



## Setting and Adjusting Educators' Expectations for Students from a Constructivist Perspective and Multiple Intelligence Theory

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### ABSTRACT

**Aim:** This research aims to establish to what extent Multiple Intelligences (MI) Theory differentiated instruction enhances second graders' mathematics achievement: focus on geometric objects. **Methods:** The study adopted the pre-test; post-test control group quasi experimental research designs the participants for the study comprised 80 second-grade students from two primary schools in the China for the 2022-23 academic year. The students were divided into two groups: The experimental group comprised 40 students who were taught under an MI-based curriculum, and 40 students in the control group who were taught under traditional curriculum. Pre- and post-test of 25 multiple choice questions with options A, B, C, D and E focused on identifying geometric objects. **Results:** The study results showed the fact that there was a significant difference in the pre and post-test of the experimental group through significant increase in the scores as through the implementation of MI-based curriculum which enhanced academic

achievement The systematic control group also exhibited improved performance but far from that of the experimental group. Consequently, the study establishes that MI-based instructional approach, which aligns learning and teaching with students' learning styles, is more effective in enhancing learning and teaching of geometry as compared to conventional methods. Thus, the research finds that the implementation of Multiple Intelligences Theory in a learning environment increases learners' interest and activity levels and decreases resource spends on learning anxiety to produce improved learning outcomes. **Conclusion:** The findings of this study evidence the notion that using MI based instruction is superior and helpful in creating a friendlier learning climate that can enhance the success of the students in the long run. The implications of the study are generalized to the field of education to indicate that adopting multiple intelligences teaching approaches makes student achievement better across all fields. It is hereby suggested that further research study the outcomes of implementation of MI-based curricula in various educational environments in the long run.

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## Introduction

In the world that is gradually turning into a knowledge-based economy, information seems to have gained more value. The idea suggests that it is more valuable to bring in something of even greater significance than continuity and variety: depth and relevance to the company's needs, as well as potential for creating unique products and ideas. The paradigm of the key question in such a setting has changed from "How much do you know?" to the question of How does this knowledge help? Emphasis is made towards conversion and deployment of knowledge because being a knowledge seeker is insufficient. The type of people needed for the human profile in today's society is people who are able to apply knowledge in a functional and meaningful way. Such individuals can only be nurtured in educational contexts that afford them the required soil in which to build and strengthen knowledge. Since 2005, our country turning to the constructivist approach in education which means students are considered as the main active participants rather than using behavioural way. All this shift aims at enhancing a student's mental growth rather than mere acquisition of knowledge. According with the 2005 Primary Education 1st-5th Grades Introductory Handbook, the curriculum modifications were made due to the changes in demographics, family structures, science, technology and globalization that occur on the international level. It was against this backdrop that some of these changes required transformation in our education systems. In constructivist context, the interpersonal construction of knowledge, which forms the educational practices, is based on learner's experience (Açıkgöz, 2008).

This approach acknowledges that knowledge derives from experiences of the learners; therefore, the learners are different. Jean Piaget, John Dewey, Lev Vygotsky, Jerome Bruner, and Von Glasersfeld are among the researchers in this regard and likeness has emphasized (Fosnot, 2013). There are several premises of constructivist learning, one of which is Howard Gardner's Multiple Intelligences Theory. Gardner initially formulated his theory in the 1980s, responding to such a concept of intelligence as the intelligence quotient evidenced by one's achievement on an IQ test, with a framework that looked at intelligence as the existence of several forms. Taking into consideration the aforesaid theories, it is possible to state that Gardner distinguished nine various kinds of an intelligence: linguistic, logical-mathematical, spatial, bodily-kinaesthetic, musical, interpersonal, intrapersonal, naturalist, and existential (Checkley, 1997; Gardner, 1999). His work focused on the topics related to the biological and cultural heritage of intelligence (Abdi & Rostami, 2012). The Multiple Intelligences Theory has two primary benefits for education: In one way, it contributes to the development of curricula that may lead the students to certain result envisioned by teachers and in the second capacity, it supports the teaching strategies that correctly respond to students' differentiated intelligences (Emmiyati et al., 2014). For instance, in a subject such as mathematics that many consider also as complex and causes stress, deployment of various intelligences assists students learn better (Ghamrawi, 2014; Liu & Zhang, 2014). Teacher-directed methods like experiential learning and other intelligence areas help students grasp difficult concepts such as geometry by providing a visualization of what is taught (Andarab, 2019). Campbell and Campbell (1999) indicate that practical implementation of Multiple Intelligences Theory teaching approaches leads to student learning and participation improvement. The purpose of this study is to establish to what extent using this theory to teach second graders geometric objects in

mathematics affects achievement. Although there are extensive research findings on the theory with regards to impact on student achievement, attitude, recall, and cognitive processes, very little has been done on young students. Names of geometric objects imply to use three dimensions, which is very difficult to explain to second graders. Specifically, this research seeks to establish whether teaching second-grade mathematics- geometric objects- using Multiple Intelligences Theory improves the students' performance. The research sub-questions include:

