

Assessment of Academic Achievement of the Grade 11 Students in General Mathematics

Raymond D. Garcia

Abstract

The study was conducted to determine the Academic Achievement of Grade 11 Students in General Mathematics in the Public High Schools of Apayao during the school year 2016 – 2017.

32 of the 54 students in the GAS track senior high school of School A; 32 students in the GAS track senior high school of School B; and 32 of the 39 students in the GAS track senior high school of School C were included as the respondents of the study.

The 60-item teacher made test was used both in the pretest and posttest. An unstructured questionnaire which collected data on the beliefs of teachers' and students about assessment and its purposes was used.

The descriptive research design was employed in order to describe, record, analyze and interpret the academic achievement of Grade 11 students in General Mathematics. A one-group pre-test and post-test design was used in this study to measure progress of student during the three-week study duration.

Box-plots were used to present graphically the academic performance of the Grade 11 students in General Mathematics.

The frequency scores of the Grade 11 students improved after the interventions were given by the teachers.

The result of the study confirmed the need to really implement the policy guidelines on classroom assessment for the K-12 Basic Education Program stipulated in Dep-Ed order No. 8, series of 2015.

Teachers are encouraged to attend seminars and trainings on teaching strategies and interventions to improve their teaching methods.

For future research, it is recommended that similar investigations be conducted in order to determine the validity of the findings through a comparative study in the different grade 11 high schools

Rationale

Educators have searched for ways to a more effective way of teaching mathematics to all students. Math education enables learners to meet society demands for a competent and flexible work force (Niss, 1996). Mathematics improvement is at the core of educational strategy all over the world, but in the Philippines, teachers and learners still face with problem regarding poor achievements in general mathematics, more particularly in the Senior High School curriculum.

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General Mathematics is a core subject in the Senior High School curriculum. Students are expected to learn to utilize analytical reasoning skills to solve problems involving functions and their graphs and applications. Despite various attempts by educators to remedy poor academic performance in Mathematics as a whole, students continue to struggle with the fundamentals of mathematical reasoning and problem solving (Mayfield & Chase, 2002), and thus global underachievement from students in this subject area persists (Mbugua, et al., 2012).

Since teacher quality is an important factor in determining the academic performance of students (Metcalf, 2008), then, their responsiveness to the needs of the students would also play a major role in the students' learning and achievement. Effective pedagogy would encompass a teacher's adaptability to the needs and progress of each individual student to help them achieve the target learning outcomes (Siyepu, 2013; Christmas, Kudzai, & Josiah, 2013).

The use of formative assessments as an instructional strategy has recently risen in widespread recognition and implementation to enhance student learning and achievement in various subject areas (Brookhart, 2007; Magno & Lizada, 2015; Wiliam, 1999; Yorke, 2003). Formative assessments enable teachers to gauge their students' current capabilities, measured against learning objectives (Clark, 2012), and to refine their instruction based on such feedback and observations (Cauley & McMillan, 2010).

With this belief, this study was conducted to determine the impact of formative assessments in increasing the achievement grades and learning gains of Grade 11 students in the General Mathematics. This research was based on the premise that giving formative assessments would lead to an improvement in terms of grades using formative assessments as supplemental activities that would facilitate learning, retention and mastery of the subject matter, thereby improving student performance and increasing Mathematics achievement.

Analysis of the Problem

This study used the descriptive research design, a method of educational research used to describe, record, analyze and interpret the academic achievement of Grade 11 students in General Mathematics. One-group pre-test and post-test design was used in this study to measure progress of student from the start to end of the three-week study duration. A total of 96 Grade 11 students from 3 high schools in Luna, Apayao were selected as respondents to this study.

A group of 32 from a total of 54 students enrolled in the GAS track senior high school of School A; 32 students enrolled in the GAS track of School B; and 32 out of 39 students enrolled in the GAS track of School C were included as respondents of the study.

