EDUMATSAINS
JURNAL PENDIDIKAN MATEMATIKA DAN SAINS
E-ISSN:2527-7235
Volume 10 Issue. 1, July 2025, pp 330-358
http://ejournal.uki.ac.id/index.php/edumatsains

Students' Learning Styles Based on Multiple Intelligences Theory in Solid Geometry Learning : A Phenomenological Study Of 8th Grade Junior High School

Dzakiyah 'Izzah Ghassani Adsumi [1*], Siti Nuraini [2], Toto Subroto[3], Sri Asnawati[4]
[1,2,3,4]Mathematics Education, Faculty of Education and Science, Swadaya Gunung Jati University
e-mail: ghassaniadsumi@gmail.com[1)], sitinurainiaini528@gmail.com[2)], totosubroto@ugj.ac.id[3)],sriasnawati@ugj.ac.id[4)]

Article Info
Article history:
Received : July 6th 2025
Revised : July 29th 2025
Accepted : July 30th 2025
Available online : July 31st 2025

https://doi.org/10.33541/edumatsains.v10i1.7160

Abstract
This study aims to explore how eighth-grade students' learning styles, based on Multiple Intelligences, manifest in geometry learning, and to address the research question: How can learning diversity in solving geometry tasks be revealed through the lens of the eight Multiple Intelligences? Using a qualitative approach with a descriptive phenomenological method, nine participants (N = 9) were purposively selected from a pool of 357 students through questionnaires, interviews, observations, and artifact analysis. Each participant represented one of six dominant intelligences according to the theories of Gardner and Armstrong (2018). The findings show that instruction tailored to students' dominant intelligences enabled them to complete tasks in distinctive ways—for example, building physical models for kinesthetic learners or composing mathematical narratives for verbal learners. This adaptation facilitated active engagement, deeper conceptual understanding, and authentic learning expression. The study highlights the importance of intelligence-based differentiated instruction in geometry teaching to optimize diverse learning potentials.

Keywords: learning styles; multiple intelligences; phenomenology; geometry learning

1. Introduction

Mathematics instruction in the classroom encompasses both mathematical content and mathematical processes (Harel, 2008). These processes require appropriate support to facilitate

various types of multiple intelligences. Gardner (1993) identified eight distinct intelligences: logical-mathematical, visual-spatial, bodily-kinesthetic, verbal-linguistic, musical, interpersonal, intrapersonal, and naturalistic. In classroom settings, these intelligences are often referred to using the terms proposed by Armstrong (2018), such as: logic smart (logical-mathematical), word smart (verbal-linguistic), body smart (bodily-kinesthetic), picture smart (visual-spatial), music smart (musical), people smart (interpersonal), self smart (intrapersonal), and nature smart (naturalistic). This study adopts the terminology introduced by Armstrong (2018).

A number of studies have shown that applying the MI approach in mathematics learning can enhance students' motivation, conceptual understanding, and academic performance (Armstrong, 2018; Bambang et.al, 2024). In the context of geometry, students with visual-spatial intelligence tend to excel in understanding shapes through visual representations, whereas those with bodily-kinesthetic intelligence demonstrate better comprehension through manipulative activities and model construction (Darwis, Mashuri, Tahmir, & Talib, 2024; Michelaki & Bournelli, 2022). Other research has also found that the MI approach accommodates students with non-logical intelligences who are often underserved in conventional mathematics instruction (Petruta, 2013; Safarudin, 2023). This study also employs a phenomenological approach to explore students' learning styles based on multiple intelligences. It emphasizes the importance of deeply understanding students' perspectives so that instruction can be more aligned with each individual's needs and potential.

However, in Indonesia, instruction remains largely classroom-based and has yet to fully optimize the broader school environment. Armstrong (2018) describes the classroom as a learning ecosystem that involves various aspects of the school environment. In practice, mathematics education in Indonesia still primarily emphasizes visual, auditory, and kinesthetic learning styles, without explicitly addressing the full spectrum of intelligences proposed by Gardner. In this study, students are assigned tasks aligned with Gardner (1993) eight intelligences, further operationalized by Armstrong (2018). One tangible manifestation of the learning ecosystem is students' learning styles, which refer to their tendencies in choosing the best ways to receive, process, and retain information (Supit, Melianti, Lasut, & Tumbel, 2023). Learning becomes smoother, more effective, and more enjoyable when students' learning styles are aligned with their dominant intelligences, as each student responds differently to various instructional models (Mailili, 2016; Sufianti, 2022).

In the context of mathematics learning, especially in the topic of three-dimensional geometry that requires visualization, logical reasoning, and spatial and kinesthetic skills, an MI-based approach becomes highly relevant. Students with visual-spatial intelligence (picture smart) can better understand the structure and form of 3D shapes through visual or manipulative media, while kinesthetic learners (body smart) become more engaged through model-building or project-based activities.

Therefore, educational systems should recognize multiple intelligences and provide opportunities and resources for students to develop their abilities and creativity (Arum, Kusmayadi, & Pramudya, 2018; Bracero-Malagón et al., 2022; Putri, Amelia, & Y, 2019; Shirawia et al., 2023; Wulandari, 2022). Based on this background, this study aims to explore the diversity of students' learning approaches in solving geometry problems based on the eight types of Multiple Intelligences

2. Methods

This study uses qualitative research with a Phenomenological approach. The phenomenological approach is a descriptive study of how individuals experience a phenomenon or situation (Davidsen, 2013). The research data were collected through unstructured interviews, observations, and the collection of artefacts, such as traces of phenomena (Klinke & Fernandez, 2023; Koster & Fernandez, 2023).

Participants in this study were nine students of class VIII of SMP Negeri 4 Cirebon. The participants were selected through a gradual process from 357 individuals who completed the questionnaire. From the results of the questionnaire, 40 participants were selected with classifications in each intelligence, namely 7 participants with logical-mathematical intelligence (logic smart), 7 participants with visual-spatial intelligence (picture smart), 4 participants with kinesthetic intelligence (body smart), 8 participants with verbal-linguistic intelligence (word smart), 3 participants with musical intelligence (music smart), 3 participants with interpersonal intelligence (people smart), 5 participants with intrapersonal intelligence (self smart), and participants with naturalistic intelligence (nature smart) to take part in the interview stage. After completing the interview process, nine students were selected as the main participants. who were then involved in special activities and collecting artefacts as part of the research data collection. In the main participants of this study, no students were found to have dominant naturalistic intelligence (nature smart); this is thought to be because the school environment is located in an urban area, so direct interaction with nature is limited and does not become a significant part of daily learning activities.

In the initial stage, the researcher aimed to identify the dominant type of intelligence exhibited by the participants, drawing on the Multiple Intelligences theory proposed by Armstrong (2018). For this purpose, the researcher prepared an initial instrument in the form of an open-ended questionnaire. This questionnaire is only an initial stage of participant selection, not as the primary data collection tool. According to the data collection results, 357 participants completed the questionnaire. Furthermore, a qualitative reduction process was carried out, relying on direct observation. The following indicators have been modified from Armstrong (2018) as a basis for making questionnaires, direct observations, observations, and student artefacts that are observed in dept:

Table 1.
Indicators of 8 types of intelligences according to the theory of multiple intelligences

No	Logic Smart	Picture Smart	Body Smart	Word Smart
1	Can easily do mental calculations	Easily visualize images with eyes closed.	Are highly sensitive to touch and enjoy feeling different textures.	Loves reading books.
2	Enjoys Math or Science subjects Likes playing puzzles or games	Sensitive to colors and color combinations.	Best ideas often come to you while walking or exercising.	Can "hear" words in their mind.
3	Likes playing puzzles or games that require logical thinking.	Enjoy taking photos or making videos.	Enjoy hands-on activities such as knitting, carving, modeling, or crafts.	Prefers audio over video.
4	Enjoy conducting science experiments.	Likes visual puzzles or mazes.	Feel that you have good body coordination.	Enjoy word games.
5	Often looks for patterns or logical sequences in things.	Often dreams with clear visual stories.	Find it difficult to stay still for long periods.	Likes making puns or rhymes.
6	Interested in new discoveries in science and technology.	Good at finding directions without a map.	Frequently use hand or body movements when speaking.	Has a wide and growing vocabulary.
7	Believes that most things have logical explanations.	Loves drawing or doodling.	Learn and understand better through direct practice rather than	Excels in text-based subjects.
8	Likes looking at graphs, tables, or statistics in the news.	Finds geometry easier to understand.	Prefer physical activity over sitting still.	Learn new languages easily.
9	Enjoy fixing broken items and finding out why they broke.	Can imagine shapes from a bird's-eye view.	Regularly participate in sports or physical activities.	Likes to retell stories from what they've read.
10	Feels more comfortable when things are measured or analyzed	Prefers books with lots of pictures	Understand things better when you can physically touch and try them out.	Has written something they're proud of

