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Preferred learning styles among junior high school students using non cognitive diagnostic assessment

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Abstract

Every student possesses individual learning styles, making it crucial to examine their preferred approaches as a means of designing courses and implementing effective instructional methods. The aim of this research endeavor was to identify the predominant learning style among junior high school students, along with discerning any gender-related associations with specific learning styles. Employing a descriptive quantitative research methodology, data were collected from 97 participants via non-cognitive diagnostic assessments. The results revealed that the visual learning style emerged as the most favored choice, with a prevalence rate of 60.8%. It was followed by the auditory style (12.4%), kinesthetic style (9.3%), visual-auditory style (7.2%), visual-kinesthetic style (7.2%), and auditory-kinesthetic style (3.1%). In terms of gender distribution, a significant majority of male students exhibited a preference for the visual style (42.3%), while the visual style also predominated among female students (18.6%). These findings hold valuable implications for fostering pedagogical excellence. Based on these results, educators are strongly advised to embrace diverse teaching methods and design multifaceted activities that encompass and accommodate the different learning styles exhibited among students.

Keywords: *learning style, non-cognitive diagnostic assessment, junior high school student*

INTRODUCTION

All students have the same goals of learning, but they have diverse ways of achieving them. Students have their own ways in acquiring, retaining, and retrieving information in the learning process. These different ways in which students process information in learning are commonly referred to as their learning styles. Learning styles are related to how students acquire and process information.

Every student has a combination of preferred learning styles. Some students may find that they prefer to learn in a quiet environment, some students also prefer to learn while listening to music, and some students also prefer to learn while practicing. Due to these different learning styles, every student has an effective way of learning that is different from one another.

By accommodating the learning style preferences of students, it means that a teacher is trying to provide a fair education and equal opportunities for all students. Selfish teachers disregard the conditions and readiness of students when learning. They will prioritize completing the material, neglecting their duty to teach. However, humanistic teachers tend to consider and design learning based on the learning styles of each student. Teachers are expected to maximize the learning outcomes of each student by providing a supportive learning environment in accordance with students' preferred learning styles so that the students' learning success can be achieved.

The learning success of students is influenced by cognitive and non-cognitive factors. Cognitive factors relate to students' abilities or knowledge which can be measured through structured questions where the answers to these questions are in accordance with existing theories. While non-cognitive factors are all elements that support the learning success of students outside or other than the domain of knowledge. One form of this non-cognitive factor is the student's learning style.

One way that can be done by a teacher to find out the non-cognitive aspects of students' learning styles is with diagnostic assessment. Assessment is not only carried out at the end of learning, but it also can be started at the beginning of learning. The assessment carried out at the beginning of the learning is diagnostic assessment. Diagnostic assessment is the first step or initial step for a teacher to obtain information about the profile of preferred learning styles of students. This assessment is used to diagnose students according to the aspects being assessed. Some diagnostic assessments focus on cognitive, whereas others are designed for non-cognitive (Barlian et al., 2105; Indrawati et al., 2022). Cognitive diagnostic assessment is

performed at the start of the lesson to diagnose the ability of students and their prior knowledge. Meanwhile, non-cognitive diagnostic assessment is utilized to identify the learning habits of students and factors that contribute to their learning process, including the preferred learning styles of students. In this non-cognitive diagnostic assessment, the teacher compiles a set of questions based on predetermined indicators so that conclusions can be drawn about the learning styles of students.

Considering students can learn in diverse ways, it is important for teachers to know the preferred learning styles of students when creating and delivering lessons. Understanding the learning style preferences of students allows teachers to develop appropriate strategies for teaching (Singh et al., 2015). In addition, by knowing the preferred learning styles, students can effectively engage in the learning process. Based on the result of the diagnostic assessment, the teacher can develop learning activities that are appropriate and in accordance with the needs of students (Ilyas, 2016; Nanaware & Baviskar, 2023).

