# INSTRUCTIONAL MATERIAL IN STRENGTHENING DIFFERENTIATED INSTRUCTION IN TEACHING MATHEMATICS

## Ms. Kristela Janine A. Hortal

*Doctor in Educational Management, Laguna State Polytechnic University, Laguna, Philippines*

## ABSTRACT

*The study determined whether the use of differentiated instructional material maximized students' performance in Mathematics. It also revealed the validation of the instructional material patterned on differentiated instruction and the learning style of the students. The learning styles of the students were classified as visual, aural, linguistic, and kinesthetic. The instructional material patterned on differentiated instruction was validated in terms of usability, aesthetic value, consistency, objective, content, development, and evaluation. The study also determined the difference in the students' performance based on the pretest and posttest. Using the one group pretest and posttest design, 40 Grade 7 students from Mamplasan National High School were subjected to differentiated instruction. Thirty-five Math teachers from Cluster 4 of the Division of Biñan City validated the instructional materials. Interesting findings from the study include: 30% of the students were visual learners, 27.5% were aural learners, 22.5% were read/ write learners and the remaining 20% were kinesthetic learners. It was concluded that there is a significant difference in the mean level of the students' performance in terms of their pretest and posttest and there is a significant effect on differentiated instruction and the students' performance in terms of their pretest and posttest.*

## INTRODUCTION

Willis and Mann (2000) define differentiated instruction as a teaching philosophy based on the premise that teachers should adapt instruction to student differences. Rather than marching students through the curriculum in lockstep, teachers should modify their instruction to meet students' varying readiness levels, learning preferences, and interests. As cited by Allan and Goddard (2010), the first thing to do is to determine the students 'learning style/ multiple intelligences and then proceed with differentiation. The goal of differentiated classroom is to maximize student growth and individual success (Tomlinson and Allan, 2000). This can only be achieved by providing many avenues for the students to acquire knowledge, to process the acquired information and ideas and to develop products. In this kind of instruction, the teacher should have the knack to understand the students' need to put across humor or their need to work alone or with a group, or if they have a need for supplementary activities or follow ups and to explore more deeply on a topic and this calls for the teacher to respond with these needs actively and positively. Tomlinson and Allan (2000) presented a concept map on how teachers can create differentiated, personalized, or responsive classrooms. The figure shows that teachers can differentiate in terms of content, process and product based on the student's readiness, interests and learning profile. Differentiated instruction is the teacher's response to learners' need guided by general principles of differentiation such as respectful task, flexible groupings and ongoing assessment and adjustment. A learning style is a student's consistent way of responding to and using stimuli in the context of learning. Keefe (2009) defines learning styles as the "composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment." Stewart and Felicetti (2005) define learning styles as those "educational conditions under which a student is most likely to learn." Thus, learning styles are not really concerned with what learners learn, but rather how they prefer to learn. Emerging research demonstrates that differentiated instruction, when fully implemented, can significantly improve student achievement (Goddard & Goddard, 2007). To determine the effectiveness of the use of differentiated instruction in teaching Mathematics and its effect on students' perception towards the subject, this study will be conducted. The said study covered 40 students who were classified according to four major learning styles such as visual, aural, read/write and kinesthetic.

## OBJECTIVES

This study aimed to determine the effect of differentiated instruction on the students' performance in Mathematics. It would find if the use of this instruction helped in maximizing students' performance to reveal the validation of the module patterned on differentiated instruction and the learning style of the students.

Specifically, it aimed to cover the following areas:

1. the learning style of the students in terms of visual, aural, linguistic, and kinesthetic?
2. the mean level of validation of the instructional material to be used in teaching differentiated instruction in terms of usability,

aesthetic value, consistency, objective, content, development, and evaluation?
3. the mean level of the students' performance in their pre-test and post-test in terms of visual, aural, linguistic, and kinesthetic?
4. the significant difference in the students' performance in their pre-test and post-test in terms of visual, aural, linguistic, and kinesthetic?
5. the significant effect of differentiated instruction on the students' performance in terms of their pre-test and post-test.

## SAMPLING DESIGN
Using purposive sampling, 40 Grade 7 students from Mamplasan National High School (Jacobo Annex) were selected who used the instructional material patterned on differentiated instruction. The thirty-five (35) Mathematics teachers coming from Cluster 4 of the Division of Biñan City were also chosen using purposive sampling.