Based on table 1. A person who has logical-mathematical intelligence (logic smart) characterized by analytical and systematic thinking skills, such as being able to easily do calculations, enjoying science and mathematics subjects, and enjoying looking for patterns or logical sequences in various

things. Someone who has visual-spatial intelligence (picture smart) reflects the ability to understand and manipulate visual information; individuals with this intelligence tend to easily imagine images, like colours, and enjoy drawing or solving visual puzzles. Someone with kinesthetic intelligence (body smart) is characterized by their sensitivity to movement and touch, with traits such as enjoying physical activity, having good body coordination, and learning more easily through direct practice

Someone who possesses verbal-linguistic intelligence (word smart) is characterized by a love of language, as evidenced by their enjoyment of reading, writing, playing with words, and having a vast vocabulary and strong language skills. The following are the continued indicators of intelligence: music smart, people smart, self smart, and nature smart.

Table 2.
Continued indicators of 8 types of intelligences according to the theory of multiple intelligences

No	Music Smart	Smart People	Self Smart	Nature Smart
1	Can sing a song after hearing it once or twice.	Often chosen by friends to listen to problems or give advice	Often spend time alone to reflect	Enjoy hiking or walking in mountains, forests, or the outdoors.
2	Can play a musical instrument.	Prefers team sports such as futsal, basketball, or volleyball.	Have attended counseling or self- aw areness training.	Have participated in nature-loving communities or activities.
3	Can sing a song after hearing it once or twice.	Tends to seek help from others when facing challenges	Quickly recover after failure.	Like having pets.
4	Easily follow music rhythms.	Has at least three close friends	Have a special hobby or interest that few people know about.	Have hobbies related to nature, such as bird watching.
5	Know many songs by heart.	Enjoy playing multiplayer games like Monopoly	Often think about dreams and life goals.	Have taken courses about plants or animals.
6	Life feels empty without music.	Likes teaching others what is already mastered.	Know your strengths and weaknesses.	Skilled at distinguishing different types of plants, birds, or animals.

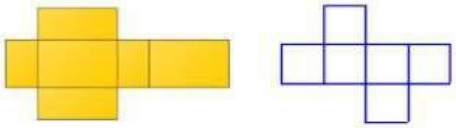
7	Often hum or sing quietly while walking.	Feels confident taking on leadership roles	Prefer nature trips over crowded hotels.	Enjoy reading or watching programs about nature.
8	Often listen to music in your free time.	Comfortable being in social or crowded environments	Independent and positive stubborn.	Prefer vacations in nature rather than in the city.
9	Often tap the table or hum while studying.	Actively participates in school or community social events	Like to write a diary or personal notes.	Love visiting zoos or national parks.
10	Singing voice sounds pleasant.	Enjoys spending time with groups rather than being alone	Have seriously considered starting your own business.	Enjoy gardening at home.

Based on table 2. A person with musical intelligence (music smart) is perceived as being sensitive to tone, rhythm, and melody. Individuals with this intelligence typically memorize songs easily, can play musical instruments, and often sing or hum unconsciously while engaging in various activities. Someone who has intrapersonal intelligence (self-smart) reflects high self-awareness, where someone likes to reflect, knows their strengths and weaknesses, and has an interest in self-development and life goals. Someone who has naturalist intelligence (also known as "nature smart") is characterized by their closeness to and interest in nature, as evidenced by their enjoyment of outdoor activities, affection for animals or plants, and hobbies or knowledge related to the environment.

Based on the results of the questionnaire, 40 participants were selected for in-depth confirmation through unstructured interviews. The interview instrument also utilized indicators of eight types of intelligence, as outlined in the theory of multiple intelligences, as presented in Tables 1 and 2. Based on these results, the researcher conducted a selection process to identify participants who would proceed to the observation and artefact collection stage. This reduction process was carried out qualitatively, relying on the researcher's direct observation of responses, the consistency of answers, and the clarity of participants' expressions in explaining their experiences related to the intelligence they possessed. The researcher assessed the extent to which participants were able to represent certain types of intelligence based on indicators that refer to the framework of the theory of multiple intelligences developed by Armstrong (2018).

Based on these observations, 9 participants were selected who were considered most suitable for further observation. At this stage, participants are asked to work on practice questions arranged according to their respective dominant intelligences.

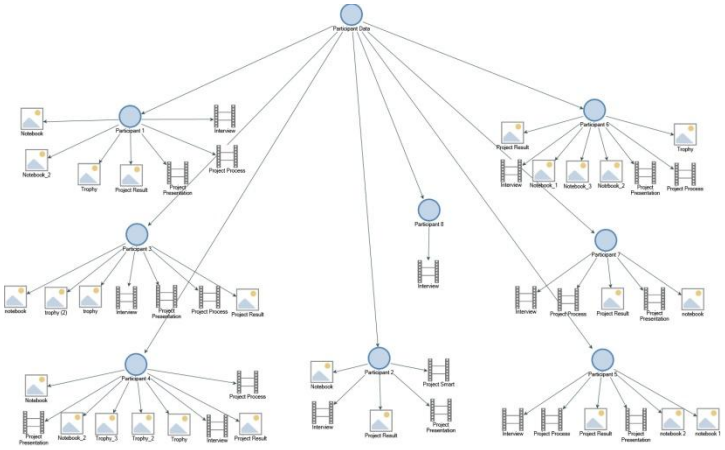
Table 3.
Questions given

No	Intelligence	Question
1	Logical-Mathematical Intelligence (Logic Smart)	A block has a length of 10 cm, a width of 6 cm, and a height of 4 cm. Calculate: a. Volume of a cuboid b. Surface area of a cuboid
2	Visual-Spatial Intelligence (Picture Smart)	Look at the following net image!  Can you determine the geometric shape by imagining the net? ……. Draw a geometric shape that can be formed from the net and name the shape and how you know it!
3	Bodily-Kinesthetic Intelligence (Body Movement Intelligence)	Make a model of a geometric shape (Cube/Pyramid/Prism) Describe the parts of the geometric shape you created (sides, edges, vertices, height, base)!
4	Verbal-Linguistic Intelligence (Word Smart)	Write a short story (5–7 sentences) involving an object in the form of a geometric figure (for example a ball, cylinder, or cube). Name the geometric figure in your story and describe its characteristics mathematically!
5	Musical Intelligence (Music Smart)	Create a short song or jingle (3–4 lines) that explains the formula for volume and surface area of a geometric shape (e.g. cube). Feel free to use any tune you can! Example: A cube has equal sides, all the lengths are the same... Its volume is the cube of one side, its area is six sides in total...
6	Interpersonal Intelligence (People Smart)	Create a mini presentation about geometric shapes (cubes, cuboids, prisms). Present the properties of these shapes and examples of similar real objects!
7	Intrapersonal Intelligence (Self Smart)	Write down your experience while learning about geometric shapes. Which geometric shapes are the easiest and which are the most difficult in your opinion and to what extent do you understand the geometric shapes? Why?
8	Naturalistic Intelligence (Nature Smart)	Find the following pictures in the environment around your house or school. 