There are some models in assessing learning styles, for example, David Kolb's Experiential Learning Model (1984), Peter Honey and Alan Mumford's model (1992), Neil Fleming's Vark Model (2005), Barch's Modle (1996) (Singh et al., 2015). However, only few studies identified the preferred learning styles using non-cognitive diagnostic assessment, especially for junior high school students. Therefore, the instrument of diagnostic assessment is needed to measure the learning style preferences of students. This research aims to identify what learning styles are preferred by junior high school students and what types of learning styles are more associated with the student's gender.

LITERATURE REVIEW

Learning Styles

Learning styles referred to the preferences of students in the process of learning. Some researchers define learning styles from various perspectives. According to (Djavairovna, 2022), learning styles related to the students' abilities to perceive and process information in learning environments. Similarly, (Nanaware & Baviskar, 2023) also explained the learning styles as the capacity of students to acquire and process information within a learning environment. More specifically, (Yaw, 2023) defined learning styles as the preferred approach through which a student sees, processes, comprehends, and retains knowledge. Shortly, the preferred way in which a student acquires, retains, and retrieves knowledge or information is considered to as a learning style.

Learning style is essential for every student to achieve success in their learning. Many previous research have been confirmed that learning styles impact students' learning outcomes positively. (Raj & Renumol, 2023) reported that determining appropriate learning styles of students and providing the right learning resources can contribute to enhancing students' learning outcomes. In addition, students more likely to achieve good learning outcomes when they actively participate in personalized learning following their personal intelligence that aligns with their preferred learning styles (Ayodele, 2023). To sum up, when the students know their learning styles, they can apply them in learning so that the learning styles can affect the students' learning outcomes. Based on the above scholar points, learning style is the preferred way of acquiring and processing information in the learning environment. In general, learning styles can be divided into 3 categories, namely:

Visual Learning Styles: Students with a visual learning style learn best when they see and observe things. In this category, students prefer pictures, graphic illustration, observation, charts, diagrams, flashcards, lists, and written instructions (Ayodele, 2023; Djavairovna, 2022; Nanaware & Baviskar, 2023; Yaw, 2023; Yotta, 2023). In addition, (Yotta, 2023) revealed that students with this learning style require eye contact during a conversation and they often face difficulties with verbal instructions. Thus, students who possess visual learning style will find it easier to absorb information when utilizing their visual capabilities. To accommodate students with visual learning style, teachers are required to use slides or power point, pictures, graphics, maps, and arts into learning activities (Maryani et al., 2018). Furthermore, teachers can use multimedia presentations, making posters, videos, or showing real objects to help students understand the material. For that reason, students can achieve optimal learning if they can take advantage of their visual learning styles.

Auditory Learning Styles: Kinesthetic students enjoy learning by doing and practicing. Some research reported that students with kinesthetic learning style acquire knowledge through moving, touching, handling physical objects, creativity, role play, and simulations (Ayodele, 2023; Nanaware & Baviskar, 2023; Yaw, 2023; Yotta, 2023). They tend to be engaged with body experience and movement. They also like making posters and creating artwork. To address the students with kinesthetic learning style, teachers should design learning activities that involve students practicing something, like bringing imitation animals or moving objects, practicing to touch object, and drawing (Maryani et al., 2018). In addition, teachers can employ practical exercises, experiments, or hands-on activities. Thus, maximizing the utilization of kinesthetic learning styles is essential for students to succeed in learning.

Kinesthetic Learning Styles: Kinesthetic students enjoy learning by doing and practicing. Some research reported that students with kinesthetic learning style acquire knowledge through moving, touching, handling physical objects, creativity, role play, and simulations (Ayodele, 2023; Nanaware & Baviskar, 2023; Yaw, 2023; Yotta, 2023). They tend to be engaged with body experience and movement. They also like making posters and creating artwork.

Non-Cognitive Diagnostic Assessment

The newest curriculum of Indonesia, Kurikulum Merdeka, divides the implementation of learning into three stages: diagnostic assessment, planning, and learning stages. One equally essential step that teachers can undertake is diagnostic assessment. Diagnostic assessment is aimed at diagnosing students' basic abilities and determining students' initial conditions.