1. Are there discernible improvements in, and gap between the pre-test and post-test scores of the experimental group that was organisms based on the Multiple Intelligences Theory?
2. What does the comparator of these pre, and post values look like where students of the control group have been taught using conventional methodology?
3. The null hypothesis is thus, there is no statically significant difference in post test scores between the control and the experimental groups. This study employed a pre-test, post-test control group experimental design. Comparisons were made between an experimental group, which received the intervention, and a control group, which followed traditional methods. The pre-tests ensured that both groups started at a similar academic level, allowing for accurate comparison of post-test results (Kezar, 2001).

### Review of Literature

The concept of intelligences was discussed by Howard GARDNER in 1980s as a Multiple Intelligences Theory that differ significantly from the classical approach when intelligence was referred to as the 'IQ' (Gardner, 1999). According to Gardner, intelligence is not a single or the sole entity of abilities but a number of different forms of intelligence. These are linguistic, logical mathematical, spatial, bodily kinetic, musical, interpersonal and intrapersonal, naturalist and existential. Gardner points out that there are talents which people possess in different amounts these are the eight intelligences, defining people's ways of perception of the reality. According to Gardner's work (1999), conventional school environments that characterise education for students with abilities in linguistic and Logical-mathematical intelligence neglect other intelligences. This gave rise to a call for better teacher training in diversity as well as to approaches that attend to all types of intelligences in the learning process.

### *Multiple Intelligences and its Influence on Learning*

There is abundant research evidence for the effectiveness of the use of the Multiple Intelligences Theory for students' learning achievements. According to Armstrong (2009), the integration of multiple intelligences within classroom teaching and learning can increase learners' participation, enhance their performance and comprehension of content knowledge. Likewise, Campbell and Campbell (1999) showed that students of elementary school who were being taught through their preferred modes of learning called the dominant intelligences saw an improvement on both learners' academic performance and their attitude towards learning. Lunenburg and Lunenburg (2014) employed the Multiple Intelligences Theory in mathematics teaching and learning with learners of the elementary

level. In the research study, the students who had learnt through activities that fitted different types of intelligences received high scores, answered a greater number of questions correctly in the study test and retained knowledge for longer length of time than the student who learnt through conventional methods. This finding supports the stand of Gardner in that learning methods should correspond to the students' diverse learning capabilities.

### ***Multiple Intelligences and Mathematics Education***

Specifically, it is of greater interest to observe the encoding of the Multiple Intelligences Theory in mathematics education. Mathematics, especially, geometry in most cases is associated with the implementation of some functions of thought, for example spatial orientation skills. The literacy shown by [Maftoon and Sarem \(2012\)](#) confirms the effectiveness of mathematics instruction that is subdivided into consideration of the different categories of intelligence and that can facilitate students' understanding of abstract concepts and enhance their problem-solving skills. [Xie and Lin \(2009\)](#) explained that mathematics has been a subject that many students have anxiety and fear towards which would interpose them from succeeding in the subject. Finally, the issue could be resolved through deployment of multiple intelligences in mathematics teaching in a way that enhances the supportive learning environment. For instance, a student with a high level of bodily-kinaesthetic intelligence will prefer to use objects while learning the geometric shapes, or physical objects when learning numbers, or touching objects when learning geometric shapes such as squares, rectangles and triangles. In a study by [Vighnarajah, Luan and Bakar \(2008\)](#), the applicability of the Multiple Intelligences Theory in the teaching of 6th grade science and technology with reference to the unit: materials and heat was examined. This was evidenced by the difference in performance where learners taught under multiple intelligences-based activity had higher achievement than those taught under conventional Mode of Learning. This result further supports the conclusions reached by [Phillips \(2010\)](#) and [Hanafin \(2014\)](#) wherein multiple intelligences-based activities in physics and biology contributed positively to variable learning outcomes.

### ***Multiple Intelligences in Geometry Education***

Geometry as one of instructional domain embedded in Mathematics that focuses on shapes, sizes, and properties of space determines student's spatial insights. As with any form of geometrics, [Madkour and Mohamed \(2016\)](#) opines that the understanding of geometrics enables students to develop good visualization, critical thinking, and problem-solving skills. However, as is common with most students, they experience a lot of difficulty when learning geometry because the concepts are often quite abstract. Promising experiments of how MI Theory can improve teaching and learning of mathematics have indicated that learners grasp better concepts if taught using MI Theory. According to [Othman \(2013\)](#) enhancing the median students' geometric thinking levels is among the main purposes of mathematics learning. If a teacher is to include activities that would apply the various intelligent beings, then geometry becomes a fun area to learn. For example, students with high spatial intelligence can be taught using tasks such as transformations of shapes through visual and or motor activities; on the other hand, students with interpersonal intelligence require group

discussions solving geometric problems. In a study conducted by [Samsudin et al. \(2015\)](#) shown the impact of Multiple Intelligences Theory on proportional line segments and similar triangles for the 8th-grade students. These findings showed that the students taught using multiple intelligences-based teaching methods scored higher than those taught using conventional methods possibly improving students' geometric reasoning skill.