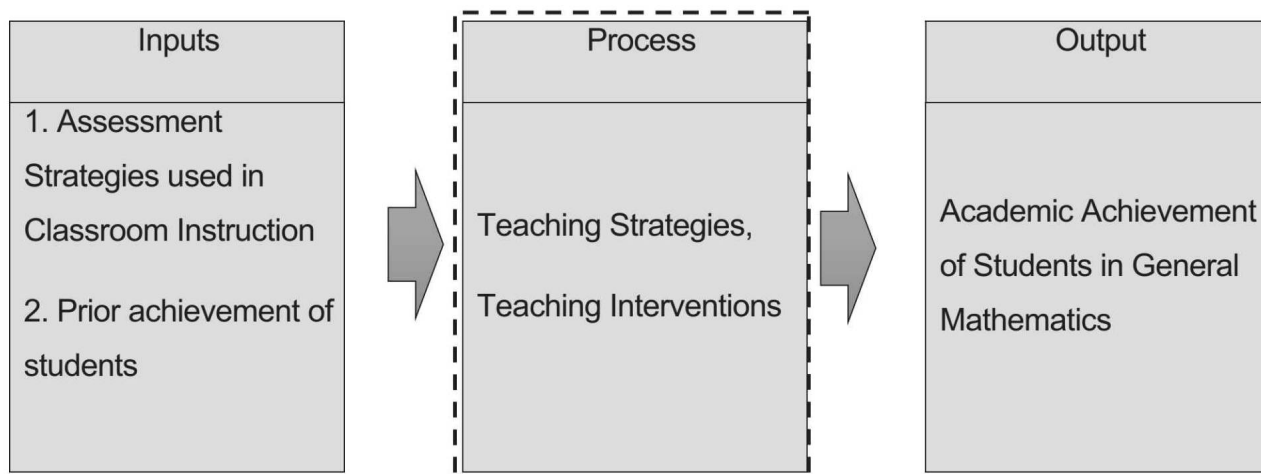
Pre-achievement data was gathered at the beginning of the study period using the teacher made test. Afterwhich, a set of teacher assessment interventions were conducted by the subject teacher. At the end of three weeks, the post-test was administered. In addition, students were interviewed.

The data gathered was analyzed using some statistical tools such as means and percentages. The t – test for paired samples was used to summarize and analyze the academic achievement of Grade 11 students.

Box-plots were also used to present graphically the per school performance of the respondents.

Conceptual Framework

The diagram below presents the summary of the Conceptual Framework showing how the Formative Assessments may affect the Academic Achievement of Student



The Conceptual Framework

Objectives

This study aimed to determine the academic achievement of Grade 11 students in general mathematics in the three (3) selected Public Schools of Luna, Apayao.

Specifically, it sought answers to the following questions:

1. What is the level of academic achievement of Grade 11 students in general mathematics in the three (3) schools before the use of assessments?
2. What is the level of academic achievement of Grade 11 students in general mathematics after assessments were used?
3. Is there a significant difference in the level of academic achievement of Grade 11 students in general mathematics before and after the use of assessments?
4. What are the teachers' and students' beliefs about assessment and its purposes?

Research Instrument

The descriptive survey method was used in this study using a questionnaire and interview guide as instruments. The questionnaire consists of 60 - item teacher made test to measure the achievement of students in General Mathematics. The interview guide consists of set of preliminary interview questions to guide the interview process. Guide questions as interview guide was also used to further gather data on the beliefs of teachers and students about assessments and their purposes.

Data Gathering Procedure

Pre-achievement data was gathered at the beginning of the study period using the teacher made test. After which, a set of teacher assessment interventions were conducted by the subject teacher. At the end of three weeks, the post-test was administered and students were interviewed.

Data Analysis Procedure

The data gathered was analyzed through the use some statistical tools such as means and percentages. The t – test for paired samples was used to summarize and analyze the academic achievement of Grade 11 student respondents.

Box-plots were also used to present graphically the per school performance of the respondents.

Results and Discussion

Observe in figure 2 that the scores of the students after the use of assessment in the classroom instruction improved. *It is obvious that the mean score of 22.44 is greater than the second quarter score of 21.* Score increase is similar to the results of Wang, Martin, Lambert, and Pugalee (nd) wherein the development of students' mathematical abilities observed in terms of monthly growth was influenced by the number of formative assessments administered in that particular set-up.