There are two types of diagnostic assessment, namely cognitive and non-cognitive diagnostic assessment. Cognitive assessment is used to test students' learning abilities and achievements (Yusuf, 2023). On the other hand, non-cognitive diagnostic assessment is used to explore the psychological and socio-emotional aspects of students, students' activity during remote learning, family conditions and student social interactions, learning styles, character, and student interests (Widodo et al., 2022). The non-cognitive diagnostic assessment is used by teachers to evaluate the psychological condition of students is utilized to design service programs (Munawwar et al., 2023). Therefore, teachers can apply cognitive diagnostic assessment to identify students' competency achievement and non-cognitive diagnostic assessment to determine students' learning styles.

Drawing from the definitions mentioned above, it can be concluded that non-cognitive diagnostic assessment is conducted at the beginning of the learning process to explore the psychological and emotional conditions of students. In this assessment, teachers ask questions related to students' socio-emotional aspects and learning styles. Teachers must be aware that students have their own unique ways of learning. Social diversity and learning styles vary greatly in the process of learning. Thus, the use of non-cognitive diagnostic assessment is necessary to evaluate the diverse learning styles and preferences among students.

(Hatami, 2013) in his research, explains that learning style is not merely an ability, but rather a preference in utilizing one's abilities. This research successfully identified that individuals face situational variations in their learning styles, which involve differences in

natural characteristics, habits, and preferences in the process of absorbing, processing, and storing new information and skills. The weakness of this research lies in its inability to map out how to measure learning success related to each individual learning style. In line with this, (Rido & Wahyudin, 2020) has carried out research that focuses on learning style variants by taking into account differences in student backgrounds. This research aims to explore the perceptions and learning style preferences of master's level students studying at a university in Malaysia. A total of sixty students, representing countries such as Indonesia, Iran and Libya, took part in this research. The research findings reveal that Indonesian and Libyan students tend to have a tendency to be kinesthetic/tactile learners, while Iranian students tend to be visual learners. In addition, this research provides advice to educational practitioners to adopt various learning methods and strategies that can meet students' learning style preferences. Positively, this research was successful in measuring students' cognitive learning outcomes with a striking level of significance. However, it should be noted that this research does not present a mapping regarding how to measure student learning styles in non-cognitive dimensions.

Referring to various research that has been carried out, this research focuses on exploring and mapping learning styles that are student preferences, especially in the context of using non-cognitive diagnostic assessments.

METHOD

This current research generally applied descriptive quantitative to identify the preferred learning styles of junior high school students. Besides, this research also intended to investigate the preferred learning styles of students in term of gender. The descriptive approach to quantitative research was useful when the researchers wanted to collect and analyze large amounts of data. In addition, descriptive quantitative was effective when comparing preferred learning styles and gender. Due to these explanations, the researchers used descriptive quantitative for this research (Bahtiar & Azmar, 2022; Sugiono, 2020).

A total of 107 students seventh-grade students participated in this research. However, data from ten students were excluded because ten of them were did not take part in the non-cognitive diagnostic assessment. The age range of the students in this research was between 12 and 13. Out of the total 97 students participated in this recent research, 66 were male and 31 were female. All of the respondents enrolled as students at SMP Negeri 24 Samarinda, East

Kalimantan Province, Indonesia, in the academic year 2023/2024. Table I below indicated the gender distribution of respondents.

Table 1
The Gender of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	66	68.0	68.0	68.0
	Female	31	32.0	32.0	100.0
	Total	97	100.0	100.0	

As the table I shown above, it could be observed that out of the total 97 respondents, a majority of the respondents (68%) belonged to the male students, while the rest of them (32%) belonged to the female students. This led to the conclusion that the number of male students was higher than that of female students as respondents.