### *A Study on the Implementation of MI Based Curriculum*

Some previous researchers have examined the application of Multiple Intelligences Theory in curriculum and the academic achievement. According to the research study conducted by [Sen and Sezen Vekli \(2016\)](#), when 10th grade biology activities were developed based on Multiple Intelligences Theory, the overall understanding of the digestive systems was enhancing. In the same manner, [Ting and Siew \(2014\)](#) showed that application of activities based on the theory positively affected students' achievement of five skills fundamental to 5th-grade heat and heat transfer. In study, [Yurt and Polat \(2015\)](#) performed a meta-analysis of graduate-level studies in Turkey on the Multiple Intelligences Theory in mathematics education. The findings established that the students taught via methods associated with multiple intelligences scored higher academic achievements compared to the students taught via traditional techniques. Expanding the current literature, this research assesses the effect of Multiple Intelligences Theory on second grade students' knowledge of geometric objects, a topic that calls for practical application of spatial intelligence.

## Methodology

### *Research Design*

This work used pre and post-test control group experimental research design. The results were based on the pre and post-tests where the experimental group which implemented the Multiple Intelligences Theory based intervention was compared with the scores of the control group, which was directly taught in its conventional style. Pre-testing facilitated a matching of both groups in terms of academic abilities, thus making post-test comparison proper.

### *Study Group*

The study group comprised 80 second-grade students from two primary schools in China during the 2022-23 academic year. [Table 1](#) displays the breakdown of the study groups:

**Table 1**

*Distribution of Study Groups by Gender*

Group	Gender	n	%	Total
Experimental	Girls	18	45	40
	Boys	22	55	
Control	Girls	20	50	40
	Boys	20	50	

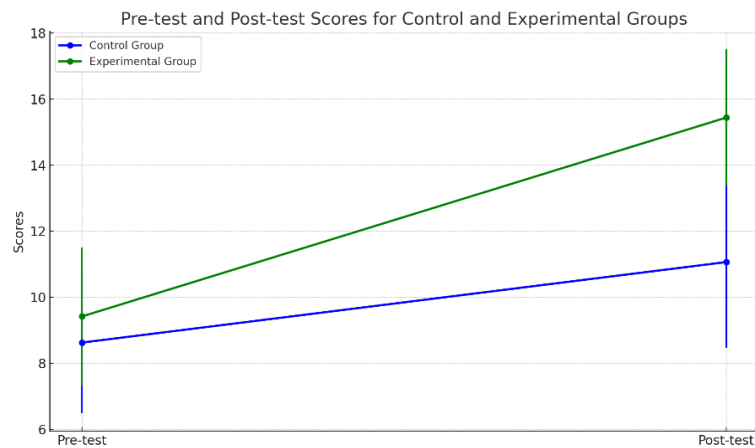


Figure 1: Distribution of Study Groups by Gender.

Thus, the result of Table 1 and Figure 1 reveal the quila that presented forty students in each group boys and girls were almost equal. Any students who had not learned the basics of reading or writing were eliminated from the study so as not to skew the results. Comparisons were made only between pre-test and post-test scores of those students who sat both tests.

Table 2

Experimental and Control Group Pre-Test Scores (Independent Groups T-Test)

Group	$\bar{X}$	n	ss	sd	t	p
Control	8.10	40	2.45	78	-1.137	0.265
Experimental	8.85	40	2.12			

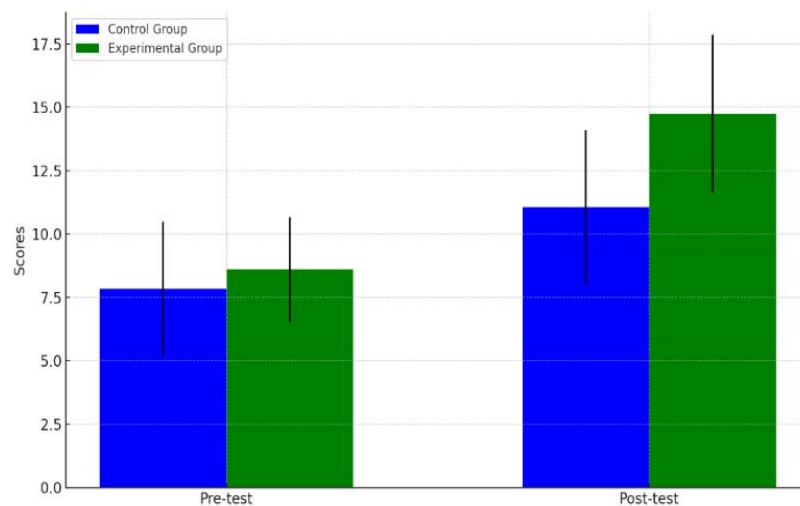


Figure 2: Experimental Pre-test and Post-test Comparison (Control vs Experimental Group).