This question is used to confirm the identification of students' dominant intelligence based on the theory of multiple intelligences developed by Gardner (1993). Each question item is designed to represent one type of multiple intelligence through contextual activities related to the concept of spatial shapes in mathematics. There are seven types of intelligence measured, namely: Logical-Mathematical Intelligence (Logic Smart), Visual-Spatial Intelligence (Picture Smart), Bodily-Kinesthetic Intelligence (Body Smart), Verbal-Linguistic Intelligence (Word Smart), Musical Intelligence (Music Smart), Interpersonal Intelligence (People Smart), Intrapersonal Intelligence (Self Smart), and Naturalistic Intelligence (Nature Smart). Each question encourages students to demonstrate the unique abilities of each intelligence, either through calculations, visual depictions, physical activities, language expressions, musicality, cooperation, or self-reflection. The results of this instrument are expected to provide an overview of students' dominant intelligence, which can then be used to adjust more personal and effective learning strategies.

During the observation, the researcher noted how participants responded to the questions, how they worked on them, and when they presented their answers. The purpose of this observation was to gain a deeper understanding of how participants used their dominant intelligence in completing the tasks. In addition, participants also collected supporting artefacts, such as study notebooks, award certificates, and competition trophies that they had received, to strengthen data related to their intelligence and learning styles. The following is the complete data obtained:

Figure 1
Research Data



Data obtained from interviews, observations, and artifacts were reanalyzed using Nvivo software starting from field findings and established theories. In the analysis process, researchers reduced

unnecessary data. Data was coded based on the eight multiple intelligence indicators from the theory Armstrong (2018).

To ensure the validity of the data, this study employed several validation procedures as follows: 1) Source Triangulation: Data were collected from various sources, including questionnaires, interviews, observations, and student artifacts. 2) Member Checking: Preliminary findings were analyzed and then re-confirmed with participants to ensure the accuracy of the representation of their experiences. 3) Inter-Coder Agreement: Four researchers independently coded a portion of the data. Discussions were then conducted to reach consensus on differing code interpretations, thereby enhancing the reliability of the analysis.

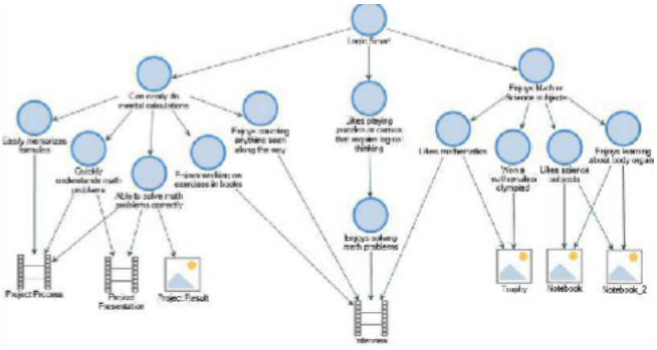
3. Result and Discussion

Logic-Mathematics Intelligences (Logic Smart)

Participant 1 showed a strong tendency in logical-mathematical intelligence. It was found that three theoretical approaches, as outlined by Armstrong (2018), were owned by logical person. suggests that it can *easily do mental calculations, enjoys math or science subjects, likes playing puzzles or games that require logical thinking*. This finding confirms logical-mathematical intelligence, as outlined in the theoretical framework of multiple intelligences in logical person. The results of the analysis are presented in Figure 2.

Figure 2

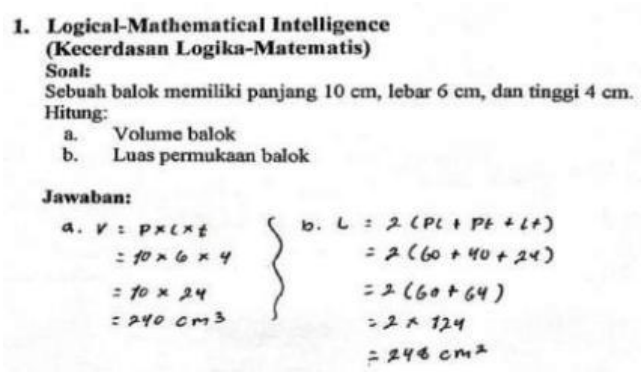
Mapping of logical-mathematical intelligence (logic smart) based on the results of interviews, observations, and artifacts



The results of the assignment indicate that logical person was able to complete the project-based learning questions, particularly in the area of spatial mathematics. Bambang et al., (2024) stated that students tend to have a logical-mathematical learning style, which is analytical and structured,

supporting mathematical problem-solving. This is supported by Safarudin (2023), who found that they understood the concept of geometry systematically. The results of the analysis are presented in Figure 3.

Figure 3.
Results of participant 1's work


1. **Logical-Mathematical Intelligence**
(Kecerdasan Logika-Matematis)
Soal:
Sebuah balok memiliki panjang 10 cm, lebar 6 cm, dan tinggi 4 cm.
Hitung:
a. Volume balok
b. Luas permukaan balok

Jawaban:
a. V = p × l × t
= 10 × 6 × 4
= 10 × 24
= 240 cm³

b. L = 2 (pl + pt + lt)
= 2 (60 + 40 + 24)
= 2 (60 + 64)
= 2 × 124
= 248 cm²

In the interview data, it was found that participants had dominant logical-mathematical intelligence. This is evident in their interest in mathematics and science subjects from childhood, their habit of performing calculations such as determining the speed of vehicles on the road, and their enjoyment of working on math problems in their spare time. These findings reflect the ability to think logically and analytically, as well as an interest in problem-solving, which are characteristics of logical- mathematical intelligence. Research by Safranj (2016) states that individuals with logical- mathematical intelligence possess high numerical abilities and enjoy patterns and logical challenges. The results of the analysis are presented in Table 4.

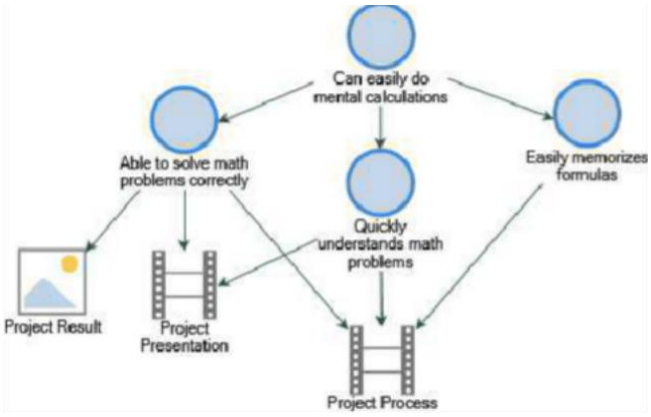
Table 4.
Interview data from participant 1

Timespan		Content
10:55-11:28	P0 :	Why do you like math and science?
	P1 :	I like math and science because I've been exposed to math since I was a child, so I've grown to enjoy it. As for science, I'm just interested in subjects like chemistry and physics
12:16-12:35	P0 :	Do you sometimes find yourself counting things around you while you're out and
	P1 :	about?

		Sometimes, I like to calculate the speed of a vehicle on the road
18:44-18:55	P1 :	During my spare time, I enjoy working on math exercises in my textbook

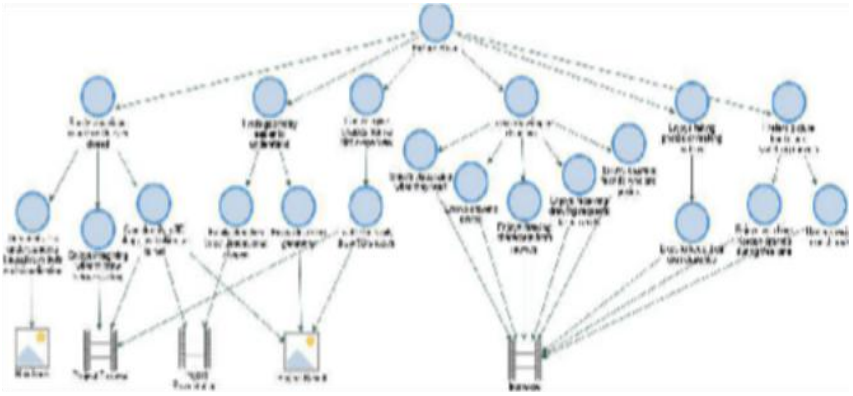
The process of working on questions and the presentation shows the ability of logical person to think logically and systematically. The results of the problem-solving also reflect the level of understanding of mathematical concepts. The results of the analysis are presented in Figure 4.