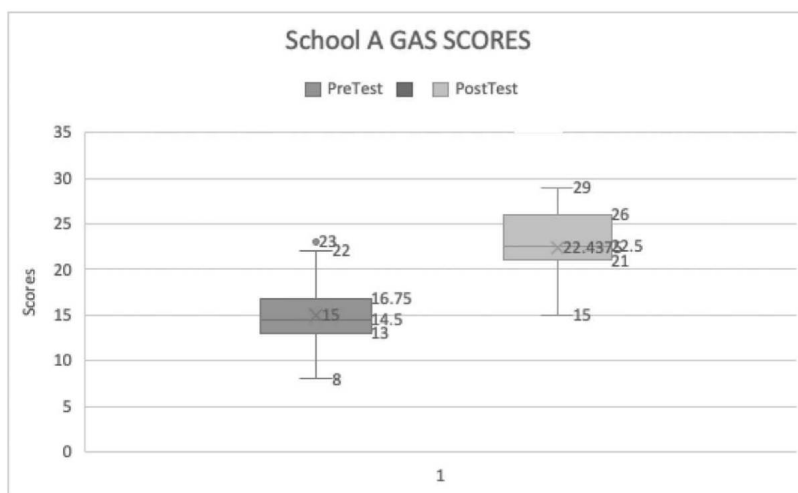


Figure 2. Pretest and Posttest Scores of School A – GAS Students

A significant increase in the posttest scores of the students can be gleaned in figure 3 which show that the computed second quartile of 26.5 in the posttest is greater than the mean which is 25.875.

This result was attributed to the concept of scaffolding as proposed by Christmas, Kudzai and Josiah (2013) as an operationalization of the Zone of Proximal Development theory indicating that additional practice would equate to improved resulting grades (Mayfield and Chase, 2002; McKeown, Beck, Omanson, and Perfetti, 1983) hence, providing students with more formative assessments would facilitate progress towards

the learning objectives and standards through developing their current capabilities (Heritage, 2010; Taras, 2005).

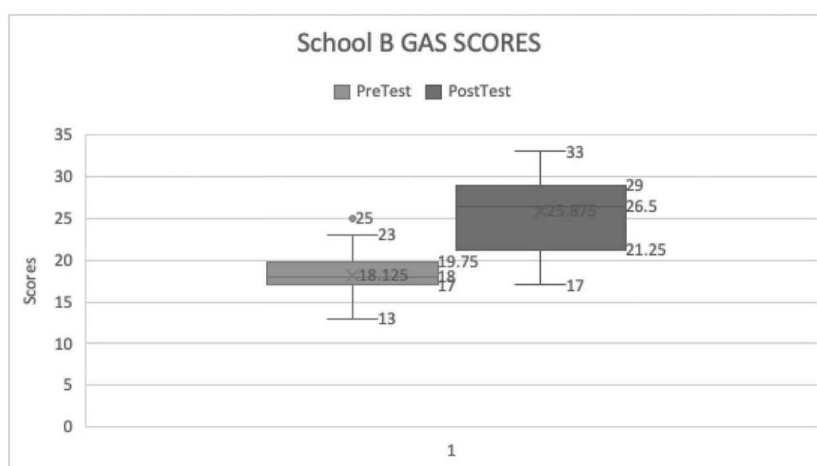


Figure 3. Pretest and Posttest Scores of School B – GAS Students

The chart below revealed big difference on the students' scores, although the second quartile in both the pretest (18.1875) and posttest (25.5313) scores is lower than the median (20 and 28.75, respectively).

This result corresponds with the notion that beyond teacher quality or mere subject content knowledge, teacher must also employ the proper and appropriate instructional strategies and tools to enhance student learning and achievement (Siyepu, 2013).