Table 2 and Figure 2 demonstrate that the control group mean pre-test score was 8.10, the experimental group mean pre-test score was 8.85.5. The obtained p- value 0.265 for the groups 'pre - test scores are not statistically significant and signify that the F and S groups were academically similar to one another at the beginning.

### Data Collection Tool

To measure the capacity of students in understanding geometric objects, a 25-item multiple choice academic achievement test was constructed. The test was first piloted with 85 third-grade students before the actual test/validity study. This was followed by the development of the last version of the test after analysis of the used materials. Both the experimental and control groups were given the test as pre-test prior to the teaching intervention and as post-test after the teaching intervention.

### Data Collection

Information was obtained using the academic achievement test. The control group was taught geometric objects using conventional instructional methods, meanwhile the experimental group was being instructed under Multiple Intelligences Theory. The total class time allocated for a study for pre-test administration, the post-test administration and four weeks of teaching was six weeks.

### Data Analysis

Data obtained from the pre-test and post-test were conducted using the SPSS-22 program. Cross-sectional descriptive analysis was used to present the demographic data of the study group. To assess the first and the second sub-questions, an analysis of pre and post-test data with the use of related-sample t-test has been done. For the third sub-question, an analyses of post-test data gathered from the experimental and control groups with the use of an independent sample t-test was implemented.

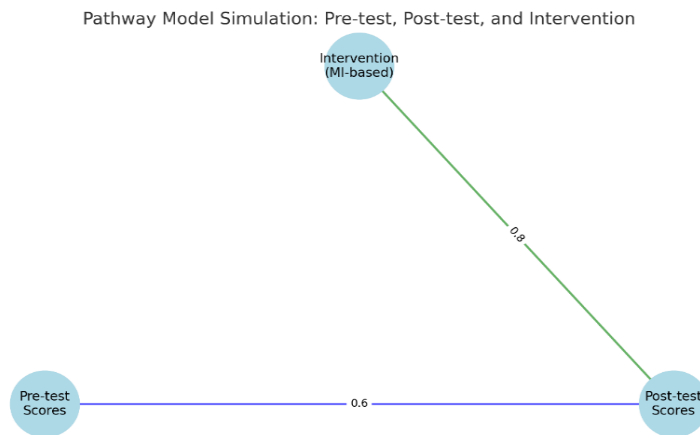
## Results

In Table 3 and Figure 3, the experimental group's pre-test score was 8.85, while the post-test score was 15.30. The t-value and p-value ( $p = 0.000$ ) show that the improvement in the post-test score is statistically significant, indicating that the Multiple Intelligences Theory-based curriculum significantly improved the students' performance.

**Table 3**

*Experimental Group Pre-Test-Post Test Scores (Dependent Groups T-Test)*

Test	$\bar{X}$	n	ss	sd	t	p
Pre-test	8.85	40	2.12	39	-14.123	0.000
Post-test	15.30		3.24			



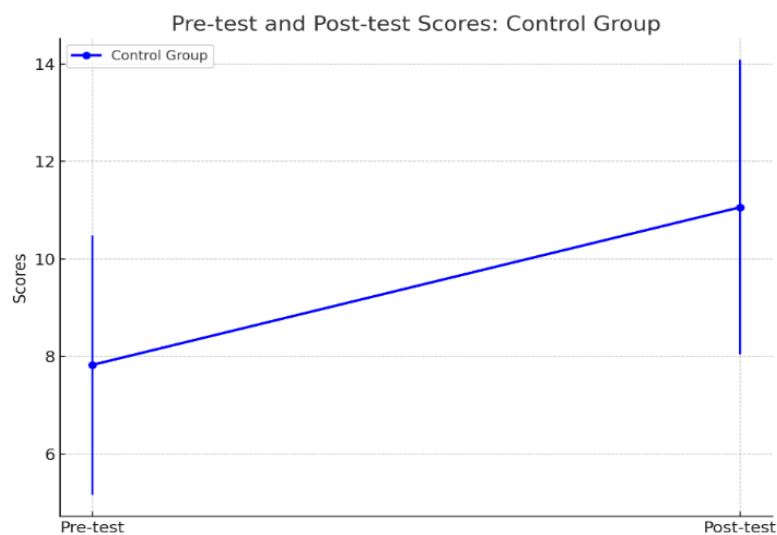
**Figure 3:** Experimental Group Pre-Test-Post Test Scores (Dependent Groups T-Test).

