhadi, A., & Nurunnabi, M. (2019). Clustering students into groups according to their learning style. *MethodsX*, 6(September), 2189–2197. <https://doi.org/10.1016/j.mex.2019.09.026>
- Priya, D. D., Chavan, G., Thopte, K., Pawar, N., Raut, S., Waghmare, S., & Suji, M. (2020). Learning styles through visual, auditory and kinesthetic (Vak) scale. *Indian Journal of Forensic Medicine and Toxicology*, 14(4), 3777–3782. <https://doi.org/10.37506/ijfamt.v14i4.12218>
- Rambe, M. S., & Yarni, N. (2019). The influence of visual, auditorial, and kinesthetic learning styles on the learning achievement of dian andalas padang high school students (Pengaruh Gaya Belajar Visual, Auditorial, Dan Kinestetik Terhadap Prestasi Belajar Siswa SMA Dian Andalas Padan). *Jurnal Review Pendidikan Dan Pengajaran*, 2(2), 291–296. <https://doi.org/10.31004/jrpp.v2i2.486>
- Rigas, D., & Ayad, K. (2010). Using edutainment in e-learning application: an empirical study. *International Journal*, 4(1), 1–8. <https://www.naun.org/main/NAUN/computers/19-261.pdf>
- Rogayan, D. V., & Nebrida, E. E. D. (2019). Environmental awareness and practices of science students: Input for ecological management plan. *International Electronic Journal of Environmental*

- Education*, 9(2), 106–119. <https://files.eric.ed.gov/fulltext/EJ1219420.pdf>
- Sacks, O. (2006). The power of music. In *Brain* (Vol. 129, Issue 10, pp. 2528–2532). <https://doi.org/10.1093/brain/awl234>
- Schäfer, T., Sedlmeier, P., Städtler, C., & Huron, D. (2013). The psychological functions of music listening. *Frontiers in Psychology*, 4(AUG), 1–33. <https://doi.org/10.3389/fpsyg.2013.00511>
- Seinfeld, S., Figueroa, H., Ortiz-Gil, J., & Sanchez-Vives, M. V. (2013). Effects of music learning and piano practice on cognitive function, mood and quality of life in older adults. *Frontiers in Psychology*, 4(NOV), 1–13. <https://doi.org/10.3389/fpsyg.2013.00810>
- Soomro, R. B., Mirani, I. A., Sajid Ali, M., & Marvi, S. (2020). Exploring the green purchasing behavior of young generation in Pakistan: Opportunities for green entrepreneurship. *Asia Pacific Journal of Innovation and Entrepreneurship*, 14(3), 289–302. <https://doi.org/10.1108/apjie-12-2019-0093>
- Sreenidhi, S. K., & Tay Chinyi, H. (2017). Styles of learning based on the research of Fernald, Keller, Orton, Gillingham, Stillman, Montessori and Neil D Fleming. *International Journal for Innovative Research in Multidisciplinary Field*, 3(4), 17–25. https://www.researchgate.net/publication/317305325_Styles_of_Learning_VAK
- Trimble, M., & Hesdoeffler, D. (2017). Music and the brain: The neuroscience of music and musical appreciation. *BJPsych International*, 14(2), 28–31. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5618809/pdf/BJPI-14-28.pdf>
- Vilés-lópez, K., & Obando-paz, E. (2022). Music habits and academic performance in veterinary science. *Music Habits and Academic Performance in Veterinary Science*, 36(May), 1–29. <https://doi.org/10.6244/JOMR.202205>
- Virgana, V. (2019). Understanding of mathematical concepts through cooperative learning, and learning styles. *Journal of Education and Learning (EduLearn)*, 13(2), 212–218. <https://doi.org/10.11591/edulearn.v13i2.9917>
- Zorica, M. B. (2014). Edutainment at the higher education as an element for the learning success. *Edulearn14: 6Th International Conference on Education and New Learning Technologies*, 9(July), 4089–4097. https://www.researchgate.net/publication/264382563_EDUTAINMENT_AT_THE_HIGHER_EDUCATION_AS_AN_ELEMENT_FOR_THE_LEARNING_SUCCESS