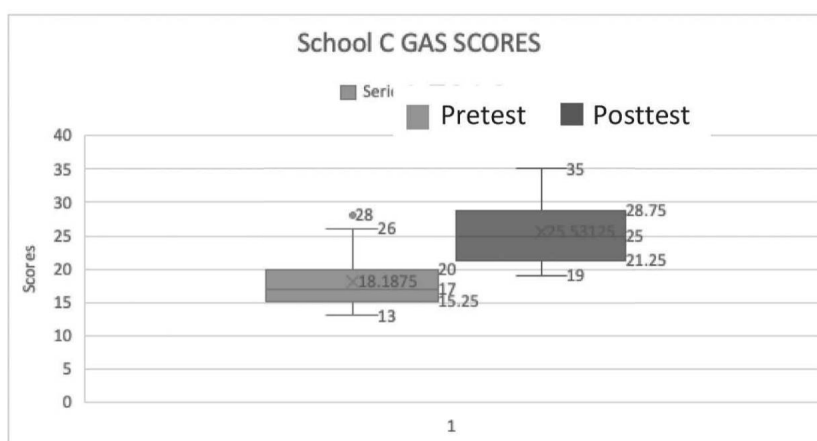


Figure 4. Pretest and Posttest Scores of School C – GAS Students

Obviously, only School C exhibits a second quartile score which is higher than the median in the students' pretest scores. *It can be seen that the second quarter scores in the pre – test is 18.1875 while the median is 17.* However, the other two schools signify a little difference between the second quartile and median.

This finding was supported by the study of Christmas, Kudzai, and Josiah, (2013) which emphasized the teacher's important role as the guide or expert person whom the student would rely on for help to increase

competence and achieve the functions within his/her zone of proximal development. This indicates the teacher's responsibility to be responsive to the needs of the students on providing proper and adequate support (Donato, 1994), including upgrading the scaffolding provided or removing such depending on whether the student requires more or less assistance (Rogoff, 1990).

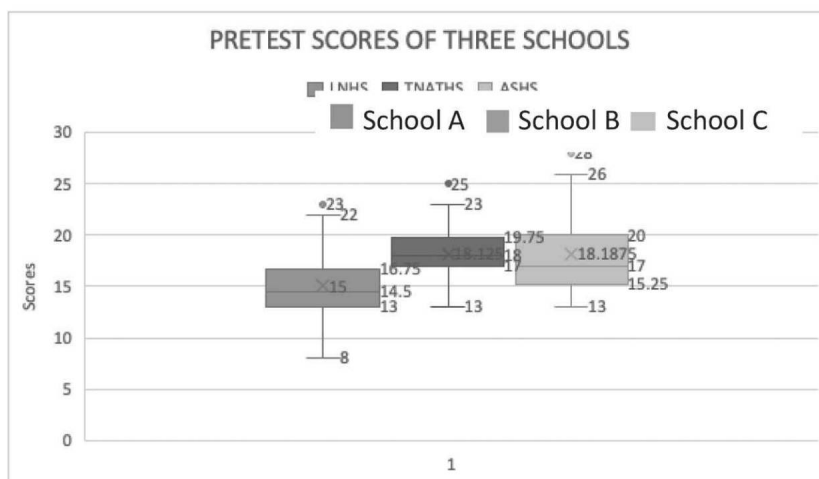


Figure 5. Comparison of the Pretest Scores of Three Schools

In the posttest, School C revealed the highest score compared to School B and School A. However, only School B obtained a second quartile score (26.5) that is greater than the median (25.875).

The study of Andrade, Lui, Palma, & Hefferen (2015) indicates that the impact of formative assessment arises from the strength of the feedback provided to students about their learning and to teachers about their teaching. According to Shute (2008, p. 154), formative feedback is information transmitted to students that allows or encourages them to organize their thoughts or behaviors in order to improve their learning.

