

Evaluating the Learning Style and Academic Performance of Selected Students in a Public Middle School in China Toward Performance Improvement

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ABSTRACT

This study examines student learning styles in a group of public schools in China, with a focus on identifying and understanding these learning styles. The learning style of this study is analyzed from three dimensions, visual, auditory, and tactile, to help students make progress. This study employs quantitative research methods, including statistical analysis, correlation analysis, and questionnaire-based assessments, to investigate learning styles. The research results indicate that visual, auditory, and tactile learning styles interact with one another, and students cannot rely solely on one learning style; instead, they should be influenced by all three learning styles together to enhance their academic performance. By highlighting the key points of vision, hearing, and touch, the study provides recommendations for future schooling, family education, and students themselves.

Keywords: Learning Style, Visual Learning, Auditory Learning, Tactile Learning, School Education,

CHAPTER 1

INTRODUCTION

The learning style in the article is formed quietly under the influence of the environment. For example, the family's growth environment, the school's learning atmosphere, and the social background, among others, all affect students' learning styles. Recognizing learning styles is necessary because understanding and recognizing them can improve the quality of the learning process.

Helping students find a learning program that suits them is the first step to help them improve their grades. This study aims to help students identify their learning style and also to assist teachers and

parents in finding effective ways to support students, ultimately improving their academic performance. (Lawrence et al., 2020)

Zhang et al. (2023) also noted that understanding students' learning styles is beneficial for implementing personalized teaching. The article also noted that each student's learning style is unique, and by understanding these styles, teachers can make timely adjustments to the curriculum, which significantly improves students' academic performance.

The research conducted by Oladoye and Sulyman (2022) also supports the idea that shifting pedagogical approaches can enhance children's learning in modern classrooms. Their study explores innovative teaching methods that encourage more effective learning while reducing the level of interaction between teachers and students, as well as among students themselves.

Some scholars pointed out that with the advent of the information age, online learning based on the Internet has also become one of the learning methods chosen by many learners. The influence of learning style on learners' learning effect is crucial. (Zhao et al., 2019) In fact, from another perspective, this also opens up another teaching model for educators and the educated, which not only breaks the limitation of time but also breaks the limitation of region.

Objectives of the Study

- Identify the learning styles of the selected Middle School students.
- Evaluate the impact of parents on a student's learning habits and learning style.
- Determine the effectiveness of students' learning styles in achieving good academic standing in school.

Significance of the Study

This study benefits various stakeholders in education. For parents, it helps them understand and support their children's learning styles, promoting home-school collaboration. Educators can use the results to provide personalized learning plans, enhancing student development. Students, particularly those in middle school, can benefit from discovering learning styles that match their habits, thereby improving their academic performance. School administrators can adjust campus culture and management systems to support students' individual needs.

LITERATURE REVIEW

Importance of Learning Style

Lew (2024) states that human beings, with their unique learning styles, determine the nature of their learning because each individual has a distinct personality. These specific personality characteristics, in turn, create their preferred ways of learning.

Albar (2021), students have diverse learning preferences, with a significant number being auditory learners. These learners benefit from auditory resources, but many available tools are

primarily visual. Audio podcasts offer a valuable solution for auditory learners, helping them better comprehend teaching materials. As an innovative method, audio podcasts are not only effective in enhancing learning but also efficient in terms of internet data usage. They provide an effective way for students to engage with and understand content.

This is consistent with the researcher's view that auditory learners should listen more and take notes accordingly. Others who agree with this view include Lawrence et al. (2020). Every student can be categorized based on their unique learning style, and they tend to perform best when teachers adjust their teaching methods to align with each student's preferred style.

Different learning methods are most effective depending on the task, context, and individual characteristics. It's essential to recognize your learning preferences, understand various learning approaches, and determine which ones work best for specific situations and for you personally (Tran, 2024).