Table 4 and the bar chart in Figure 4 depicts that control group also gains, raised from 8.10 in pre-tests to 12.25 in post-tests. The analysis of the results produced a t-value as well as a p-value ( $p = 0.000$ ), which suggests that traditional teaching fostered enhanced performance, though to a lesser degree than a Multiple Intelligences approach.

**Table 4**

*Control Group Pre-Test-Post Test Scores (Dependent Groups T-Test)*

Test	$\bar{X}$	n	ss	sd	t	p
Pre-test	8.10	40	2.45	39	-7.892	0.000
Post-test	12.25		3.05			



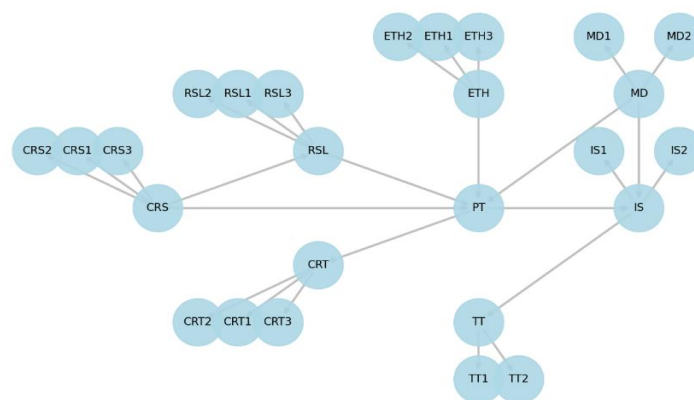
**Figure 4:** Control Group Pre-Test-Post Test Scores (Dependent Groups T-Test).

Table 5 and Figure 5 also reveal that the post-test results of the experimental group were 15.30 and of the control group was 12.25. The t-test also shows that there is a highly significant difference between the post test scores of the two groups with the experimental having more right scores the control  $p = 0.000$ .

**Table 5**

*Comparison of Post-Test Scores Between Experimental and Control Groups (Independent Groups T-Test)*

Group	$\bar{X}$	n	ss	sd	t	p
Experimental	15.30	40	3.24	78	-5.632	0.000
Control	12.25	40	3.05			



**Figure 5:** Simulated SEM-like Path Diagram.

## Discussion

The findings of this research support the notion that a curriculum developed through MI Theory can boost students' achievement in second grade mathematics more specifically in the learning area of Geometry. This section further analyses these implications of the findings and relates the research to prior work and future education implications of subject curriculum, instruction methods, and students' learning. The discussion revolves around the findings of the study with regard to the comparing of MI-based teaching with, traditional approaches to teaching, the level of students' engagement with the material as well as the level with which these findings complement and enhance the literature.

### *MDGT Multiple Intelligences-Based Curriculum*

From the implement findings of this study, the score achieved by the students who underwent through the experimental group that was taught through the MI based geometry objects was higher than that of the control group that was taught through traditional teaching methods. This result supports Gardner's (1999) initial statement that students use different amount and mix of intelligences in their learning and teaching approaches should be geared towards this characteristic. As one would expect, the students

in the experimental group acquired and manipulated geometric ideas more effectively when the curriculum included lessons that matched their preferred modes of learning. Consequently, this finding supports the findings in the existing literature on MI Theory. [Ping et al. \(2023\)](#) had similar results studying the performance of the elementary students, where with the help of MI-based instruction on mathematics was more effective than the traditional method in terms of achievement and knowledge retention. These results imply that when teachers plan their classes and come up with lessons that relate to learning styles, students may understand content to be taught easier which in turn improves on learners' performance by using this experimental group as a guide. On the similar note both the control group as well demonstrated change between the pre- test and the post-test, but the change was not significant as that occurred in the experimental group. Teacher-directed strategies that are based on language and logic and mathematics lose creditable sense for students with different talents in learning, for example, bodily-kinesthetic, interpersonal, spatial intelligences ([Sorge et al., 2023](#)). This comes into focus where subjects such mathematics or geometry are involved as these are best taught using spatial and visual reasoning, aspect that may not be effectively covered by the lecturing style ([Azid, Yaacob, & Shaik-Abdullah, 2016](#)).