## RESEARCH DESIGN
The researcher used descriptive one group pretest posttest design. The researcher utilized the descriptive method in this study as it mainly focused on developing a module to strengthen the use of differentiated instruction in teaching Mathematics. This design was used since the study wanted to determine what would be the effect of the use of Differentiated Instruction in Strengthening Students' Performance in Mathematics. The treatment given to the students was the use of Differentiated Instruction as a way of modifying the usual way of teaching Mathematics. The pretest and posttest of the students was compared to determine the effectiveness of the module.

## STATISTICAL DESIGN
To find the mean level of performance in terms of their pretest and post test scores, the researcher used frequency distribution and class mark. The data was presented in tables according to frequency counts, equivalent percentages, mean average, standard deviation, two-way ANOVA to test the null hypotheses at 5% level of significance advanced in this study. The t-test for dependent samples was used to measure the difference in the level of performance of the students under the controlled and experimental group in terms of their pretest and posttest. It was also used to measure if there is significant difference between the perceptions of the students at the beginning and at the end of the session.

## RESULTS
**Level of Learning Style of the Students in Terms of Visual, Aural, Linguistic, and Kinesthetic**
Table 1 presents the level of Learning Style of the students in terms of visual, aural, linguistic, and kinesthetic.

| Learning Styles | Frequency(f) | Percentage (%) |
|---|---|---|
| Visual | 12 | 30 |
| Aural | 11 | 27.5 |
| Linguistic | 9 | 22.5 |
| Kinesthetic | 8 | 20 |
| Total | 40 | 100% |

**Table 1. Level of learning style of the students**

**Level of Validation of the Instructional material to be used in Teaching Differentiated Instruction**
Table 2 presents the mean level of validation of the instructional material to be used in teaching differentiated instruction.

| Criteria | Mean | SD | Remarks |
|---|---|---|---|
| 1. Usability | 4.63 | 0.49 | Highly Acceptable |
| 2. Aesthetic Value | 4.63 | 0.50 | Highly Acceptable |
| 3. Consistency | 4.62 | 0.49 | Highly Acceptable |
| 4. Objectives | 4.62 | 0.49 | Highly Acceptable |
| 5. Content | 4.68 | 0.48 | Highly Acceptable |
| 6. Development | 4.67 | 0.47 | Highly Acceptable |
| 7. Evaluation | 4.63 | 0.50 | Highly Acceptable |

**Table 2. Level of validation**

**Level of the Students' Performance in Pretest and Posttest in terms of their Learning Style**
Table 3 presents the mean level of the students' performance in their pretest and posttest in terms of their learning style.

| | Visual | Aural | Linguistic | Kinesthetic |
|---|---|---|---|---|
| Pretest | 5.92 | 5 | 5.44 | 5.88 |
| Posttest | 14.85 | 16 | 16.67 | 15.3 |

*Table 3. Students' performance in pretest and posttest*

**Significant Difference in the Students' Performance in their Pre-Test and Post Test in Terms of Their Learning Style**

Table 4 presents the data on the mean level of performance in Mathematics among 40 grade 7 students who were subjected to Differentiated Instruction.

| | | Mean | Mean Difference | t- Value | p-value | Verbal Interpretation |
|---|---|---|---|---|---|---|
| Visual | Pre-test | 5.42 | 9.08 | -14.7143 | 0 | Significant |
| | Post test | 14.5 | | | | |
| Aural | Pre-test | 5 | 11 | -14.6519 | 0 | Significant |
| | Post test | 16 | | | | |
| Linguistic | Pre-test | 5.44 | 11.23 | -11.257 | 0 | Significant |
| | Post test | 16.67 | | | | |
| Kinesthetic | Pre-test | 5.88 | 9.5 | -15.1568 | 0 | Significant |
| | Post test | 15.38 | | | | |

**Table 4. Significant Difference in the Students' Performance**

**Significant Effect on the Differentiated instruction and the Students' Performance in terms of their Pretest and Post test**

Table 5 shows the computed value of the students' learning style during the pretest and posttest.

| | Computed t-value | P-Value p< .05 | V.I | Computed t-value | P-Value p< .05 | V.I |
|---|---|---|---|---|---|---|
| **Learning Styles** | 8.72 | 0.000 | Sig | 44.51 | 0.000 | Sig |
| **Differentiated Instruction** | | | | | | |
| Usability | -.3.07 | 0.004 | Sig | -39.35 | 0.000 | Sig |
| Aesthetic Value | -4.07 | 0.003 | Sig | -39.45 | 0.000 | Sig |
| Consistency | -2.50 | 0.017 | Sig | -39.19 | 0.000 | Sig |
| Objective | -3.09 | 0.004 | Sig | -39.23 | 0.000 | Sig |
| Content | -2.89 | 0.006 | Sig | -39.23 | 0.000 | Sig |
| Development | -2.93 | 0.006 | Sig | -39.48 | 0.000 | Sig |
| Evaluation | -3.05 | 0.004 | Sig | -39.41 | 0.000 | Sig |