Importance of Family Education

Gao (2021) constructs a Chinese local characteristic from the perspective of epistemology, political theory, and practical theory—the family education philosophy knowledge system. Shen Renhong, Director of Chongqing Normal University and Chongqing Curriculum and Teaching Research Base, introduced the four types of talents required for the construction of family education, the interdisciplinary nature of the family education knowledge system, the complexity of the family education knowledge field, and the basic carrier of talent development. (Shen, 2021)

Professor Bian Yufang, the director of the Children's Family Education Research Center at Beijing Normal University, emphasized that family education is a field that draws from multiple disciplines, with research in family education psychology serving as a critical foundation for establishing family education as a scientific discipline. She highlighted that family education psychology aims to scientifically and empirically explore the complexities of family education. (Bian, 2022). Wu (2022) states that parents can improve their children's confidence in participating in more in-depth cooperation, and homeschooling can stimulate endogenous motivation through integration, thereby building a differentiated education pattern that promotes homeschool cooperation.

Learning styles' importance in e-learning

Learning styles play a crucial role in eLearning, as recognizing and understanding them can significantly enhance the learning experience. These styles reflect individual preferences in how learners receive, process, understand, express, and retain new information (Learning Everest, 2023). Each student develops a unique approach to help them remember information more effectively during their studies. Some students may take notes, others may create diagrams, while some prefer listening to lectures or using other methods to aid their learning.

The results indicate that the use of saturated, bright, and warm colors, pictures, and anthropomorphic design in multimedia learning materials are beneficial to the cognitive process and learning effect of multimedia learning. (Yang et al., 2019).

Theoretical and Conceptual Framework

Theoretical Framework

To help parents approach family education in a more scientific and effective way, nine organizations, including the All-China Women's Federation and the Ministry of Education, collaboratively introduced the "Five-Year Plan on Guiding and Promoting Family Education (2016-2020)." This plan highlights the increasing importance of family education (Zhai, 2020). In recent years, parents have increasingly involved themselves in and invested in their children's educational development.

Before the widespread implementation of free compulsory education, variations in family educational investment were mainly evident within schools. However, as free compulsory education expanded in China and school equality progressed, the current disparities in family education investment are now primarily observed outside the school environment (Wei, 2020).

The primary factor influencing children's academic development is the time parents spend actively accompanying their children (Li & He, 2019). Mothers invest more than fathers. Especially in middle-class families, mothers provide more for their children's extracurricular education.

Students with a visual learning style were able to write down and paraphrase the given questions, although not entirely accurately. When understanding questions, students with a visual learning style needed explanations from others and then wrote them down. (Machromah et al., 2021)

Rather than leading them to grow up, it is better to say that parents grow up again. They can try to understand their children and communicate more with teachers. (Yang, 2020)

Family education is often based on blood ties, and the original family determines the quality and level of education within the family. (Gao, 2021)

This means that family education knowledge, as systematic knowledge, is self-consistent; however, it does not imply that it is a static, single structure, nor is it a closed, self-replicating system, but instead it is in an endless movement. (Gao, 2020)

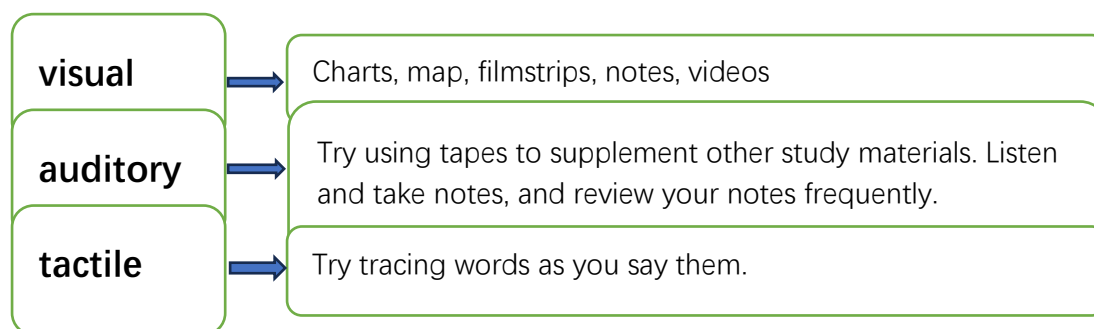
In addition, it should also be initiated by addressing students' needs for self-esteem, self-realization, security, belonging, love, and aesthetic needs, thereby systematically and comprehensively enhancing students' learning motivation. (Wang, 2020)

Students who adopt an auditory learning style are more likely to receive information during online learning (Sri et al., 2021)

Watching knowledge point animations may be helpful for learning, so students should try to find infographics or summaries related to knowledge points. (Astrid Tran, 2024).

