Varied Intervention Models: Its Effect on Students’ Retention Score

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Abstract The study used a pretest-posttest quasi-experimental design. The experimental groups were exposed to three intervention models: Differentiated Intervention Model, Re-teaching Intervention Model, Modularized Intervention Model. Questions in posttest and retention were all multiple choice. 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

The performance of the country's public high school students in the National Achievement Test (NAT) has been declining continuously and are significantly lower than the scores of public elementary pupils. The Department of Education data showed that the average NAT score of public high school students was significantly lower at 48.9% compared to the elementary pupils' 66.79% [1]. Early and appropriate remediation is important for secondary students at all levels to improve needed performance. Making the students possess strong foundations of mathematics concepts is a challenging work of a teacher since majority of the students have a difficulty in understanding the subject in general. As stipulated in DepEd Order #8, series of 2015, teachers should ensure that learners should receive remediation when they earn scores which are consistently below expectations in written and performance tasks in the fifth week of any quarter [2]. Education supervisors thought that remediation will prevent a student from failing in any learning area at the end of the fifth week but in reality it does not work. It may be better if the intervention is given every after the formative assessment of each topic. To improve students’ performance, diagnostic assessment may be considered to determine the strengths and weaknesses of students and to decide mathematics teaching approach appropriate to fit to the students’ needs.

Diagnosis can provide information about students’ mastery of basic prior knowledge and skills as well as preconception and misconceptions about the lesson[3]. In giving intervention, differentiated approach can be a help, according to Carol Ann Tomlinson, it is the process of ensuring what a student should learn, how he should learn, and how he can demonstrate what he has learned to match to their readiness level, interests, and preferred mode of learning [4]. Another way of giving intervention is through modular approach. It has been proven to be an effective and efficient tool to help students to learn mathematics in their own pacing. In addition, re-teaching the lessons can also be a way of giving intervention. Lalley et al indicated that re-teaching produced significant increases in student performance in mathematics, problem solving and computational skills [5]. Thus, researchers want to verify the effects of the three intervention models to the students’ retention scores.

2. Related Work

According to Gani, diagnostic assessment improves teaching-learning episode because it identifies the strength and weaknesses of students and do appropriate action to remediate weaknesses. He stressed out that the outcome of a well- designed diagnostic assessment with a proper remediation will go a long way in reducing failure rate especially in the standardized examinations but it can improve performance in the area of skills acquisition [6].
In the study of Valiandes, it was found out that students made better progress in classrooms where differentiated instruction methods were systematically employed, compared to students in classrooms where differentiated instruction methods were not employed [7]. Dosch and Zidon implemented differentiated instruction in higher education to compare to a non-differentiated (NDI) classroom in two sections of Educational Psychology course taught by the same instructor. Findings showed, the DI group significantly outperformed the NDI group in the combined assignments and the examinations [8]. On the other hand, Devesh and Nasseri revealed that nearly 93% of the students have realized that the use of mathematics module has been helpful in achieving the basic mathematics skills required for their learning at higher levels [9]. In learning for all, teaching matters if learning will last [10]. Sustainable learning provides a powerful framework for orchestrating effective teaching practices that respond to individual learning needs and use resources effectively. Pedagogically, re-teaching sits largely within the context of direct instruction, more specifically when direct instruction is teacher-led using specific language, rather than Direct Instruction (DI) which uses published commercial programs [11]. As stated in the documentation published by Saskatoon Public School (2014b), Teachers who can re-teach are much more successful in helping all students succeed, that is why to re-teach is very important.

3. Methodology

The study was conducted at Bugo National High School, Cagayan de Oro City during the third quarter of the school year 2019-2020. Three classes in the grade 11 regular sections were randomly assigned on the three experimental intervention models. A teacher-made posttest and retention test covering the topics in Statistics and Probability with a reliability of 0.73 were given to the three groups. There were 20 items which was given 2 points each, a total of 40 points. The scores in the posttest and retention 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 retention scores and promotion rate among the students being exposed to the three methods of intervention.

3.1. The Intervention Process

All three experimental groups underwent the following routine: 1. Do the routine in teaching such as conducting a review of the previous lesson discussed; 2. Give motivation; 3. Apply appropriate strategies in the entire development of the lesson; 4. Give formative assessment which serves also as diagnostic test for mastery level of students; 5. 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:

![Differentiated Intervention Model](image)

**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**

When the group was given a task, they worked together to explore, learn or solve a problem, where each individual is responsible for understanding the concepts and process. The learning tasks which students were engaged required them to mutually and positively depend on one another and the group’s work as a whole. 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
This phase assessed students’ acquisition of concepts and mastery at their own pace. It may be in a form of a quiz, seatwork and other related mathematical tasks. This provided feedback to students, explained how to get the correct answer, and provided a management system to keep track of student progress.