**Table 5. Significant Effect on the Differentiated instruction and the Students' Performance**

## CONCLUSION

It was concluded that there is a significant difference in the mean level of the students' performance in terms of their pretest and posttest and there is a significant effect on differentiated instruction and the students' performance in terms of their pretest and posttest.

## AREAS FOR FURTHER RESEARCH

It is recommended that Math Teachers group their students accordingly to their learning style and subjected them to differentiated instruction to strengthen their knowledge and understanding about Mathematics. Moreover, it is also recommended to the school board, the schools administrators and Mathematics teachers to comprise a regular monitoring on the performance of the students to maintain the satisfactory performance in Mathematics. Math teachers utilize the Learning Module in Math to aid the students in achieving high performance in Mathematics. Math experts may further improve the self-made instructional materials for teachers to use in their classes. Future researchers may conduct similar studies about the use of differentiated instruction in strengthening the students' performance not just in Mathematics but in other subjects too and to use other variables aside from those considered in this study.

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**APPENDIX**
**SAMPLE MATERIAL**

## Lesson 1— Points, Lines and Planes

| Term | Figure | Description | Notation |
|---|---|---|---|
| Point | •H | A point suggests an exact location in space. It has no dimension. We use a capital letter to name a point. | Point H |
| Line | ←•——•→ W  A | A line is a set of points arranged in a row. It is extended endlessly in both drections.  It is a one-dimensional figure. Two points determine a line which are two distinct points contained exactly in one line.  We use a lower case letter or any two points on the line to name the line. | Line **W** or  D̅A⃗ |
| Plane | • A  • B  •C | A plane is a set of poins in an endless flat surface. The following determine a plane:  A) three non-collibear points;  B) two intersenting lines;  C) two parallel lines; and  D) a line and a point not on the line. | Plane ABC  or  ▢ABC |

Name _____     Score _____

Grade / Section _____     Date _____

**Activity No. 1.a**
**Point, Line and Plane**

1) Use the figure below to identify what is being asked:

M      .I          .W        .B

.S        .G

.X        .T

f        h      .r

.O

.K
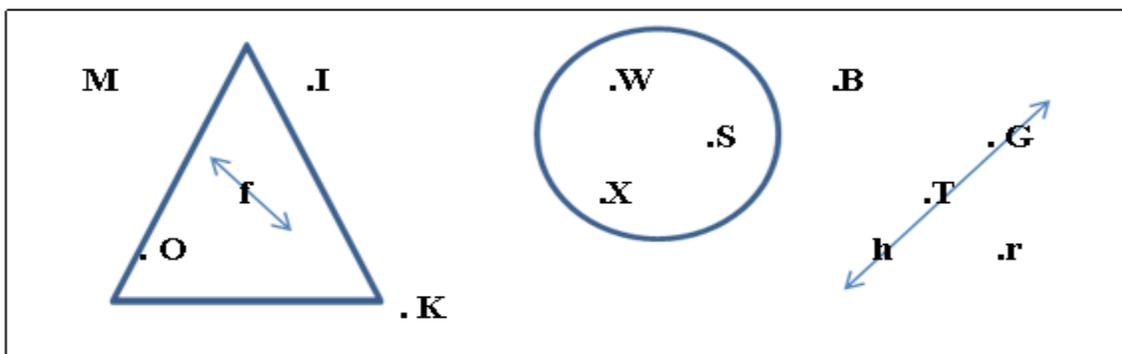
a) Name the point(s) in the interior region of the circle. _____

b) Name the point(s) in the interior region of the triangle. _____

c) Name the line(s) in the interior region of the triangle. _____

d) Give the other name (s) for line h. _____

e) Name the plane that can be formed by the three points in the interior of the circle. _____

f) Name the points outside the circular region. _____

g) Name the plane that can be formed by line h and point r. _____

h) Name the points outside the region bounded by the triangle. _____

2) Identify if the points/lines is/are coplanar, skew, concurrent, parallel or intersecting.

A. _____          B. _____          C. _____

D. _____          E. _____