

EFFECTS OF INTERVENTION MODELS ON STUDENTS' CONFIDENCE LEVEL AND PROMOTION RATE IN MATHEMATICS

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ABSTRACT. *The study was a quasi-experimental design which aimed to determine the effects of Differentiated Intervention, Re-teaching Intervention, Modularized and Intervention Models to the confidence level and promotion rate of students in mathematics. The data were analyzed using mean, standard deviation, ANCOVA Unequal n's. The analysis of the data revealed that those who were exposed to differentiated intervention model retained more mathematical concepts compared to those exposed to re-teaching model but is as good as those students exposed to modularized model. Furthermore, retention of students exposed to re-teaching have comparable retention of those who underwent modularized model. The researchers recommend that mathematics teachers may employ any of the three models but preferably used differentiated model to improve students' retention in mathematics. Modules may be used as intervention to help students increased performance since it only need teacher's presence as consultant.*

Keywords: intervention models, differentiated intervention, retention

1. INTRODUCTION

Education is the best weapon to fight poverty. Education institutions must provide a relevant education for global competitiveness. Performance of the students is measure via National Achievement Test. Result of the public high school students in the National Achievement Test (NAT) was 48.9% in Mathematics [1]. The result was significantly lower which calls for immediate intervention in the process of learning.

Interventions which focus on supporting students' understanding through explicit instruction may strengthen conceptual and procedural knowledge. K. Abdul Gafoor & Abidha Kurukkan (2015) [2], stated that Mathematics is most liked subject for only (6%) of students and it is the hated one for (88%) of them. Their main reasons for hating mathematics are difficulty in understanding the subject, poor instruction, and demand for more time to grasp the concepts considering.

According to Carol Ann Tomlinson [3]. as cited in Ellis, Gable, Greg, & Rock (2008, p. 32)[4]., differentiated intervention can be a help students in the process of learning. Dosch and Zidon [5]. explored the implementation of differentiated instruction in higher education and found out improvements of the students scores both assignments and exams. Furthermore, the study of Ogunkunle and Henrietta (2014) [6]., showed that teaching geometry using differentiated instructional strategies is effective for retaining concepts in mathematics..

Melo [7].), claimed that the most prevalent factors that facilitate heighten classroom interaction is the material availability. It is the teachers' duty to provide adequate educational materials which are effective, suitable and adaptable to the nature of students.

In addition, Nix [8]., revealed that mathematics remediation has an impact to students' achievement.. It was supported by Zhao, [9]. who stressed that remediation is gaining ground and closing the gap in academic achievement for at-risk students. Re-teaching the lessons can also be a way of giving remediation.. Lalley *et al.* [10]. indicated that re-teaching produced significant increases in student abilities in

remembering mathematics concepts and skills in mathematics problem solving.

Clarkson, et al. (2017) [11] emphasized in their study the importance of confidence in eliciting students' motivation and success. Their study has led to other studies being carried out to determine how well students are able to calibrate their confidence.

As cited in Khun-Inkeeree, *et al.* [12]., they mentioned that if the self-confidence toward mathematics is low it will defeat the purpose of learning in mathematics. They emphasized that self-confidence toward mathematics is an important factor to succeed in mathematics. Shaikh [13]., believed that students' mathematics confidence were probably influenced by the experience of their own parents or elementary school teachers who also felt incompetent when working with numbers. According to Dweck [14]., students with low self-confidence may commit mistakes and feel discouraged due to that failure, and categorize themselves as not smart. But those with mathematical confidence are able to persevere through challenging problems, trying again and again until they can successfully solve the problem. Identification of students who are at-risk for failure can be guided through delivery of a carefully designed supplemental intervention.

2. Methodology

The study used pretest-posttest quasi experimental design using the three groups. Each group had different intervention such as differentiated, module and re-teaching. During regular classes, all experimental groups were given a diagnostic test before the discussion of each topic, a short assessment consisting of 5-10 items to assess the prior knowledge of the students on Probability and Statistics topics. A short review on the previous lesson and a motivation to hook the mind of the students were done. The lessons were carried out using different strategies in teaching mathematics. Drills and exercises were given for mastery. Then the teacher conducted a formative assessment on the topic discussed. The result served as basis to select students to undergo the intervention sessions. The teacher grouped the students with common mistakes in competencies expected to be mastered.