Researchers used questionnaires as a data collection tool needed to develop the basis for this research. In an effort to identify students' preferred learning styles and the types of learning styles associated with male and female students, this research adopted a non-cognitive diagnostic assessment as explained by Widodo et al. (2022). The use of this instrument is based on certain considerations, among which is the fact that the questionnaire consists of 14 questions designed to reveal students' learning style preferences. The six learning style categories introduced in this questionnaire include Visual, Auditory, Kinesthetic, Visual-Auditory, Visual-Kinesthetic, and Auditory-Kinesthetic. In addition, to obtain relevant descriptive statistics, all data must be expressed in numerical form. Therefore, the letters representing gender and learning style were changed to numbers. Nominal data, such as gender, is coded by assigning a numerical value, with Male represented by the number 1 and Female by the number 2. Likewise, for preferred learning styles, each category is given a numerical code, namely Visual = 1, Auditory = 2 , Kinesthetic = 3, Visual-Auditory = 4, Visual-Kinesthetic = 5, and Auditory-Kinesthetic = 6. Overall, this instrument is identical in the context of research that is identification of students' non-cognitive learning styles, with a focus on gender differences.

FINDINGS AND DISCUSSION

After collecting the quantitative data, the results of this research were analyzed using SPSS version 22. The researchers conducted this analysis into two types. First, descriptive quantitative such as frequencies distribution was used to analyze the preferred learning style of

students. Second, cross-tabulation was applied to identify the distribution of gender and preferred learning styles of students. Variables of descriptive statistics such as frequency, percent, valid percent, and cumulative percent were calculated.

This part of the research focused on assessing students' preferred learning styles which were obtained through non-cognitive diagnostic assessment. The descriptive statistic presented in Table II reported the information on the distribution of questionnaire across preferred learning styles of the overall students.

Table 2
Descriptive Statistics Related to the Preferred Learning Styles of Students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Visual	59	60.8	60.8	60.8
	Auditory	12	12.4	12.4	73.2
	Kinesthetic	9	9.3	9.3	82.5
	Visual-Auditory	7	7.2	7.2	89.7
	Visual-Kinesthetic	7	7.2	7.2	96.9
	Auditory-Kinesthetic	3	3.1	3.1	100.0
	Total	97	100.0	100.0	

According to Table II, among six learning styles, 59 (60.8%) of participants preferred visual learning style, 12 (12.4%) of participants were auditory, 9 (9.3%) of participants were kinesthetic, 7 (7.2%) of participants were both visual-auditory and visual-kinesthetic, and 3 (3.1%) of participants were auditory-kinesthetic. Therefore, it can be concluded that most preferred learning style of junior high school students was visual learning style, followed by auditory, kinesthetic, visual-auditory, visual-kinesthetic, and auditory-kinesthetic styles of learning.

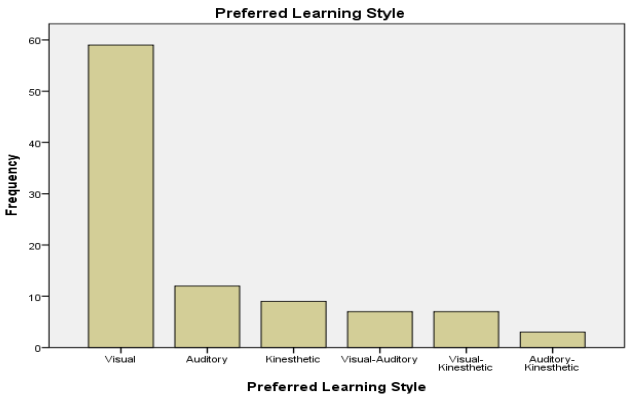

Figure 1 Preferred Learning Style of Students

The other finding of this research intended to investigate the type of learning style which more associated which is more associated with the gender of students. The researcher analyzed the desired data using cross-tabulation analysis in descriptive quantitative. Table III below cited the results of the cross-tabulation analysis between male and female students and the preferred learning style.