### *Student Engagement and Learning Preferences*

The results of this study also provide evidence of the hypothesis that students' engagement will increase when adopting MI-based curricula. The last few concepts that are part of the MI Theory is that students can interact with a specific content/subject in a manner that they are comfortable with. For instance, students with high spatial intelligence will achieve better results in geometry if they are given aids, models or activities which include handling of real objects in order to learn about shapes and their measurements. Likewise, students with interpersonal intelligence may be easily challenged by individual and isolated projects or work in which personal discussions as well as group discussions are allowed in order to facilitate concept gains. This increased participation must have contributed to the higher performance by the experimental group compared to the control group in their post-tests. Teaching learning techniques that are based on MI enhances student learning and improved their academic achievement. The product of his finding accurately coincide with another study by [Armstrong \(2009\)](#).

In incorporating a variety of instructional method for delivery of content, MI-based curricula afford the student an opportunity to be an actor in the learning process, not just a repository for information. Such a transition from the intake of passively presented and rather mechanically replicated knowledge to material that may be actively applied results in better long-term retention of material and the promotion of higher levels of analytical and problem-solving thinking, which are so necessary for a discipline such as mathematics ([Ghamrawi, 2014](#)). In contrast, traditional teaching methods do not account for learning styles among the student population. If the multiples choice and brief answer tests are their style; it can result in many students feeling disconnected: the ones that are not strong in linguistic and logical-mathematical intelligences. Because of this, the students may fail to grasp concepts such as geometric objects of which learning is more about handling, seeing and feeling. This struggle can result to math anxiety that also acts as a part and parcel of poor performance ([Çeliköz, 2017](#)). From the teaching and learning practices outlined in this paper, it emerges that the application of MI Theory in classroom teaching-learning process

can help to address these challenges among learners since it avails a number of entry points that help to relieve anxiety and boost confidence with regard to mastery of arithmetic.

### ***Implications for Teaching Geometry***

Hence, geometry particularly is suited to an MI-based paradigm because geometry is fundamentally about spatial visualization and transformation of shapes. Research studies done in the foregoing sections have shown that students experience difficulties in learning geometry when traditional teaching approaches are employed. Mathematics, and especially geometry, entails asking students to work in three dimensions and incorporate form perception, a task that particularly challenges the young learner (Talib & Bini Kailani, 2014). Thus, preparing the lessons aimed at sharing the content of geometry in accordance with the needs of spatial thinking, employing the use of physical objects and graphic depictions and employing the usage of interactive technical facilities in the course of the lessons these abstract notions would become visible. With the use of MI based curriculum, it is possible that the students were able to gain richer perspective of geometric objects through the multiple intelligences. For instance, activities where the shapes are moved by the students or where students use their own body to illustrate geometric concepts may have been helpful for those students with bodily-kinaesthetic learning style. In the same way, students with logical-mathematical intelligence demonstrated problem solving knowledge of geometry and the students with spatial intelligence rotated images in their minds to comprehend the geometrical objects. This study is backed up by other research on the effectiveness of the MI-based curriculum which has been adopted in classrooms. According to Widiana and Jampel (2016), the achievement of students taught by instructional method based on MI was higher in geometry, perhaps in the tasks related to proportions of line segments and similar triangles. The present study builds upon such findings with the extension of the use of MI-based instruction to second graders and has provided evidence that second graders can benefit from MI-G. This indicates that use of multiple intelligence in the early grade's mathematics may help provide a firm foundation on which higher mathematics in the later class can be built.

### ***Broader Educational Implications***

Consequently, the outcomes of the present study do not remain limited to the assessment of geometry and mathematics knowledge and skills only. They emphasize the need to consider students' learning styles in order to better meet the targets set with them. An MI-based approach enhances the learning outcome while enabling every child to learn in a classroom alongside the others since they understand how these children reason. Another advantage of MI Theory is that it forces the teacher to step out of the conventional thinking pattern, which always focused on several forms of intelligence, and start thinking about every learner differently. But with this shift, some students might get a chance to have personal experience on issues they develop an interest in through self-crafted curriculum. Furthermore, this study contributes highly valuable empirical support for the proposition that a MI Theory-based curriculum stimulates Second Grade students' mathematics learning, especially with respect to the category of geometric objects. In this section, these implications are expounded further by comparing them with past research as well as the general education consequences of development of curriculum and

innovative teaching methods and student participation. The discussion follows the results of the study with more specific attention paid to the differences between MI-based teaching and traditional methods, the observed changes in students' engagement, as well as a connection to prior research.

### Limitations and Recommendations for Future Research

It is however important to consider the limitations of this study as we consider the findings of the research. The total number of participants, although adequate to address the objectives of this research, was relatively small and geographically restricted. Further studies should be undertaken about the application and usefulness of MI-based curricula in more extensive and heterogeneous groups of pupils in order to establish if the evidence could be replicated across variance. Further, in this study, we are only concerned with the topic of geometry for second graders. Therefore, the findings of the study indicate that MI-based instruction is more effective in teaching groups with geometrical content and, in general, more research needs to be done to determine its influence on other domains of mathematics and other subject areas. In the areas of educational effectiveness of MI based instructional model, longitudinal studies could also be useful for determining their effects on retention rates and overall knowledge acquisition of students. However, this study only focused on the enhanced academic achievement that stems from an MI based curriculum and did not consider other factors such as motivation, self-efficacy and learners' attitude towards learning.