Pretest and posttest on the confidence level was given to the students before and after the intervention respectively. The scores in the pretest and posttest of the three groups of participants were analyzed using the mean, standard deviation to describe the data and ANCOVA was used to determine if there is a significant difference of the confidence level and promotion rate among the students being exposed to the three methods of intervention.

3.1. The Intervention Process

The three experimental groups underwent the teaching same strategy and activities during the discussions of the lesson. Also same formative assessment is given to determine the mastery level of students. Students who do not master the competencies were required to undergo intervention. Among the three experimental groups, one group was exposed to re-teaching method, where the teacher re-teach the competencies they failed and employed other strategies aside from lecture discussion to develop their skill in critical thinking and problem solving. Provided mathematical tasks for them to analyse and understand situations, identify applicable mathematical concepts and procedures, reason about them, generate solutions and express the results properly. In modularized method, a module was given to students for them to re-learn the concept and process as they underwent intervention. This module assisted students in understanding complex and difficult concepts discussed and also involve required participation to do the task and to give immediate feedback which is self-pacing. Students were allowed to consult the teacher whenever they had concepts that they did not understand in the exercises of the module. In Differentiated Intervention method, the model used is shown below:

Figure 1. Differentiated Intervention Model

Phase 1: Task

Students were given differentiated activities according to their learning styles. Those students who belong to intrapersonal intelligence may opted to work on their own at first but later they decided to join other groups of intelligence based on their second interest.

Phase 2: Analysis

The students worked together to explore, learn or solve a problem, where each individual is responsible for understanding the concepts and process. Each member of the group has a responsibility to contribute to the group work and is accountable for the learning progress of the group. Students analyzed each step necessary to solve the assigned problem to produce an accurate solution.

Phase 3: Performance

Each group demonstrated the concept learned on the task given to them. They provided evidence of understanding through their output.

Phase 4: Drill

Giving assessment to student's at their own pace. It may be in a form of a quiz, seatwork and other related mathematical tasks.

3. RESULT AND DISCUSSION

Table 1. Mean and Standard Deviation of the Students' Confidence Level in Mathematics

	Differentiated Intervention		Modularized Intervention		Re-teaching Intervention	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Mean	2.25	3.28	2.43	3.07	2.42	3.16
Mean Gain		1.03		0.64		0.74
SD	0.33	0.18	0.50	0.40	0.54	0.40
n	42		30		21	

Legend:

Mean Ranges	Description
3.40 – 4.00	Very High Confidence
2.60 – 3.30	High Confidence
1.80 – 2.50	Average Confidence
1.00 – 1.70	Low Confidence

Table 1 shows the pretest and posttest mean and standard deviation of the students' confidence level in mathematics of the three experimental groups. It can be observed that among the three groups, the pretest of the group that was exposed to differentiated intervention has least confidence level compared to groups exposed to modularized and re-teaching methods of intervention. However, posttest result shows differentiated intervention gets the highest level which is 3.28 and has the highest increase compared to the other two groups. The result can be attributed to the differentiated activities given to the students. To determine the significant difference, further analysis was done using ANCOVA Unequal n's.

Table 2. One-Way Analysis of Covariance on Students' Level of Confidence in Mathematics of the Three Experimental Groups

Source of Variation	Adj. Sum of Squares	df	Adj. Mean Squares	F Computed	P Value
Treatment					
between groups	1.406	2	0.7032	8.04	0.001*
Error					
Within	7.783	89	0.0875		
Total	9.189	91			

*Significant at 0.05 level

Table 2 shows the summary of the ANCOVA Unequal n's of students' confidence level in mathematics of the three

experimental groups. The analysis yielded a computed F-ratio of 8.04 with a P-value of 0.001 which is less than 0.05 level of significance. This led the researcher not to accept the null hypothesis that there is no significant difference of the students' confidence level as influenced by the intervention models. This means that among the three intervention models, there existed one or two among the models that had significantly increased the confidence level. To determine which among the three intervention models was effective in increasing the confidence level of the students, further analysis was done using Scheffe' Posteriori Test.

Table 3: Posteriori Test Comparison of Confidence Level of the Three Intervention Models

	Mean Difference	SE	T	P _{scheffe}
1	2	0.28	3.93	0.01
	3	0.19	2.35	0.15
2	3	-0.10	-1.12	0.74

*Significant at $p < 0.05$ level

Table 3 shows the Scheffe as Posteriori comparison test among the three intervention models of the group confidence levels. Results revealed that among the three sets, pairing the differentiated model and modularized model yielded a t-value of 3.93 with a p-value of 0.01 which is less than 0.05 level of significance. This means that there was a significant difference of the confidence levels of the students exposed to differentiated and modularized intervention. Differentiated was more effective among the two. The result can be attributed to the consideration of the students' learning styles, multiple intelligences and the method of doing the intervention.