Conceptual Framework

This study adopts the Dunn and Dunn learning style inventory model as its primary theoretical framework. This study investigates three dimensions: visual learning style, auditory learning style, and tactile learning style.



CHAPTER 3

RESEARCH METHODOLOGY

Research Design

Data was collected through a questionnaire. The questionnaire was designed to assess three dimensions of learning style: visual, auditory, and kinesthetic learning, in order to understand students' learning style preferences in detail and help them understand their learning styles. During this period, some students may discover that they possess a composite learning style, which is a combination of two or more distinct learning styles. This is also the feedback brought to students by this questionnaire.

A quantitative research design refers to the systematic plan and structure that researchers employ to conduct a study aimed at collecting and analyzing numerical data. It involves the use of quantitative methods and statistical analysis to examine relationships, patterns, or effects within a population or sample (Fleetwood, 2023).

In addition, this study employed a descriptive quantitative research approach. Descriptive research is a methodology designed to observe and document the characteristics, behaviors, or phenomena of a specific subject or group. The main goal of this approach is to offer an accurate and comprehensive depiction of the subject being studied (Siedlecki, 2020).

Population, Sample Size, and Sampling Technique

The school population of Qicheng School from kindergarten to junior high school is approximately 910 students. Based on this, the researcher drew 271 people from the 910-student population. Using Qualtrix statistics, it was determined that the study would sample 271 students. The 271 students were 18 years of age or older. The researcher organized an online survey with 271 students to know their learning styles and academic performance.

Purposive sampling is a non-probability sampling technique used to select participants or cases based on specific criteria or characteristics relevant to the research objectives. Purposive sampling involves deliberately selecting respondents with certain qualities or attributes that align with the research goals. (Dudovskiy, 2022)

Purposive sampling ensures that the chosen respondents have the necessary knowledge, expertise, or experiences to provide valuable insights or information related to the research topic. This sampling technique enables a targeted and focused approach, allowing researchers to gather data from individuals or cases that are most likely to be relevant and informative for the study (Black, 2010).

Research Locale

The research was conducted at Qichen Middle School, a public school located in Weifang City, Shandong Province. This school is located at No. 1098, Tuoshan Middle Road, Qingzhou District, and Weifang City, Shandong Province.

This school includes kindergarten, primary school, and junior high. The majority of the students in this school have been studying since kindergarten, which provides the researcher with the idea to choose the school as the subject of research.

Research Instrument

The research tool used by the researcher was a survey. Through the survey, the researcher gained insight into the learning styles and academic performance of the respondents. The researcher used Microsoft Excel to summarize the questionnaire data, ensuring the accuracy of the results.

Questionnaire surveys offer several benefits. Firstly, they are efficient, saving time, labor, and effort. Secondly, the results are easier to quantify. This method is structured, with predetermined questions, a fixed order, and predefined answer options, making it straightforward to administer. As a result, it is a user-friendly approach for gathering information.

Data Collection Procedures

The researcher used the VAT Learning Style questionnaire to survey the students. The data were unified and integrated, and a corresponding report of the results had been prepared.

The research was conducted at Qicheng Middle School, and the principal's consent was obtained prior to the commencement of the study. The research was conducted with the knowledge of the respondents to ensure that the participants would be treated ethically and respectfully.

Data Analysis

Descriptive research can be used to investigate objects in depth and a focused manner; therefore, this study was conducted by combining descriptive research with quantitative research. The questionnaire was designed in this way, allowing students to make clear choices and ensuring the validity of the data.

Therefore, the research in this paper primarily relies on quantitative and descriptive research methods, utilizing an online questionnaire. Regarding data analysis, the researcher used Microsoft Excel to collect and organize data.

Ethical considerations

The distribution of this questionnaire fully respects ethical considerations and has been approved by TUA-IERC before distribution, with approval code 2023-1st-CASE-Wang-v1. The relevant departments must approve the distribution of questionnaires. Only then can it be carried out, and the purpose and use of the questionnaire must be clearly stated so that the respondents can understand the purpose and significance of the survey. The researcher must ensure that the privacy of the research is protected.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

Therefore, this study analyzed the learning styles (visual, auditory, tactile) of 271 students and answered the following questions through a questionnaire of 271 students:

The following table is a descriptive study. Descriptive research refers to data obtained using routine test records or through special surveys.