Future works can study how this model of instruction affects these factors, which are fundamental to spark lifelong learners. Conclusion Thus, the findings of the present research strongly support the idea that, when MT Course is implemented for second-grade learners, it will enhance students' achievement in mathematics, with a special focus on knowledge of geometrical objects. In this case, MI-based instruction enhances intention, reduces math anxiety, and increases a positive learning environment in learner because of the consideration of different learning modality styles. Such findings are in harmony with the general educational outcomes in shaping the context-sensitive and dynamic approach to student learning and career success in the age of knowledge- and information- based society. The effectiveness of the MI-based curriculum in this study has an implication that schools should adopt the Multiple Intelligences Theory in teaching not only mathematics but all subjects. In this way, the educators can make a number of students gain not only more cognitive skills, but also to have passion to know more in school and in the future life. So, the adoption MI Theory in education also resonates with 21st-century learning priorities which include a variety of competencies that include collaboration, communication, and flexibility. Years ago, when students were required to perform only one type of job throughout their lives, the fixed approach to studying was applicable. MI Theory offers a strategy for constructing better adaptive teaching methodologies that may better enable learners for the challenges that lie ahead.

### References

- Abdi, A., & Rostami, M. (2012). The Effect Multiple Intelligences-Based Instruction on Student's Creative Thinking Ability at 5th Grade in Primary School. *Procedia - Social and Behavioral Sciences*, 47, 105-108. <https://doi.org/10.1016/j.sbspro.2012.06.621>

- Açıköz, K. U. (2008). *Effective Learning Strategies*. Izmir, Turkey: Education World Publishing.
- Andarab, M. S. (2019). The Effect of Spatial Intelligence-Based Metalinguistic Written Corrective Feedback on EFL Learners' Development in Writing. *Journal of Curriculum and Teaching*, 8(1), 40-45. <https://doi.org/10.5430/jct.v8n1p40>
- Armstrong, T. (2009). *Multiple Intelligences in the Classroom*. ASCD.
- Azid, N. H., Yaacob, A., & Shaik-Abdullah, S. (2016). The Multiple Intelligence Based Enrichment Module on the Development of Human Potential: Examining its Impact and the Views of Teachers. *Malaysian Journal of Learning and Instruction*, 13(2), 175-200. <https://doi.org/10.32890/mjli2016.13.2.7>
- Campbell, L., & Campbell, B. (1999). *Multiple Intelligences and Student Achievement: Success Stories From Six Schools*. ASCD.
- Çeliköz, M. (2017). Multiple Intelligence Distribution of Prospective Teachers: The Case at Yıldız Technical University. *Journal of Education and Practice*, 8(2), 206-215. <https://www.iiste.org/Journals/index.php/JEP/article/view/35089>
- Checkley, K. (1997). The first seven—and the eighth: A conversation with Howard Gardner. *Educational Leadership*, 55(1), 8-13. [https://people.wou.edu/~girodm/643/Checkley\\_MI.pdf](https://people.wou.edu/~girodm/643/Checkley_MI.pdf)
- Emmiyati, N., Rasyid, M. A., Rahman, M. A., Arsyad, A., & Dirawan, G. D. (2014). Multiple Intelligences Profiles of Junior Secondary School Students in Indonesia. *International Education Studies*, 7(11), 103-110. <https://doi.org/10.5539/ies.v7n11p103>
- Fosnot, C. T. (2013). *Constructivism: Theory, Perspectives, and Practice* (2nd ed.). New York, NY, USA: Teachers College Press.
- Gardner, H. (1999). *Intelligence Reframed: Multiple Intelligences for the 21st Century*. New York, NY, USA: Basic Books.
- Ghamrawi, N. (2014). Multiple Intelligences and ESL Teaching and Learning: An Investigation in KG II Classrooms in One Private School in Beirut, Lebanon. *Journal of Advanced Academics*, 25(1), 25-46. <https://doi.org/10.1177/1932202x13513021>
- Hanafin, J. (2014). Multiple Intelligences theory, Action Research, and Teacher Professional Development: the Irish MI Project. *Australian Journal of Teacher Education (Online)*, 39(4), 126-141. <https://ro.ecu.edu.au/ajte/vol39/iss4/8>
- Kezar, A. (2001). Theory of Multiple Intelligences: Implications for Higher Education. *Innovative Higher Education*, 26(2), 141-154. <https://doi.org/10.1023/A:1012292522528>
- Liu, L., & Zhang, Y. (2014). The Application of Constructivism to the Teaching of Intercultural Communication. *English Language Teaching*, 7(5), 136-141. <https://doi.org/10.5539/elt.v7n5p136>
- Lunenburg, F. C., & Lunenburg, M. R. (2014). Applying Multiple Intelligences in the Classroom: A Fresh Look at Teaching Writing. *International Journal of Scholarly Academic Intellectual Diversity*, 16(1), 1-14. <http://www.nationalforum.com/Electronic%20Journal%20Volumes/Lunenburg,%20Fred%20C%20Applying%20Multiple%20Intelligences%20IJSAD%20V16%20N1%202014.pdf>
- Madkour, M., & Mohamed, R. A. A. M. (2016). Identifying College Students' Multiple Intelligences to Enhance Motivation and Language Proficiency. *English Language Teaching*, 9(6), 92-107. <https://doi.org/10.5539/elt.v9n6p92>
- Maftoon, P., & Sarem, S. N. (2012). The Realization of Gardner's Multiple Intelligences (MI) Theory in Second Language Acquisition (SLA). *Journal of Language Teaching and*