Table 3
Cross-Tabulation Analysis between Gender and Preferred Learning Style

			Gender		
			Male	Female	Total
Preferred Learning Styles	Visual	Count	41	18	59
		% of Total	42.3%	18.6%	60.8%
	Auditory	Count	9	3	12
		% of Total	9.3%	3.1%	12.4%
	Kinesthetic	Count	6	3	9
		% of Total	6.2%	3.1%	9.3%
	Visual-Auditory	Count	3	4	7
		% of Total	3.1%	4.1%	7.2%
	Visual-Kinesthetic	Count	5	2	7
		% of Total	5.2%	2.1%	7.2%
	Auditory-Kinesthetic	Count	2	1	3
		% of Total	2.1%	1.0%	3.1%
Total		Count	66	31	97
		% of Total	68.0%	32.0%	100.0%

The results of the cross-tabulation analysis between gender and preferred learning style are being cited in table III. From total of 97 junior high school students, the results indicated that the visual learning style displayed a higher percentage (42.3% male, 18.6% females) with 9.3% of males preferring the auditory learning style, followed by the kinesthetic (6.2%), the visual-kinesthetic (5.2%), the visual-auditory (3.1%), and lastly the auditory kinesthetic (2.1%). Female students preferred the visual-auditory learning style (4.1%), followed by the auditory (3.1%), the kinesthetic (3.1%), the visual-kinesthetic (2.1%), and lastly the auditory kinesthetic (1.0%). Therefore, both male and female students have tendency to be in the same category of visual learning styles as the highest learning style preference of students.

As mentioned previously, this recent research was to investigate the preferred learning style of junior high school students. The results of the descriptive statistics of frequencies showed that the overall of junior high school students preferred visual learning style (60.8%) followed by auditory (12%), kinesthetic (9.3%), visual-auditory (7.2%), visual-kinesthetic (7.2%), and auditory-kinesthetic (3.1%). The results demonstrated that the most dominant of

students' learning style is visual. The students mostly remember best what they see. They preferred to see things like pictures, diagrams, maps, photographs, and so on.

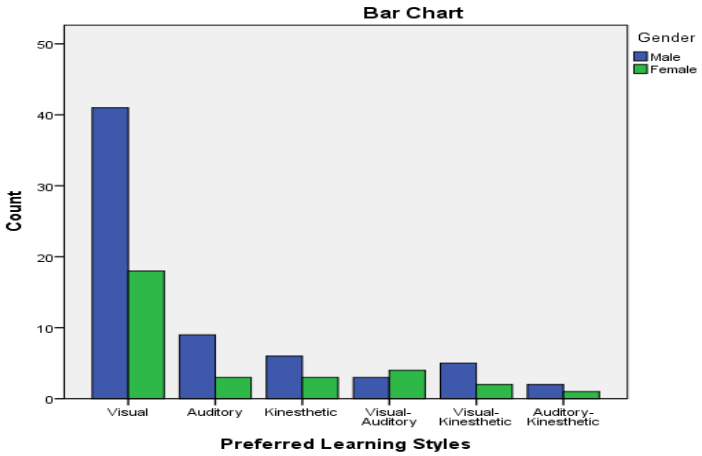

Figure 2 Preferred Learning Styles based on Gender

These results are in agreement with the findings conducted by (Niga & Janggo, 2022; Siddiquei & Khalid, 2022) which revealed that visual learning style was typically preferred among all the learning styles of students. These results are also consistent with the findings of (Jumrah, 2022; Rasdi & Rusli, 2023) which showed that the most common of the learning styles of students was visual learning. Similarly, (Dakay et al., 2023) also confirmed that based on the data, the learning style of the students' majority was visual students. They further implied that the students learn best from visual images.

The results of this research, however, differ with those of (Hosseini & Mehraein, 2022) who found that learners were mostly favored by auditory. Moreover, (Pagalilauan, 2023) said in his finding that auditory was more popular, followed by kinesthetic and visual learning. This result also goes against what (Nanaware & Baviskar, 2023) found, which the auditory was more prevalent than visual and kinesthetic learning. They further added that auditory students preferred a lecture with discussion.

Besides investigating the most preferred learning styles among students, this recent research also explored the distribution of male and female student across the preferred learning style. Understanding diverse learning styles is crucial for fostering the potential of male and female students in their educational settings and environment (Wahyuni et al., 2023). The results of the cross-tabulation showed that the most dominant learning style used by both male and female students was visual learning style. The results were different from the previous research conducted by Nanaware & Baviskar (2023), who discovered that male students were

found to be dominant with the auditory style of learning, whereas female students did best when all learning styles were combined.