Figure 4
Mapping of logical-mathematical intelligence (logic smart) based on the results of working on the flat-sided geometric geometry mathematics problem



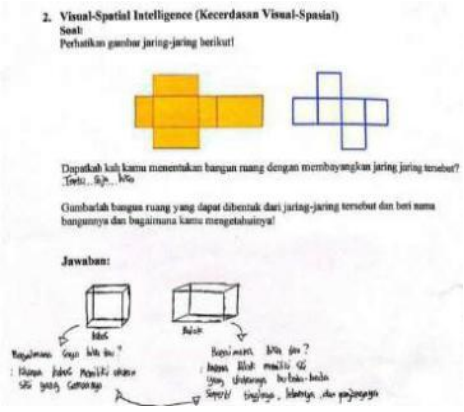
Visual-Spatial Intelligences (Picture Smart)
Participant 2 showed a strong tendency in visual-spatial intelligence. It was found that the theoretical approach of Armstrong (2018) owned by Visual-spatial person. The theory shown is*easily visualizes images with eyes closed, finds geometry easier to understand, can imagine shapes from a bird's-eye view, loves drawing or doodling, enjoys taking photos or making videos, prefers picture books and watching movies.* his finding confirms the visual-spatial intelligence based on the theoretical framework of multiple intelligences, according to Visual-spatial person. The results of the analysis are presented in Figure 5.

Figure 5
Mapping of visual-spatial intelligence (picture smart) based on the results of interviews, observations, and artifacts



The results of the assignment indicate that Visual-spatial person can identify the type of geometric shape based on its net and accurately represent its visual form in detail. Visual-based learning models and image media, especially in subjects that involve understanding form and space, such as geometry and mathematics. This finding is supported by studies by Darwis et al., (2024), which show that students with high visual-spatial intelligence tend to have strong abilities in understanding geometry and algebra and demonstrate visual thinking skills in solving mathematical problems. Study Sari & Pujiastuti (2020) also shows that visual learning styles have a positive relationship with mathematical understanding abilities if the learning method is adjusted to the student's dominant intelligence. A study by Pico & Bravo (2024) also shows that the use of visual media, such as images and videos, significantly improves the learning outcomes of students with visual learning styles. The results of the analysis are presented in Figure 6.

Figure 6
Results of participant 2's work



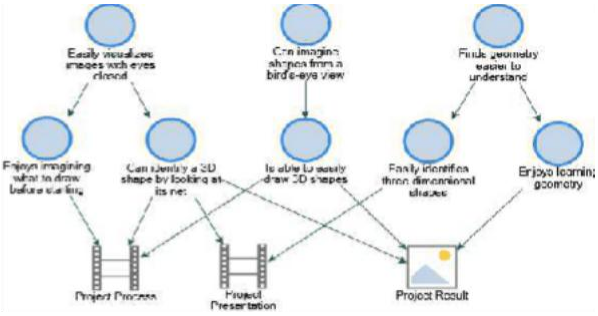
In the interview data, findings were identified that aligned with visual-spatial intelligence. Visual-spatial person stated that he enjoyed drawing in his spare time, especially anime or human images. Visual-spatial person also admitted to often drawing in textbooks during class, indicating a habit of expressing ideas through visualsIn addition, his friends often asked him to draw anime characters or their portraits, indicating recognition of his ability in visual representation. These findings reflect the characteristics of visual-spatial intelligence, namely the ability to visualize, understand shapes, and express ideas through pictures or visual images. The results of the analysis are presented in Table 5.

Table 5.
Interview data from participant 2

Timespan		Content
20.35-20-55	P0 :	What do you like to do in your free time
	P2 :	I like to draw in my free time, especially anime or people
21.45-21.57	P0 :	Do you like to draw during class?
	P2 :	Yes, I like to draw things in my textbook during lessons
22.53-23-02	P0 :	Have your friends ever asked you to draw something?
	P2 :	Yes, many times. They often ask me to draw anime characters, and sometimes they even ask me to draw them while they're posing

Process of working on questions, as well as the presentation and results of the problem-solving, also demonstrate that Visual-spatial person has an understanding through the use of symbols and visualization. The results of the analysis are presented in Figure 7.

Figure 7
Mapping of visual-spatial intelligence (picture smart) based on the results of working on flat-sided geometric mathematical problems.

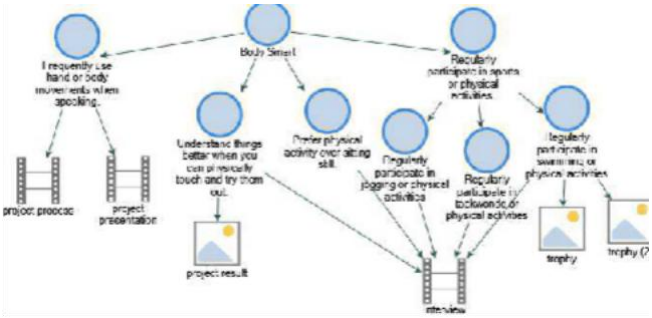


Bodily-Kinesthetic Intelligences (Body Smart)

Participant 3 showed a strong tendency towards kinesthetic intelligence. It was found that four theoretical approaches, as outlined by Armstrong (2018) were owned by Kinesthetic person. The theory suggests that individuals *frequently use hand or body movements when speaking, understand things better through physical interaction, prefer physical activity over sitting still, regularly participate in sports or physical activities*. These findings confirm kinesthetic intelligence, as outlined in the multiple intelligences theoretical framework, as seen in Participant 3. The results of the analysis are presented in Figure 8.

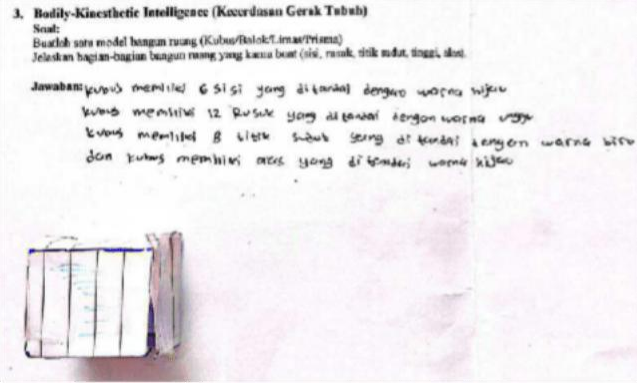
Figure 8

Mapping of kinesthetic intelligence (body smart) based on the results of interviews, observations, and artifacts



The results of the task indicate that participants can complete practice-based tasks, demonstrating their ability to create a cube-shaped space and describe it in detail. This finding is supported by a study by Berliana & Atikah, (2023); Petruta, (2013), and Minasadiyah, et al., (2023)which states that kinesthetic intelligence can improve learning outcomes if facilitated with appropriate approaches such as physical activity and body coordination. Research results in Laila Ulfa (2022), Gunawan et al., (2023); and Michelaki & Bournelli, (2022). Also show that students with this intelligence learn more effectively through physical activity and practice. Therefore, active and movement-based learning is highly recommended. The results of the analysis are presented in Figure 9.

Figure 9
Results of participant 3's work



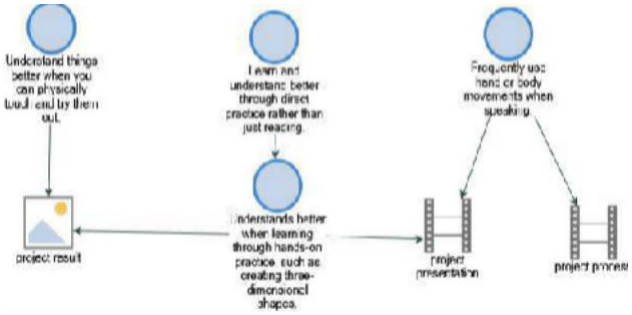
In the interview data, findings were identified that aligned with kinesthetic intelligence. Kinesthetic person stated that they preferred learning methods that involved direct practice and presentations because they could physically see and touch the material, such as when making crafts. They also emphasized that understanding was more effective when there were real objects that could be touched rather than just imagining them. These findings suggest that participants learn more effectively through physical activity and direct interaction with objects, which are key characteristics of kinesthetic intelligence. The results of the analysis are presented in Table 6.