- Research, 3(6), 1233-1241. <https://doi.org/10.4304/jltr.3.6.1233-1241>
- Othman, I. (2013). Elements of Multiple Intelligences in Teaching and Learning Activities and the Effect on Students' Achievement Based on Gender. *IOSR Journal of Research and Method in Education*, 2(3), 28-32. <https://www.iosrjournals.org/iosr-jrme/papers/Vol-2%20Issue-3/F0232832.pdf>
- Phillips, H. (2010). Multiple Intelligences: Theory and Application. *Perspectives In Learning*, 11(1), 4. <https://csuepress.columbusstate.edu/pil/vol11/iss1/4>
- Ping, X., Wang, J., Zhang, D., & Wang, J. (2023). The Research Landscape of Global Competence: Theory Development, Research Focus and Prospects. *Journal of Science Education*, 24(1). <https://www.chinakxy.com/downloads/V24-2023-1/V24-2023-1-1.pdf>
- Samsudin, M. A., Haniza, N. H., Talib, C. A., & Ibrahim, H. M. M. (2015). The Relationship Between Multiple Intelligences with Preferred Science Teaching and Science Process Skills. *Journal of Education and Learning*, 9(1), 53-59. <https://doi.org/10.11591/edulearn.v9i1.1118>
- Sen, C., & Sezen Vekli, G. (2016). The Impact of Inquiry Based Instruction on Science Process Skills and Self-Efficacy Perceptions of Pre-Service Science Teachers at a University Level Biology Laboratory. *Universal Journal of Educational Research*, 4(3), 603-612. <https://doi.org/10.13189/ujer.2016.040319>
- Sorge, S., Doorman, M., Maass, K., Straser, O., Hesse, A., Jonker, V., et al. (2023). Supporting Mathematics and Science Teachers in Implementing Intercultural Learning. *ZDM - Mathematics Education*, 55(5), 981-993. <https://doi.org/10.1007/s11858-023-01478-3>
- Talib, A., & Bini Kailani, I. (2014). Problem Based Learning in Cooperative Situation (PBLCS) and Its Impact on Development of Personal Intelligence. *International Journal of Evaluation and Research in Education*, 3(4), 236-244. <https://doi.org/10.11591/ijere.v3i4.6969>
- Ting, K. L., & Siew, N. M. (2014). Effects of Outdoor School Ground Lessons on Students' Science Process Skills and Scientific Curiosity. *Journal of Education and Learning*, 3(4), 96-107. <https://doi.org/10.5539/jel.v3n4p96>
- Vighnarajah, Luan, W. S., & Bakar, K. A. (2008). The Shift in the Role of Teachers in the Learning Process. *European Journal of Social Sciences*, 7(2), 33-41. <https://maaz.ihmc.us/rid=1N5QX84SV-7QN025-329W/Vighnarajah%20The%20shift%20in%20the%20role%20of%20teachers.pdf>
- Widiana, I. W., & Jampel, I. N. (2016). Improving Students' Creative Thinking and Achievement through the Implementation of Multiple Intelligence Approach with Mind Mapping. *International Journal of Evaluation and Research in Education*, 5(3), 246-254. <https://doi.org/10.11591/ijere.v5i3.4546>
- Xie, J., & Lin, R. (2009). Research on Multiple Intelligences Teaching and Assessment. *Asian Journal of Management and Humanity Sciences*, 4(2-3), 106-124. <https://doi.org/10.6413/AJMHS.200909.0106>
- Yurt, E., & Polat, S. (2015). The Effectiveness of Multiple Intelligence Applications on Academic Achievement: A Meta-Analysis. *Journal of Social Studies Education Research*, 6(1), 84-122. <https://doi.org/10.17499/jsser.202746>