Descriptive research will systematically collect data on learning styles and interpret and analyze the data in detail, helping students identify a suitable learning style and achieve the goal of enhancing their academic performance.

Table 1: Mean Score, Standard Deviation, and Descriptive Interpretation on the Visual Learning Styles of the Student Respondents

Statements	Mean	Interpretation	SD
1. I prefer to see information written on the board and supplemented by visual aids and assigned readings.	1.48	Often	0.60
2. I like to write things down or take notes for visual review.	1.52	Often	0.64
3. I am skillful with and enjoy developing graphs and charts	1.89	Sometimes	0.73
4. I can easily understand and follow directions on a map.	1.54	Often	0.59
5. I can understand a news article better by reading about it in the newspaper or online rather than by listening to a report about it on the radio or internet.	1.67	Often	0.69
6. I think the best way to remember something is to picture it in my mind.	1.44	Often	0.57
7. I am good at working and solving jigsaw puzzles and mazes.	1.69	Often	0.69
8. I prefer obtaining information about a fascinating subject by reading about it.	1.53	Often	0.60
Visual	1.59	Much likely	0.45

Legend:

Rating	Interval	Descriptive	
1	1.00 – 1.74	Often	Much likely
2	1.75 – 2.49	Sometimes	Likely
3	2.50-3.24	Seldom	Less Likely
4	3.25 – 4.00	Never	Not at all

Table 1 presents the assessment of the student respondents on the different characteristics of visual learners. Based on the table, students perceived that “much likely” visual learners ($m = 1.59$, $sd = 0.45$) are “sometimes” ($m = 1.89$, $sd = 0.73$) skillful with and enjoy developing graphs and charts.

They are generally skilled at solving puzzles and mazes ($m = 1.69$, $sd = 0.69$). They also tend to prefer seeing information presented on the board, along with visual aids and assigned readings ($m = 1.48$, $sd = 0.60$). Many find it helpful to take notes or write things down for visual review ($m = 1.52$, $sd = 0.64$). Additionally, they are able to easily follow directions on a map ($m = 1.54$, $sd = 0.59$) and grasp a news article more effectively by reading it online or in the newspaper rather than listening to it on the radio or internet ($m = 1.67$, $sd = 0.69$). They often believe that picturing something in their mind is the best way to remember it ($m = 1.44$, $sd = 0.57$) and prefer learning about interesting topics through reading ($m = 1.53$, $sd = 0.60$).

The researcher concluded that, consistent with Machromah et al. (2021), students with a visual learning style were able to write down and paraphrase the given questions. Learning style refers to the way students absorb, organize, and process information (Wulandari et al., 2021). When understanding questions, students with a visual learning style needed explanations from others and then wrote them down.

Yang et al. (2019) noted that multimedia teaching is more conducive to learning for visual learners. They found that various visual elements such as color, shape, and personification can stimulate students' understanding and promote academic performance. Researcher Chen (2022) focused on the application of eye-tracking technology in the field of teaching and found that different teaching material designs will also affect the learning effect of visual learners. In addition, researchers Quan et al. (2021) stated that the enabling role of visual interaction in artificial intelligence education applications can help visual learners capture learning points and improve their academic performance quickly, but it also highlights the challenges faced. Learners will rely on artificial intelligence systems and lose their ability to make subjective judgments.

Table 2: Mean Score, Standard Deviation, and Descriptive Interpretation on the Auditory Learning Styles of the Student Respondents

Statements	Mean	Interpretation	SD
1. I can remember best by listening to a lecture that includes information, explanations, and discussions.	1.69	Often	0.64
2. I require explanations of diagrams, graphs, or visual directions.	1.60	Often	0.59
3. I can tell if sounds match when presented with pairs of sounds.	1.58	Often	0.60
4. I do best in academic subjects by listening to lectures and tapes.	1.87	Sometimes	0.67
5. I learn to spell better by repeating words out loud than by writing the words on paper.	1.77	Sometimes	0.72
6. I would rather listen to a good lecture or speech than read about the same material.	1.79	Sometimes	0.69
7. I prefer listening to the news on the radio or online rather than reading about it in a newspaper or on the internet.	1.73	Often	0.68
8. I follow oral directions better than written ones.	1.70	Often	0.64
Auditory	1.72	Much likely	0.49