Table 6.
Interview data from participant 3

Timespan		Content
5:57-5:59	P0 :	What kind of learning method do you prefer? Do you like just listening, or do you prefer activities like hands-on practice or presentations?
	P3 :	I prefer hands-on practice and presentations because we can see and touch the materials, like when making crafts.
12:13- 12:21	P0 :	Do you understand better when there's a physical object, or can you learn just by imagining it?
	P3 :	There has to be a physical object. It's more effective when we can see and touch it.

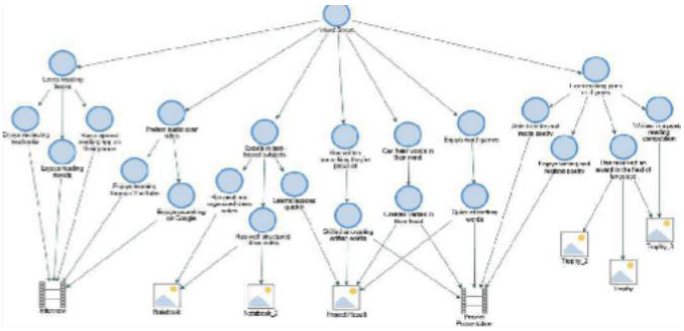
The process of working on questions and the presentation demonstrates the ability of Kinesthetic person to make a cube; the participant efficiently completes his task through practice. The results of working on the questions also reflect the level of understanding of the mathematical concept of the cube he made. The results of the analysis are presented in Figure 10.

Figure 10
Mapping of kinesthetic intelligence (body smart) based on the results of working on the flat-sided geometric geometry mathematics problem



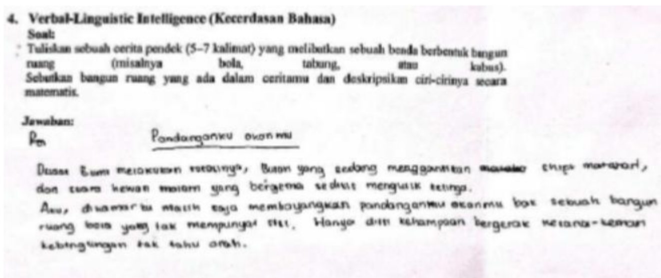
Verbal-Linguistic Intelligences (Word Smart)
Participant 4 showed a strong tendency in verbal-linguistic intelligence. It was found that even the theoretical approach of Armstrong (2018), owned by Verbal-linguistic person. The theory presented suggests *that they loves reading books, prefers audio over video, likes making puns or rhymes, has written something they're proud of, excels in text-based subjects, enjoys word games, can hear words in their mind*. This finding confirms the verbal-linguistic intelligence based on the theoretical framework of multiple intelligences, according to Verbal-linguistic person. The results of the analysis are presented in Figure 11.

Figure 11
Mapping of verbal-linguistic intelligence (word smart) based on the results of interviews, observations, and artifacts



The results of the task indicate that Verbal-linguistic person possesses structured and language-based thinking skills, as demonstrated by his ability to create a short story describing a ball. This finding is also supported by Safarudin (2023), whose research results state that students with linguistic intelligence tend to understand mathematical concepts, including plane figures, through verbal approaches such as explaining and defining concepts verbally and in writing. The results of this analysis are presented in Figure 12.

Figure 12
Results of participant 4's work


4. Verbal-Linguistic Intelligence (Kecerdasan Bahasa)
Soal:
Tuliskan sebuah cerita pendek (5–7 kalimat) yang melibatkan sebuah benda berbentuk bangun ruang (misalnya bola, tabung, atau kubus). Sebutkan bangun ruang yang ada dalam ceritamu dan deskripsikan ciri-cirinya secara matematis.

Jawaban:
Pandanganku akan mu

[illegible] Bumi melakukan [illegible], Bulan yang sedang menggantikan [illegible] cahya mentari, dan suara hewan malam yang bergema sedikit mengusik telinga.
Aku, di waktu itu masih saja membayangkan pandanganmu akanmu bak sebuah bangun ruang bola yang tak mempunyai sisi. Hanya diri kehampaan bergerak kesana-kemari kebingungan tak tahu arah.

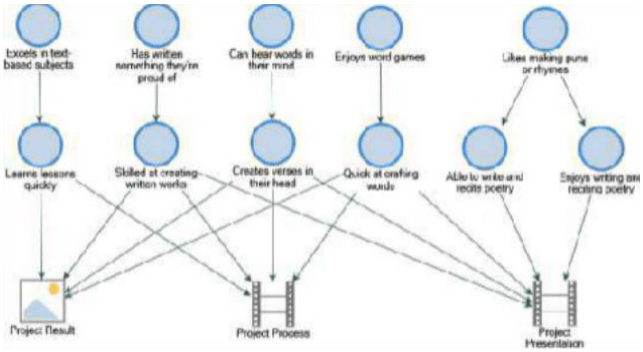
In the interview data, findings were identified that aligned with linguistic intelligence. The participant stated that he enjoyed reading books and using a special application to read on his cell phone. He also used to review the lesson material before it was taught at school. This habit reflects an interest in and ability to understand and use language, both in written and spoken forms, which is a characteristic of linguistic intelligence. The results of the analysis are presented in Table 7.

Table 7.
Interview data from participant 4

Timespan		Content
01:23-01:37	P0 :	What have you been busy with lately?
	P4 :	I've been balancing school with other activities. I enjoy reading books and reviewing the lessons that will be taught at school
03:49-03:55	P4 :	I also have a special reading app on my phone

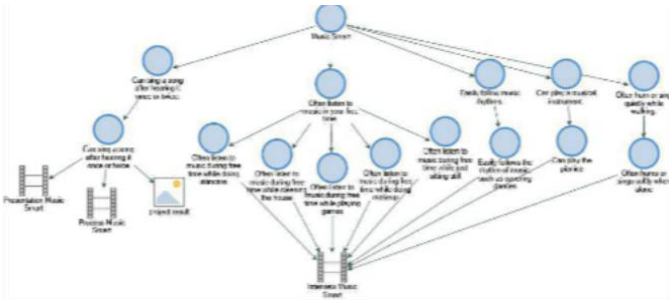
The process of working on questions and presentations shows Verbal-linguistic person ability to manage sentences. The results of the problem-solving also reflect that Participant 4 excels in text-based learning. The results of the analysis are presented in Figure 13.

Figure 13
Mapping of verbal-linguistic intelligence (word smart) based on the results of working on the flat-sided geometric geometry mathematics problem



Musical Intelligence (Music Smart)
Participant 5 showed a strong tendency towards musical intelligence. It was found that five theoretical approaches, as identified by Musical person, were owned by Armstrong (2018). The theory shown is *can sing a song after hearing it once or twice, often listen to music in your free time, easily follow music rhythms, can play a musical instrument, often hum or sing quietly while walking*. This finding confirms musical intelligence, as defined by the theoretical framework of multiple intelligences, according to Musical person. The results of the analysis are presented in Figure 14.

Figure 14
Mapping of musical intelligence (music smart) based on the results of interviews, observations, and artifacts

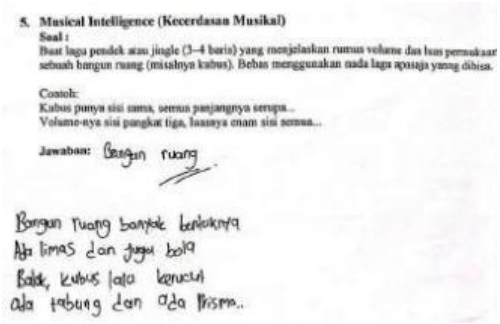


he results of the task showed that Musical person was able to create a short song that explained spatial structures. This shows that Musical person was influenced by auditory and rhythmic stimulation, which are characteristics of individuals with dominant musical intelligence. This

finding is supported by studies Snyder (1997) that demonstrate the ability to sing a song quickly after hearing it, as well as consistent musical expression and processing, indicating that the participants fall within the category of musical intelligence dominance. The results of the analysis are presented in Figure 15.