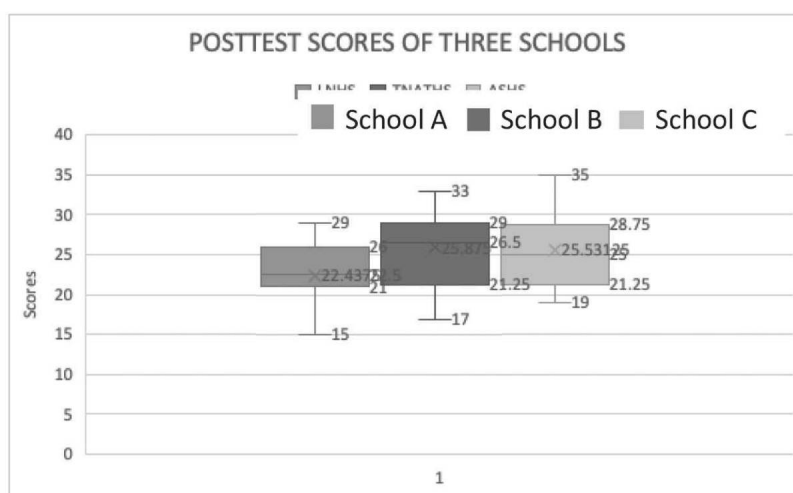


Figure 6. Comparison of the Posttest Scores of Three Schools

The data presented on the charts supported the findings of Black and William (1998) that formative assessment raises the standard of achievement, help students in self - assessment and helps low achievers and learners with learning disabilities to believe that they can still improve through feedback. Mathematics instruction and assessment can provide opportunities for students to make deeper connection, perform worthwhile tasks and apply math in their daily lives.

Per school performance of the students was used to analyze the data. The paired samples t-test was utilized in examining the data between the two schools which also determines the academic achievement of Grade 11 students. A level of significance of 0.05 determined the critical values.

The t – test of the posttest scores between School A and School B shows that the computed value of 3.410 is greater than the critical value of 1.697 when the posttest scores of School A and School B are compared implying that there is a significant difference in the students' post test score between these schools.

Table 1 t – test of Posttest Scores of SCHOOL A and SCHOOL B			
	t - computed	t - tabular	Decision
School A – School B	3.410	1.697	<i>Reject Ho</i>
Significant at $\alpha = 0.05$			

Table 2 shows the computed value of 2.800 which is greater than the critical value of 1.697 implying that differences in the posttest scores of the students between these schools are significant.

Table 2 t – test of Posttest Scores of SCHOOL A and SCHOOL C			
	t - computed	t - tabular	Decision
School A – School C	2.800	1.697	<i>Reject Ho</i>
Significant at $\alpha = 0.05$			

Table 3 reflects the computed value of 0.334 which is lower than the critical value of 1.697 at 5% significant level which shows that there is no significant difference among the posttest scores of the students in these schools.

Table 3 t – test of Posttest Scores of SCHOOL B and SCHOOL C			
	t - computed	t - tabular	Decision
School B – School C	0.334	1.697	<i>Fail to Reject Ho</i>
Significant at $\alpha = 0.05$			

The result showed that the achievement of students in mathematics significantly improve after formative assessment was given to them. However, the low scores obtained by the students both in the pretest and posttest also provides information that they still obtained low performance as reflected in the box plots and the table above.

One defining factor on this low achievement of students can be gleaned from a very difficult assessment tool. Chappius and Chappius (2007) supports this claim and stressed that the range of assessments in class as a way to guide instruction and to authentically determine students' mastery offers many advantages far beyond higher test scores. *Some teachers use assessment as a punishment for misbehaving students which cause loss of validity and reliability of assessment leading to a very difficult test items that tortures the students especially those who belong to a lower and average level learner.*

With this notion in mind, assessment tool was revised deleting items with very high difficulty index shown in the box plots below. *This action will definitely retain the consistency and validity of the results regardless of the level of understanding of the learners.*

The academic achievements of the students where formative assessment practices were applied were found to be significantly higher than those where no formative assessment practices were applied.

Figure 7 summarizes the comparison of the posttest scores of the three schools after deleting ten items with very high difficulty index.

As seen in the figure, School C registered the highest posttest score while School A was the lowest. However, School B and School A showed second quartile score that is greater than the median as compared to School C.

This result was supported by the study conducted by Tekin (2010) which found that formative assessment practices in mathematics class significantly increased student's attitudes towards mathematics. According to Irons (2008), formative assessment improved students' attitudes toward learning because it focused primarily on helping students understand their learning levels.