Along with the results if this current research, students with a visual learning style favored learn in calm conditions or environments. They rarely liked a lot of noise, such as their classmates talking during lessons. They also rarely engaged in discussions as a method of learning. Instead, they favored studying the lessons independently rather than having them read aloud. They enjoyed learning materials that were predominantly visual, featuring pictures or images. Emphasizing colors while teaching and utilize illustrative pictures, posters, and figures are essential (Myasar et al., 2023). Thus, choosing and determining the right learning media were the key to success for teachers to create quality interactions for students with visual learning styles.

In terms of the auditory learning style, students with this type of learning style preferred to learn effectively through material that learned orally, such as discussions and material explanations by the teacher. Students with auditory learning style also enjoyed learning methods that involved question and answer interaction between the teacher and students. They are advised to actively participate in class by listening to the lectures and recording material for later review and reference (Myasar et al., 2023; Subramanya et al., 2022). Additionally, they could enhance their focus on learning when it accompanied by music.

Regarding to kinesthetic learning style, students with this category of learning style favored a way of learning that involved physical activities. Kinesthetic students might feel bored if learning process in a monotonous manner. For example, when the classroom dominated with only one-way communication. In the classroom settings, they often display passivity and may not fully engage with traditional teaching methods (Subramanya et al., 2022). Thus, the teacher could take the initiative to carry out learning out of class by observing certain objects or phenomena. In the classroom, learning could be enriched through the use of games, roleplay, drama, sports, dancing, practicum, and other physical activities.

The learning styles found in this recent research exhibit a wide range of diversity. It is very unlikely that a class will have a homogeneous learning style; of course, the learning styles possessed by students in a class will certainly vary, there are visual, auditory, and kinesthetic (Munawwar et al., 2023). With respect to all differences in learning styles based on this current research, in which visual is more dominant than other learning styles, teachers can start learning process by giving priority to methods that support visual learning style. However, it does not mean students with auditory and kinesthetic are not accommodated. Teachers can exhibit

creatively in designing learning materials for students with auditory learning styles, and providing assignments and instructions that are suitable for kinesthetic learning styles.

After the teacher understands the various learning styles that exist in students, the teacher can develop learning strategies that encompass all types of learning styles. The teacher should be sensitive to the learning needs of students so that learning is not only rely on direct learning. Instead, students should be given the opportunity to construct their understanding of the material provided and the flexibility to analyze with the provision of knowledge they have.

CONCLUSION

Learning styles vary based on visual, auditory, and kinesthetic aspects. Different students favor different learning styles. Examining students' preferred learning styles is beneficial for designing courses and implementing instructional methods. In addition, understanding preferred learning styles is a crucial task for teachers to enable students to learn more effectively. Teachers should take this into consideration, embracing a student-oriented approach, also known as student-center learning.

Overall, the findings of this research revealed the preferred learning styles of students. Based on the research's findings, the researchers reported visual preference to be ranked as the highest preference, followed by auditory, kinesthetic, visual-auditory, visual-kinesthetic, and auditory-kinesthetic. Moreover, this present research also highlighted the type of learning style which more associated with male and female students. A majority of male and female students possessed the same style of learning, which is the visual as the most dominant learning style.

This research has limitations that need to be considered for further development in the scientific realm. First, the scope of the study was limited to a sample of junior high school students, and to increase the generalizability of the results, it is recommended to involve a more diverse sample from different educational levels as well as diverse learning environments. Second, the focus of this research lies in visual, auditory and kinesthetic learning styles. Recognizing additional factors that may influence students' learning preferences, such as cultural elements or socioeconomic background, needs to be integrated in future research. Future studies could explore the effectiveness of different learning strategies that suit specific learning styles. Additionally, it is necessary to consider how teachers can design interventions that are suitable for students with specific learning preferences, so that this research can make a more holistic contribution to the understanding of student learning.

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