Legend:

Rating	Interval	Descriptives	
1	1.00 – 1.74	Often	Much likely
2	1.75 – 2.49	Sometimes	Likely
3	2.50-3.24	Seldom	Less Likely
4	3.25 – 4.00	Never	Not at all

According to the data, students perceive that auditory learners ($m = 1.72$, $sd = 0.49$) tend to perform well in academic subjects when listening to lectures and recordings ($m = 1.87$, $sd = 0.67$). Auditory learners ($m = 1.72$, $sd = 0.49$) also improve their spelling by repeating words aloud rather than writing them ($m = 1.77$, $sd = 0.72$). Additionally, auditory learners ($m = 1.72$, $sd = 0.49$) often prefer listening to a lecture or speech over reading about the same content ($m = 1.79$, $sd = 0.69$).

They are “often” ($m = 1.69$, $sd = 0.64$) can remember best by listening to a lecture that includes information, explanations and discussions. They are also “often” ($m = 1.60$, $sd = 0.59$) require explanations of diagrams, graphs, or visual directions, “often” ($m = 1.58$, $sd = 0.60$) can tell if sounds

match when presented with pairs of sounds, “often” ($m = 1.73$, $sd = 0.68$) prefer listening to the news on the radio or online rather than reading about it in a newspaper or on the internet, and “often” ($m = 1.70$, $sd = 0.64$) follow oral directions better than written ones.

This is consistent with the research of Albar and Sari (2021). Auditory learners need materials that they can hear repeatedly to cope with exams. Students with auditory and kinesthetic learning styles tend to acquire knowledge and information by listening, discussing, and observing directly (Rini et al., 2020).

Studies have shown that auditory learners are more willing to use music to enhance brain function. Musacchia & Khalil (2023). Through music training, different areas of the learner’s brain are activated, improving learners’ concentration, knowledge acquisition ability, and emotional cognition.

Researcher Han (2021) and Zhang (2023) both demonstrated that when teachers guide learners through auditory learning training, they should allow learners to experience hearing, promote hearing through feeling, and gradually deepen their understanding of music, thereby finding ways to cultivate students’ perception abilities. This type of scenario can be used to enhance the understanding of articles and facilitate students’ recitation.

Table 3: Mean Score, Standard Deviation, and Descriptive Interpretation on the Tactile Learning Styles of the Student Respondents

Statements	Mean	Interpretation	SD
1. I prefer to use posters, models, actual practice, and other activities in class.	1.59	Often	0.63
2. I enjoy working with my hands or making things.	1.55	Often	0.65
3. I can remember best by writing things down several times.	1.58	Often	0.63
4. I play with coins or keys in my pocket.	1.78	Sometimes	0.73
5. I chew gum, smoke, or snack while studying.	2.06	Sometimes	0.8
6. I learn the spelling of words by “finger spelling” them.	1.79	Sometimes	0.73
7. I grip objects in my hands during learning periods.	1.85	Sometimes	0.73
8. I feel very comfortable touching others, such as hugging and handshaking.	1.81	Sometimes	0.76
Tactile	1.75	Likely	0.51

Legend:

Rating	Interval	Descriptives	
1	1.00 – 1.74	Often	Much likely
2	1.75 – 2.49	Sometimes	Likely
3	2.50-3.24	Seldom	Less Likely
4	3.25 – 4.00	Never	Not at all

The table indicates that students generally perceive tactile learners ($m = 1.75$, $sd = 0.51$) as sometimes likely ($m = 1.78$, $sd = 0.73$) to fidget with small objects like coins or keys in their pockets. They are also reported to sometimes ($m = 2.06$, $sd = 0.80$) chew gum, snack, or even smoke while studying. Additionally, tactile learners may occasionally ($m = 1.79$, $sd = 0.73$) use “finger spelling” as a method to remember how to spell words. They also tend to sometimes ($m = 1.85$, $sd = 0.73$) hold or grip objects during learning activities, and they are sometimes ($m = 1.81$, $sd = 0.76$) comfortable with physical gestures like hugging or handshakes during interactions.