Figure 15

Results of participant 5's work



In the interview data, findings were identified that aligned with musical intelligence. Musical person stated that he enjoyed music, was familiar with musical tones, and recognized his voice type as an alto. Musical person was also used to listening to music while working on assignments, which he said helped him understand the material and create a sense of comfort. These findings reflect sensitivity to musical elements and learning abilities supported by musical stimulation, which are the main characteristics of musical intelligence. The results of the analysis are presented in Table 8.

Table 8.

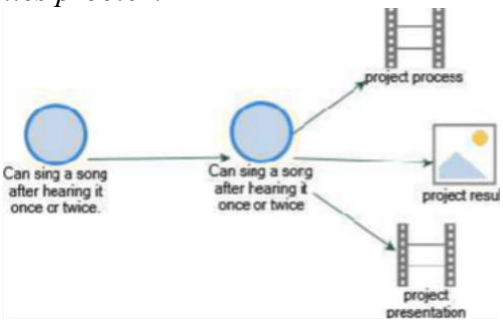
Interview data from participant 5

Timespan		Content
00:57-01:16	P0 :	Do you like listening to music?
	P5 :	I like it very much
	P0 :	Can you recognize off-key notes?
	P5 :	Yes, I'm familiar with musical notes
	P0 :	Then, do you know what your vocal type is?
	P5 :	Alto
02:00-02.19	P0 :	Do you like listening to music while doing assignments?
	P5 :	Yes, I often listen to music while working on assignments
	P0 :	Does that help you understand the material?
	P5 :	Yes, I can understand it very well and it also makes me feel comfortable

The process of working on questions, presentations, and the test results showed that participants with musical intelligence had high sensitivity to sound and rhythm and were able to express themselves musically, both spontaneously and in a structured manner. The results of the analysis are presented in Figure 16.

Figure 16

Mapping of musical intelligence (music smart) based on the results of working on the flat-sided geometric geometry mathematics problem

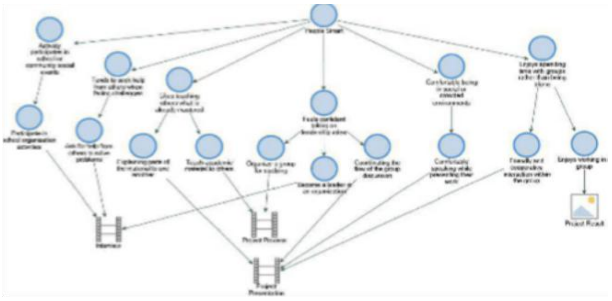


Interpersonal Intelligence (People Smart)

Participant 6 showed a strong tendency in interpersonal intelligence. It was found that six theoretical approaches of Armstrong (2018) were owned by Interpersonal person. The theory shown is *that it tends to seek help from others when facing challenges, likes teaching others what is already mastered, feels confident taking on roles, enjoys spending time with groups rather than being alone, comfortable being in leadership in social or crowded environments, actively participates in school or community social events.* This finding confirms the interpersonal intelligence based on the theoretical framework of multiple intelligences, according to Interpersonal person. The results of the analysis are presented in Figure 17.

Figure 17

Mapping of interpersonal intelligence (people smart) based on the results of interviews, observations, and artifacts.



The results of the task showed that participants were skilled at managing groups, able to divide tasks among other group members, and were also greatly influenced by social interaction and teamwork, in line with the characteristics of interpersonal intelligence. Interpersonal intelligence plays a critical role in creating adaptive and collaborative learning experiences. Saadullah et al., (2024) collaborative learning style is positively correlated with interpersonal intelligence Qutab et al., (2024). The results of the analysis are presented in Figure 18.

Figure 18
Participant 6's work results

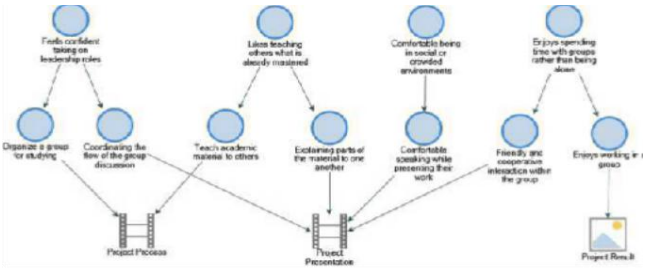
In the interview data, findings were identified that aligned with the concept of interpersonal intelligence. Interpersonal person acted as a leader in the division he joined and was able to manage group members by directly assigning tasks, especially to those who tended to be quiet. Interpersonal person also preferred group learning because it was considered more efficient. Additionally, participants demonstrated the ability to resolve conflicts in groups by offering advice and taking decisive action when necessary. These findings reflect the ability to understand, interact, and cooperate with others, which are characteristics of interpersonal intelligence. The results of the analysis are presented in Table 9.

Table 9.
Interview data from participant 6

Timespan		Content
03:10-03:20	P0 :	What is your role in the Religious Affairs Division?
	P6 :	I'm the leader
03.40-04:21	P0 :	How do you manage your group to complete the tasks?
	P6 :	Since many haven't shown initiative due to being introverted, I randomly assign tasks to them directly
05:45-06.42	P0 :	What kind of learning approach do you prefer?
	P6 :	I prefer group work so the task can be finished quickly
07:07-07:20	P0 :	What would you do if a group member is not responsible?
	P6 :	I would advise them, and if they still don't change, I would remove them from the group

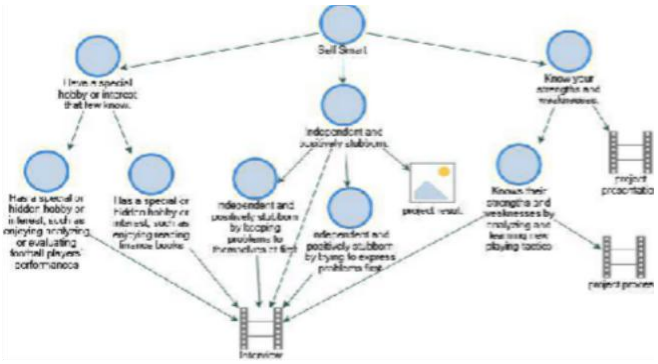
The process of working on questions, as well as the presentation and results of this work, also demonstrates skills that show collaborative results carried out harmoniously in groups. The results of the analysis are presented in Figure 19.

Figure 19
Mapping of interpersonal intelligence (people smart) based on the results of working on the flat-sided geometric geometry mathematics problem



Intrapersonal Intelligence (Self Smart)
Participant 7 showed a strong trend in intrapersonal intelligence. It was found that the theoretical approach of Armstrong (2018) was owned by Intrapersonal person. The theory presented suggests *have a special hobby or interest that few know, independent and positively stubborn, know your strengths and weaknesses.* This finding confirms the intrapersonal intelligence, as outlined in the theoretical framework of multiple intelligences, according to Intrapersonal person. The results of the analysis are presented in Figure 20.

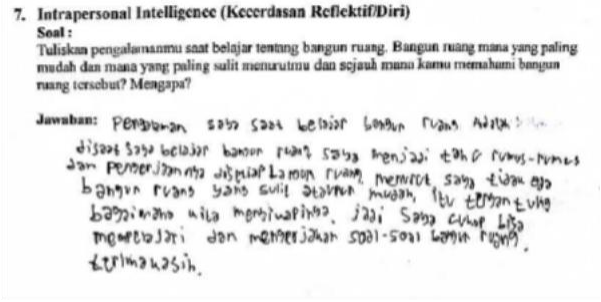
Figure 20
Mapping of intrapersonal intelligence (Self Smart) based on the results of interviews, observations, and artifacts.