4. Results and Findings

Table 1. Mean and Standard Deviation of the Posttest and Retention Score in Mathematics Achievement

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean</th>
<th>Mean Gain</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiated</td>
<td>12.88</td>
<td>2.72</td>
<td>2.66</td>
<td>42</td>
</tr>
<tr>
<td>Intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modularized</td>
<td>15.60</td>
<td>2.76</td>
<td>2.76</td>
<td>30</td>
</tr>
<tr>
<td>Intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Re-teaching</td>
<td>13.4</td>
<td>2.43</td>
<td>2.43</td>
<td>21</td>
</tr>
<tr>
<td>Intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment between</td>
<td>64.46</td>
<td>32.23</td>
<td>6.08</td>
<td>0.003*</td>
</tr>
<tr>
<td>groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error within</td>
<td>471.98</td>
<td>5.303</td>
<td></td>
<td>0.003*</td>
</tr>
<tr>
<td>Total</td>
<td>536.44</td>
<td>91</td>
<td></td>
<td>0.003*</td>
</tr>
</tbody>
</table>

*Significant at p < 0.05 level.

Table 2 shows the one-way analysis of covariance of students’ posttest and retention scores. The analysis yielded an F-ratio of 6.08 and a probability value of 0.003 which is less than the critical value at 0.05 level of significance. Thus, the null hypothesis is rejected. This implies that there is significant difference in the students’ retention scores among the three groups. This means that from among the three intervention models at least one have significantly affect the retention of the competencies on the topics discussed. To determine which of the three intervention models is more effective in retaining mathematical concepts after two weeks from taking posttest, further analysis was done using Scheffe Posteriori test.

Table 3. Posteriori Test Comparison of Retention Score of the Three Intervention Models

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean Difference</th>
<th>SE</th>
<th>T</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>1.07</td>
<td>0.55</td>
<td>1.93</td>
<td>0.30</td>
</tr>
<tr>
<td>3-2</td>
<td>2.10</td>
<td>0.62</td>
<td>3.41</td>
<td>0.01</td>
</tr>
<tr>
<td>2-3</td>
<td>1.04</td>
<td>0.66</td>
<td>1.58</td>
<td>0.49</td>
</tr>
</tbody>
</table>

*Significant at p < 0.05 level.

Table 3 shows the Posteriori test comparisons of the three intervention models in their retention scores. Results revealed that among the three sets, pairings differentiated and modularized models yielded a probability value of 0.30 which is greater than 0.05 level of significance. This means that the retention score of the differentiated intervention and modularized intervention models are comparable. Pairing differentiated with re-teaching, the scheffe yielded a t-value of 3.41 with a probability value of 0.01 which is less than the critical value 0.05 level of significance. This means that there is a significant difference of their retention score of 15.60 for the differentiated intervention over the retention score of 13.62 for the re-teaching intervention method. This means that differentiated intervention model has significantly enhanced students’ retention scores. This may be due to their being engaged in more activities given and discourse among them. It can be observed also that the group where differentiated intervention model was employed has higher result in the retention test score as compared to the group where re-teaching model was employed. Pairing the mean retention scores between modularized model and re-teaching model, the scheffe yielded a t-value of 1.58 with a probability value of 0.49 which is greater than the 0.05 level of significance. This means that modularized model of intervention is as effective as the re-teaching model. This implies that modularized model can be used to help improve students’ retention of concepts in the absence of the teacher. This result agrees with the findings of Mentz and Zyl on the effect of method of assessment on students’ retention scores that cooperative learning helps the students to improve their achievement as well as their retention ability over time [12]. This result is also in support of the study conducted by Ogunkunle and Henrietta, teaching geometry using differentiated instructional strategies which was effective for retaining concepts in mathematics [13]. Thus, differentiated instruction is very purposeful, efficient and an effective instructional strategy for increasing meaningful understanding of abstract and difficult concepts. It also promotes higher retention ability in mathematics concepts.

5. Concluding Statements

Based on the analysis and findings of the study the researcher concludes that Differentiated Intervention Model is most efficient in enhancing the retention scores of the students. Hence, the researcher recommends that teachers may use Differentiated Intervention Model in their classes to improve students’ retention scores in mathematics. Moreover, administrators may support
mathematics teachers to do early intervention using Differentiated Intervention Model in class and do in-service trainings as to how to implement the model. Finally, further research may be conducted but may consider other factors such as mental ability and other disciplines for a longer period of treatment.

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References