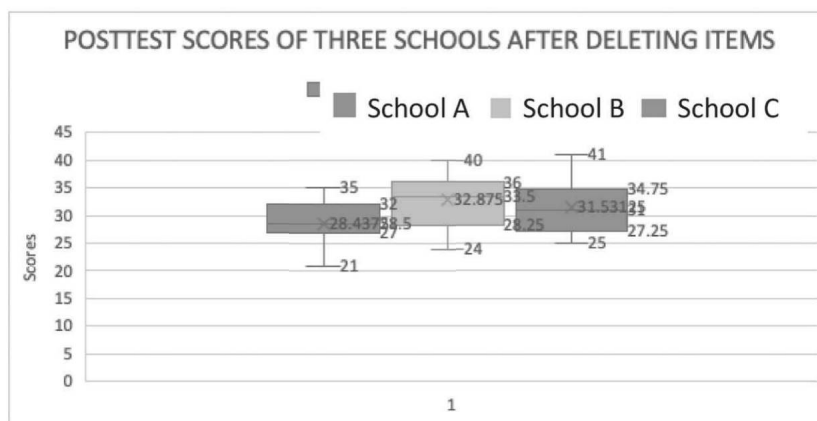


Figure 7: Comparison of the Posttest Scores of Three Schools After Deleting Items 2, 3, 5, 19, 22, 23, 26, 41, 47, and 48.

Table 4 presents the t – test of the posttest scores between School A and School B after deleting ten items with very high difficulty showing that the computed value of 2.402 which is greater than the critical value of 1.697 implied that there is a significant difference in the posttest scores of the students between these schools.

Table 4	t – test of Posttest Scores of SCHOOL A and SCHOOL B After Deleting Items 2, 3, 5, 19, 22, 23, 26, 41, 47, and 48		
	t - computed	t - tabular	Decision
School A – School B	2.402	1.697	<i>Reject Ho</i>
Significant at $\alpha = 0.05$			

The t – test of the posttest scores between School A and School C after deleting ten items with very high difficulty index revealed a computed value of 2.800 that is greater than the critical value of 1.697 which inferred that the differences in the posttest scores of the students between these schools are significant.

Table 5	t – test of Posttest Scores of SCHOOL A and SCHOOL C After Deleting Items 2, 3, 5, 19, 22, 23, 26, 41, 47, and 48		
	t - computed	t - tabular	Decision
School A – School C	2.800	1.697	<i>Reject Ho</i>
Significant at $\alpha = 0.05$			

The computed value of 1.305 is lower than the critical value of 1.697 at 5% significant level showed that there is no significant difference among the posttest scores of the students in these schools.

Table 6	t – test of Posttest Scores of SHOOOL B and SCHOOL C After Deleting Items 2, 3, 5, 19, 22, 23, 26, 41, 47, and 48		
	t - computed	t - tabular	Decision
School B – School C	1.305	1.697	<i>Fail to Reject Ho</i>
Significant at $\alpha = 0.05$			

Guide questions as interview guide was also used to further gather data on the beliefs of teachers and students about assessments and their purposes.

Teachers' Beliefs about Classroom Assessment

Teachers' responses on the interview guide revealed seven beliefs concerning classroom assessment listed as follows:

1. Assessments which take place informally in the class are the best ways of assessing students' performance. Unplanned assessment clearly determines the readiness of the students to learn.
2. Informal assessments are a waste of teaching time. It is an additional job especially informal assessment has to be recorded and graded.
3. Assessment is a joint venture between teachers and parents. Parents should also participate in knowing how their children performs in school.

4. Assessment encourages students to look critically on their own classroom performances. Teachers believe that positive feedbacks should always be given to the students to motivate to learn.
5. Assessments in the form of direct observation reduces students' academic achievements. Some teachers might focus on observing how a student performs rather than doing authentic assessments to determine the academic achievement of the students.
6. Assessment pressurizes teachers to complete their syllabi or lesson plans.
7. Assessments, in the form of formal tests, makes a negligible contribution to student learning.

Student's beliefs about assessment

Students' responses on the guide questions showed that they are strongly influenced by the form of assessment they expect.

The strategic approach to learning was also found to be sensitive to the assessment procedures used and/or expected. This is because of the belief of the students that teachers have the final say on such indicators of academic success such as student grades, hence, it seems to be reasonable that students seek information and form opinions about 'what the teacher wants'.

Within the context of assessment, students' responses revealed four student-centered factors occurring as follows:

- (a) Students' valued self-management and, generally examinations were seen as less supportive of its development. Deadlines were not seen in themselves as helpful.
- (b) Assessment, seen by the students as a powerful motivator, was regarded as a major vehicle for learning.
- (c) In order to help them learn, students wanted to know what was expected of them and a clear assessment criteria.
- (d) Students closely linked the provision of feedback with support.