The results of the assignment indicate that students with intrapersonal intelligence excel in recognizing and managing themselves effectively, as well as actively engaging in self-evaluation and self-development, particularly in the context of geometric forms such as solid figures. This ability greatly contributes to a comprehensive understanding of geometry. These findings are supported by studies conducted by Iswan (2016); and Swalaiha, (2024), which show that students with intrapersonal intelligence possess reflective abilities, self-awareness, and a self-improvement orientation as integral parts of their intelligence profile. The analysis results can be seen in Figure 21.

Figure 21

Participant 7's work results


7. **Intrapersonal Intelligence (Kecerdasan Reflektif/Diri)**

Soal :

Tuliskan pengalamanmu saat belajar tentang bangun ruang. Bangun ruang mana yang paling mudah dan mana yang paling sulit menurutmu dan sejauh mana kamu memahami bangun ruang tersebut? Mengapa?

Jawaban:

In the interview data, it was found that Intrapersonal person had dominant intrapersonal intelligence. This is demonstrated through his ability to recognize personal interests and motivations, such as his interest in reading atlases and sports history books and his decision to join a basketball club as a new challenge for himself. In addition, the participant also demonstrated reflective ability through his habit of analyzing sports matches, evaluating player performance, and understanding game strategies only through observation. These findings reflect the ability to understand oneself, have clear personal goals, and be aware of how to learn and develop, which are characteristics of intrapersonal intelligence. The results of the analysis are presented in Table10.

Table 10.

Interview data from participant 7

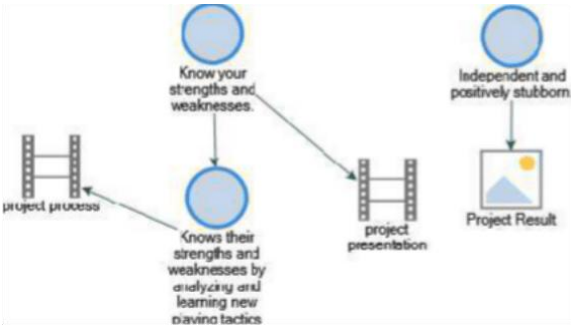
Timespan		Content
04:09-06:21	P0 :	What kind of books do you usually like to read?
	P7 :	I like reading books about the world, like atlases and sports history
	P0 :	Do you enjoy playing sports?
	P7 :	Yes, I'm currently into it and have joined the basketball club at school
	P0 :	Why did you choose basketball?
	P7 :	Because I'm trying out a new challenge
	P0 :	Besides basketball, are there any other activities you enjoy?
		I really enjoy watching football

	P7 :	Why do you enjoy watching sports shows like that?
	P0 :	Because I find them interesting to watch and analyze
	P7 :	How do you analyze them?
	P0 :	By evaluating the players' performance
	P7 :	
06:42-07:08	P0 :	What do you gain from analyzing the players?
	P7 :	I can observe new techniques, see the strategies planned on the field, and understand how they control the game's tempo
	P0 :	Can you understand all that just by watching the match?
	P7 :	Yes

The process of working on questions, presenting, and reviewing the results demonstrates the skills of Intrapersonal person in reflecting on the learning he has achieved. The results of the analysis are presented in Figure 22.

Figure 22

Mapping of intrapersonal intelligence (self smart) based on the results of working on the flat-sided geometric geometry mathematics problem



Alignment of Learning Activities with Multiple Intelligences Enhances Engagement

Findings indicate that when geometry tasks are aligned with students' dominant intelligences, their engagement increases significantly. For instance, students with kinesthetic intelligence (*body-smart*) were highly enthusiastic when asked to build 3D models using manipulatives. Conversely, verbal learners (*word-smart*) were more active when explaining geometric concepts through oral or written narratives. This demonstrates that aligning tasks with students' intelligence preferences provides comfort and facilitates better understanding.

A comparison across participants revealed different approaches and challenges. *Body-smart* students struggled when given only verbal explanations or abstract written tasks. They relied heavily on movement and hands-on experiences to understand concepts such as volume and shape. In contrast, *word-smart* students felt confused when asked to manipulate models or draw

without clear verbal guidance. These findings highlight the need for flexible teaching strategies so that all students can access the material effectively.

Visual-Spatial Intelligence Offers an Advantage in Geometry Understanding

Students with visual-spatial intelligence (*picture-smart*) demonstrated a clear advantage in understanding the structure and forms of geometric shapes. They quickly identified differences between cubes and rectangular prisms and were able to accurately depict 3D shapes. Visualization was their primary strength in completing tasks such as drawing nets or interpreting diagrams. This advantage signals the importance of providing visual media, animations, or digital simulations for these learners.

However, visual learners often lacked confidence when asked to explain concepts verbally. This suggests that despite having a strength in one area, they still require instructional support to develop other skills, such as communication and reflection.

Independent vs. Collaborative Learning Strategies Based on Intrapersonal and Interpersonal Intelligences

Self-smart (intrapersonal) students preferred working independently and reflecting on their thought processes through personal notes or learning journals. They were not verbally expressive but conveyed deep understanding through written reflections. In contrast, *people-smart* (interpersonal) students thrived in group discussions. They developed ideas more effectively through interaction and collaboration and often displayed leadership in group tasks.

These differences suggest that teachers should balance opportunities for both individual and collaborative work. Overemphasis on one format may benefit some students while disadvantaging others.

Implications for Geometry Teaching Strategies

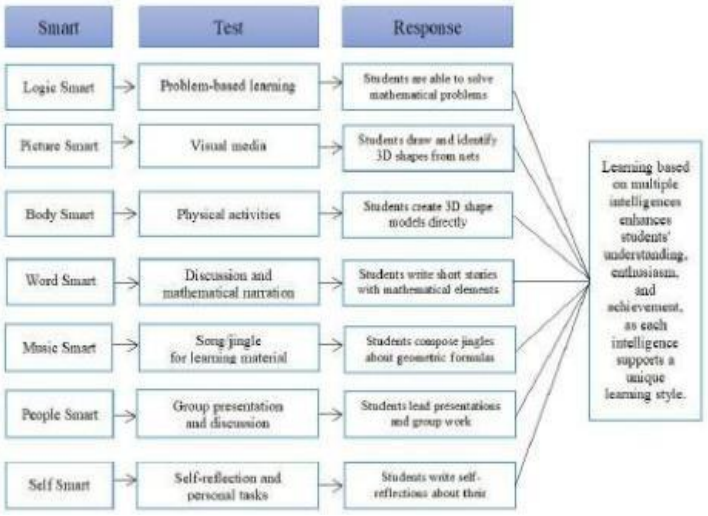
Cross-intelligence analysis revealed that no single teaching strategy is effective for all students. Each type of intelligence offers specific strengths and faces particular challenges in learning geometry. *Body-smart* students excel in hands-on construction, *word-smart* students in narrative explanations, and *picture-smart* students in visual representation. These findings reinforce the importance of differentiated instruction, where teachers combine varied activities to accommodate all intelligence types within a single lesson.

Furthermore, this approach not only enhances conceptual understanding but also boosts student motivation and confidence. Geometry learning designed with Multiple Intelligences in mind has the potential to create a more inclusive and empowering learning environment.

4. Conclusion

Based on the results and discussion, conclusions were drawn regarding the types of intelligences that emerged, which can be illustrated in the following diagram:

Figure 23
Multiple Intelligences-based learning mapping.



Based on Figure 23, this study concludes that students' learning styles in geometry are strongly influenced by their dominant intelligences. A learning approach that accommodates Multiple Intelligences provides students with opportunities to understand concepts in ways that align with their individual strengths. Geometry instruction should include model-building tasks for kinesthetic learners, narrative-based problems for verbal learners, shape visualization for visual-spatial learners, group discussions for interpersonal learners, and reflective writing or learning journals for intrapersonal learners. Therefore, it is essential for teachers to adopt an intelligence-based differentiated approach in teaching geometry to optimize the diverse learning potentials of students.

6. References

Armstrong, T. (2018). *Multiple Intelligences In The Classroom*. Basic Book.