Table 4. Class Promotion Rate of Students in Mathematic

	Differentiated Intervention 1	Modularized Intervention 2	Re-teaching Intervention 3
n	42	30	21
number of students promoted to the next quarter	42	30	21
Promotion rate	100%	100%	100%

Table 4 shows the promotion rate of the three experimental groups. Results revealed that no students failed in the 3rd quarter in all the three groups after the intervention had been given regardless of the method used. All students were promoted to the 4th quarter. This means that when intervention was given every after the quiz of each topic,

students' learning was enhanced. The result corroborates with the result of the study conducted by (Nix, 2015) that mathematics remediation has an impact to students' achievement. He stressed that remediation group is gaining ground and closing the gap in academic achievement for at-risk students.

Results of this study showed that early intervention to remediate students' weakness could successfully improve students' mathematics competencies.

4. CONCLUSION AND RECOMMENDATION

Based on the findings of the study, the researchers concluded that differentiated Intervention Model is most effective in increasing the confidence level of students in mathematics. Furthermore, Differentiated, Re-teaching and Modularized Intervention Models have caused hundred percent promotion rate in mathematics. The researchers recommend that Mathematics teachers may employ Differentiated, Re-teaching and Modularized Intervention Models in their classes to improve students' confidence level and promotion rate in mathematics.

REFERENCES

- [1] Ordinario, C. U. Low Nat Scores May Worsen Under K-12, Manila, Philippines. (2013).
- [2] Abdul K. G. & Kurukkan A. (2015). Learner and Teacher perception on Difficulties in Learning and Teaching Mathematics: Some Implications
- [3] Tomlinson, C.A. How to Differentiate Instruction in Mixed-Ability Classrooms. Virginia: ASCD (2001).
- [4] Ellis, E.; Gable, R. A.; Gregg, M.; Rock, M. L. (2008). "REACH: A framework for differentiating classroom instruction" (PDF). Preventing School Failure. 52 (2): 31-47. doi:10.3200/PSFL.52.2.31-47
- [5] Dosch, M., and Zidon, M. "TheCourse FitUs": Differentiated Instruction in the College Classroom. International Journal of Teaching and Learning in Higher Education, Vol26 n3 p343- 357 2014. 15 pp. (2014).
- [6] Ogunkunle, R. A. & Henrietta, O. A. Effect of differentiated instructional Strategies on students' retention in geometry in FCT senior secondary schools, Abuja, Nigeria. (2014).
- [7] Melo, M. (2017). Thesis Final Effectiveness of Worktext in Teaching Math 7
- [8] Nix, J. M. (2015). The effects of a seventh grade mathematics remediation course on student achievement. Dissertation Abstracts International Section A: Humanities and Social Sciences, 76(3-A(E)), No-Specified. Retrieved from <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc12&NEWS=N&AN=2015-99170-386>
- [9] Zhao, Z. (2013). An overview of studies on diagnostic testing and its implication for the development of diagnostic speaking test. International Journal of English Linguistics, 3(1), 41-45. <https://doi.org/10.5539/ijel.v3n1p4>
- [10] Lalley, J. P., Miller, R. H. Effects of Pre-Teaching and Re-Teaching on Math Achievement and Academic Self-Concept of Students with Low Achievement in Math (2006).

- [11] Clarkson, L. M. C., Love, Q. U., & Ntow, F. D. (2017). How Confidence Relates To Mathematics Achievement: A New Framework. *Mathematics Education and Life at Times of Crisis*, 2(2002), 441–451.
- [12] Khun-Inkeeree, H., Omar-Fauzee, M. S., & Othman, M. K. H. (2016). Students' attitude towards achievement in mathematics: a cross sectional study of year six students in Songklha province, Thailand. *European Journal of Education Studies*.2,(4), 89-99
- [13] Shaikh, S. N. (2013). Mathematics anxiety factors and their influence on performance in mathematics in selected international schools in Bangkok. *Journal of Education and Vocational Research*, 4(3), 77-85.
- [14] Dweck, C. S. (2006). Promises of Praise