They frequently ($m = 1.59$, $sd = 0.63$) prefer using posters, models, or hands-on activities during class. They also often ($m = 1.55$, $sd = 0.65$) enjoy working with their hands or creating things and tend to remember information best ($m = 1.58$, $sd = 0.63$) by writing it down multiple times.

Table 4: Summary of the Performance of the Students in SY 2018-2019 Utilizing a Particular Learning Style

Learning Styles	Performance Grade	Descriptive
Visual	87.13	Very Good
Auditory	84.92	Good
Tactile	83.41	Good
Auditory and Tactile	78	Good
Visual and Auditory	84.44	Good
Visual and Tactile	75.43	Good
Visual-Auditory-Tactile	99.73	Very Good

Legend:

Scores	Descriptives
0-47	Poor
48-65	Fair
66-84	Good
85-100	Very Good
101-120	Excellent

Based on the table, students who utilize more than one learning style perform better than those who use only one learning style. It was visible in the table that a visual learner performed very well, with a performance grade of 87.13. Also indicated in the table is that a student who uses three learnings performs best compared to one, with a performance grade of 99.73%

Table 5: Test for Significant Relationship between Learning Styles to Student Performance

Learning Styles	Performance			
	r	p- value	Decision	Conclusion
Visual	0.846	<.001	Reject Ho	Significant
Auditory	0.808	<.001	Reject Ho	Significant
Tactile	0.854	<.001	Reject Ho	Significant

Table 5 revealed a significant relationship between the use of learning styles and the academic performance of the students. It was found to be highly correlated, with a value of $r > 0.8$ and a p-value less than 0.05%.

Table 6: Learning Guidance Program

KEY RESULT AREAS	OBJECTIVES	STRATEGIES	POINT PERSON	SUCCESS INDICATOR
Curriculum design and instructional method	To provide an engaging and individualized methodology that can tailor fit the needs of the students with different learning styles	For visual learners, incorporate diagrams/videos/written instructions For auditory learners to use lectures/discussions/audio recordings and oral instructions For tactile learners to provide touch-based activities; to use models and physical activities with learning materials	Dept head/program coordinator/ teacher	Engage students with good academic performance
Assessment and feedback	To develop an assessment method that allows students to demonstrate knowledge in multiple ways	1. visual learners: Provide written test, 2. auditory learners: oral presentations, 3. Tactile learners: practical demonstrations and projects	Dept head/program coordinator/ teacher	Students can achieve high scores and produce quality outputs, presentations, and projects.
Teacher training	To train teachers to recognize and understand different learning styles and address these teaching strategies	Attend seminars and training related to teaching methodologies and assessment.	Dept head/program coordinator/ teacher	Able to create differentiation learning styles

CHAPTER 5

CONCLUSIONS AND FUTURE WORK

Conclusions

This study aims to investigate the characteristics of auditory, visual, and tactile learning styles, enabling students to understand their own learning styles and helping educators identify the learning styles that best suit students, thereby making adjustments in teaching and providing personalized guidance.

The researchers found that students were not unique in their preference for visual, auditory, or tactile learning, but those who chose a combination of these elements, including visual, auditory, and tactile learning, had the best grades. Some students chose a single learning style, while others chose two or more learning styles. Therefore, the researcher found that everyone has their learning preferences, and students may have multiple learning styles. The data demonstrate that multiple learning styles are effective in enhancing academic performance.

The most prominent feature of visual learning is that students are skilled at and enjoy drawing and creating charts. The visual learning style enables students to write down and explain the given problem, but it is still incomplete. When understanding the problem, students with a visual learning style need explanations from others and then write them down. Students with a visual learning style excel at using images to understand problems and possess intense observation and imagination.

Future Work

Auditory learners prefer to fill in the gaps in their notes by listening to lectures, tapes, or other audio materials and then reviewing the material by reading it aloud and discussing it with classmates after learning. Auditory learners possess strong listening skills and excel at receiving information through auditory means. However, even if the appropriate method is auditory, researchers still recommend taking more notes to help better consolidate knowledge.

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