Arum, D. P., Kusmayadi, T. A., & Pramudya, I. (2018). Students' logical-mathematical intelligence profile. *Journal of Physics: Conference Series*, *1008*(1). https://doi.org/10.1088/1742-6596/1008/1/012071

Bambang, R., Umam, K., Suhartati, Yuhasriarti, & Oktayana, S. (2024). The relationship between logical mathematical intelligence and learning independence on mathematics learning

outcomes. *Jurnal Geuthèë: Penelitian Multidisiplin*, *7*(1), 42. https://doi.org/10.52626/jg.v7i1.325

Berliana, D., & Atikah, C. (2023). Teori Multiple Intelligences Dan Implikasinya Dalam Pembelajaran. *Jurnal Citra Pendidikan*, *3*(3), 1108–1117. https://doi.org/10.38048/jcp.v3i3.963

Bracero-Malagón, J., Juárez-Ruiz de Mier, R., Reigal, R. E., Caballero-Cerbán, M., Hernández-Mendo, A., & Morales-Sánchez, V. (2022). Logical Intelligence and Mathematical Competence Are Determined by Physical Fitness in a Sample of School Children. *Frontiers in Psychology*, *13*(May), 1–7. https://doi.org/10.3389/fpsyg.2022.833844

Darwis, R. H., Mashuri, S., Tahmir, S., & Talib, A. (2024). The Relationship between Spatial and Linguistic Intelligence with Mathematical Problem Solving Abilities. *Asian Journal of Education and Social Studies*, *50*(6), 40–48. https://doi.org/10.9734/ajess/2024/v50i61392

Davidsen, A. S. (2013). Phenomenological Approaches in Psychology and Health Sciences. *Qualitative Research in Psychology*, *10*(3), 318–339. https://doi.org/10.1080/14780887.2011.608466

Gardner, H. (1993). Frames of Mind: The Theory of Multiple Intelligences. In *Basic Book*.

Gunawan, S., Syifa, M., Irianto, D. M., & Sukardi, R. R. (2023). Investigates The Implementation of Kinesthetic Intelligence-based Thematic Learning: A Case Study in Elementary School's Second-Grade. *Equator Science Journal*, *1*(1), 1–8. https://doi.org/10.61142/esj.v1i1.2

Harel, G. (2008). *What is Mathematics? A Pedagogical Answer to a Philosophical Question, Guershon Harel*. 265–290. https://doi.org/10.5948/upo9781614445050.018

Iswan, L. O. (2016). *The Relationship Between Intrapersonal Intelligence and Physical Education Learning Outcomes in Class VII Students of SMP Negeri 6 Huamual Belagang*. *7*(August), 1–23.

Klinke, M. E., & Fernandez, A. V. (2023). Taking phenomenology beyond the first-person perspective: conceptual grounding in the collection and analysis of observational evidence. *Phenomenology and the Cognitive Sciences*, *22*(1), 171–191. https://doi.org/10.1007/s11097-021-09796-1

Koster, A., & Fernandez, A. V. (2023). Investigating modes of being in the world: an introduction to Phenomenologically grounded qualitative research. *Phenomenology and the Cognitive Sciences*, *22*(1), 149–169. https://doi.org/10.1007/s11097-020-09723-w

Laila Ulfa, R. (2022). *The Role of Educators in Efforts to Improve the Kinesthetic Intelligence of Early Childhood: A Literature Review*. *1*, 20–26.

Mailili, W. M. (2016). Pengaruh Model Pembelajaran Terhadap Hasil Belajar Matematika Ditinjau Dari Gaya Kognitif Siswa. *Jurnal Matematika Dan Pembelajarannya*, *2*(1), 10. Retrieved from https://jurnal.iainambon.ac.id/index.php/INT/article/download/312/243

Michelaki, E., & Bournelli, P. (2022). Assessing the Bodily-Kinesthetic Intelligence of Pre-Schoolers. *European Journal of Physical Education and Sport Science*, *8*(5), 59–71. https://doi.org/10.46827/ejpe.v8i5.4354

Minasadiyah, P., Widiastuti, R. Y., Tyas, M. R., Masruroh, J., & Maghfirah, V. T. (2023).

Kegiatan-Kegiatan Stimulasi Multiple Intelligence Pada Anak Usia Dini. *Jurnal Buah Hati*, *10*(1), 40–52. https://doi.org/10.46244/buahhati.v10i1.2045

Petruta, G.-P. (2013). Multiple Intelligences Stimulated within the Lessons by the Practicant Students from the Faculty of Sciences. *Procedia - Social and Behavioral Sciences*, *76*, 676–680. https://doi.org/10.1016/j.sbspro.2013.04.185

Pico, I. M. S., & Bravo, K. L. M. (2024). *Visual - Spatial Learning To Enhance Teaching Vocabulary*. *24*.

Putri, F., Amelia, F., & Y, G. (2019). Hubungan Antara Gaya Belajar dan Keaktifan Belajar Matematika Terhadap Hasil Belajar Siswa. *Ejournal.Iainkerinci.Ac.Id*. Retrieved from http://ejournal.iainkerinci.ac.id/index.php/edumatika/article/view/406

Qutab, L., Raza, A., Tabbassum, R., & Zareen, S. J. (2024). An Investigation to Study the Relationship of Multiple Intelligence and Students' Learning Styles. *Pakistan Journal of Humanities and Social Sciences*, *12*(1), 178–187. https://doi.org/10.52131/pjhss.2024.v12i1.1924

Saadullah, S. M., Ammar, S., & Alazzani, A. (2024). Exploring verbal, interpersonal, and visual intelligences in accounting education: Effects on student learning and performance. *Journal of Accounting Education*, *68*(August 2023), 100917. https://doi.org/10.1016/j.jaccedu.2024.100917

Safarudin, Y. M. (2023). *Thinking Profile Of Junior High School Students In Understanding The Concept Of Quadrangles With Linguistic Intelligence , Logical-Mathematical Intelligence , And Visual-Spatial Intelligence*. *1*(November).

Safranj, J. (2016). Logical/Mathematical Intelligence in Teaching English as a Second Language. *Procedia - Social and Behavioral Sciences*, *232*, 75–82. https://doi.org/10.1016/j.sbspro.2016.10.019

Sari, W. I., & Pujiastuti, H. (2020). the Influence of Students' Learning Style Towards Students' Mathematics Knowledge. *Matematika Dan Pembelajaran*, *8*(1), 36–46. https://doi.org/10.33477/mp.v8i1.1274

Shirawia, N., Alali, R., Wardat, Y., Tashtoush, M. A., Saleh, S., & Helali, M. (2023). Logical Mathematical Intelligence and its Impact on the Academic Achievement for Pre-Service Math Teachers. *Journal of Educational and Social Research*, *13*(6), 239–254. https://doi.org/10.36941/jesr-2023-0161

Snyder, S. (1997). Developing musical intelligence: Why and How. *Early Childhood Education Journal*, *24*(3), 165–171. https://doi.org/10.1007/BF02353274

Sufianti, A. V. (2022). Hubungan Gaya Belajar Dengan Multiple Intellegences Terhadap Prestasi Peserta Didik. *Indonesian Research Journal On Education*, *2*(1), 138–145. https://doi.org/10.31004/irje.v2i1.253

Supit, D., Melianti, M., Lasut, E. M. M., & Tumbel, N. J. (2023). Gaya Belajar Visual, Auditori, Kinestetik terhadap Hasil Belajar Siswa. *Journal on Education*, *5*(3), 6994–7003. https://doi.org/10.31004/joe.v5i3.1487

Swalaiha, S. (2024). Significance of intra-personal intelligence and academic self-concept as

predictors of metacognition. *International Journal of Studies in Psychology*, *4*(1), 46–54. https://doi.org/10.38140/ijspsy.v4i1.1077

Wulandari, A. S. (2022). Literature Review: Pendekatan Berdiferensiasi Solusi Pembelajaran dalam Keberagaman. *Jurnal Pendidikan Mipa*, *12*(3), 682–689. https://doi.org/10.37630/jpm.v12i3.620