Students often reacted very negatively when they discussed what they regarded as 'normal' or traditional assessment. When students considered new forms of assessment, their views of the educational worth of assessment changed. *Students usually considered a form of assessment to be new when it is not usually or commonly used in the teaching and learning set up. Hence, when a new form of assessment was introduced, they usually feel negatively about it.*

Many students believed that traditional assessment tasks are arbitrary and irrelevant. Traditional assessment is believed to be inappropriate as a measure, because it appeared, simply to measure your memory, or in case of essay- writing tasks, to measure your ability to marshal lists of facts and details.

Alternative assessment was believed to be fairer because it appeared to measure qualities, skills and competences which would be valuable in contexts other than the immediate context of assessment.

The issue of fairness, from the student perspective, is also a fundamental aspect of assessment which is often overlooked or oversimplified by the teacher. To students, the concept of fairness frequently embraces more than simply the possibility of cheating

Students expressed the view that traditional assessment is an inaccurate measure of learning. When discussing alternative assessment, many students believed that success more fairly depended on consistent application and hard work.

Alternative assessment was fair because it was perceived as rewarding to those who consistently make the effort to learn rather than those who rely on cramming or a last-minute effort.

It can be concluded that students' beliefs of poor learning, lack of control, arbitrary and irrelevant tasks in relation to traditional assessment contrasted sharply with their belief of high-quality learning, active student participation, feedback opportunities and meaningful tasks in relation to alternative assessment.

Implications

The frequency scores of the Grade 11 students improved after the interventions were given by the teachers. This served as a proof of the significance of providing assessments in classroom instructions.

Furthermore, the result of the study confirmed the need to really implement the policy guidelines on classroom assessment for the K - 12 Basic Education Program stipulated in Dep - Ed order No. 8, series of 2015.

Recommendations

Based on the findings and conclusion of the study, the following are recommended:

1. Teachers should give students' opportunities to show what they know through varied and frequent assessments.
2. Teachers are encouraged to attend seminars and trainings on teaching strategies and interventions to improve their teaching methods.
3. Teachers should provide focused and targeted feedback to their students. The feedback should highlight gaps in understanding and specifically to inform students on how they can improve their learning rather than listing where they get wrong.
4. Teachers should provide corrective activities and achievement activities as appropriate

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Innovative School Experiments

Reviewer's Comments/Suggestions and Author's Actions

Comments/Suggestions	Action Taken
Page 5- Figure 5- The colour for school C should match.	Complied
Page 5- Figure 5- The colour for school C should match.	Complied
The scores of second quartile scores in the figures and the median should also be mentioned in the text to make the statistical information clearer.	This is a very good suggestion which the author failed to see. However, those findings have been already complied (<i>those which are written in italics – pages 5, 7, 8</i>).
APA format should be followed.	Complied
Please refer the statement on page8 which says- <i>One defining factor on this low achievement of students can be gleaned from a very difficult assessment tool. Chappius and Chappius (2007) supports this claim and stressed that the range of assessments in class as a way to guide instruction and to authentically determine students' mastery offers many advantages far beyond higher test scores.</i> The author then deletes test items of very high difficulty index based on this assertion. However, the above statement (in italics) needs to be drafted in such a way that the resulting action taken by the researcher must evolve from it.	Complied (<i>those which are written in italics – pages 10 – 11</i>).
The pretest and the post-test items should of the same difficulty level. But the researcher seems to have made modifications in the post test paper only. Needs explanation for this.	This is again a very good comment from the reviewer. But the author would like to point out that pre – test and post – test is of the same difficulty level. However, in support to the claim of the study <i>by Chappius and Chappius (2007)</i> , the revision of the test was done and another set of tests was given to the respondents. For those which are not complied, the author will be looking to incorporate all these great suggestions/comments in the future paper.
The 'new forms of assessment, or 'alternate assessments' perceived by the students (page 8) should be elaborated.	Complied (<i>page 13 – Italicized</i>)
Language editing is needed at some places. For example, <i>provides information that they still obtained low performance</i> (page 6).	This is another great observation. The author and the language editor might have failed to see this. Hence, occurrence of similar lapses will be prioritized by the author in the next paper to be submitted for publication.