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## **CURRICULUM COMPACTING: DIFFERENTIATING ALGEBRA SYLLABUS ACCORDING TO THE READINESS LEVELS OF GIFTED STUDENTS**

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## Abstract

*Gifted learners are unique, in the way they learn i.e. in processing new information and knowledge. Because of their uniqueness, teachers need to identify their learning preferences prior to lesson planning, and differentiate their instruction accordingly with appropriate classroom strategies. This study investigated a differentiation strategy called curriculum compacting, which was applied in the teaching of Algebra among gifted students. Curriculum compacting allows learners who have the potential to pursue higher level or more advanced topics at faster rate. Of the national standard, Algebra I, II, and III are introduced to Form 1, Form 2, and Form 3 respectively. However, at Kolej PERMATApintar, Algebra I, II, and III were compacted, in accordance with the gifted students' learning preferences i.e. readiness levels, and taught to Form 1 gifted students. A total of 166 Form 1 gifted students participated in this experimental study. Test results were gathered and analyzed representing the effect of curriculum compacting on the gifted students' achievement. The findings revealed that 38.6% students had excellent understanding of the compacted Algebra syllabus (marks between 85-100), 44% achieved good understanding (marks between 65-84), 11.4% had moderate understanding (marks between 50-64), and only 6% had poor understanding (marks between 0-49). From this study, we can conclude that curriculum compacting is a beneficial differentiation technique for gifted students in the teaching and learning of Algebra.*

### Keywords

Curriculum Compacting, Gifted Learners, Algebra Syllabus, Differentiated Instruction, Learning Preferences, Readiness

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## 1. Introduction

### 1.1 Overview

Gifted children are unique and require parents and educators to modify both home and school environments to meet their demanding desire and need to know. Gifted students often possess an intense desire to learn, and this has something to do with their learning preferences. Their ability to think at abstract levels earlier than their peers and form their own ways of thinking about problems and ideas indicate that intellectually gifted students need advanced content and choice in learning activities. Gifted students' high energy levels and ability to extend the range of projects signify that certain teaching and learning approaches may be appropriate for

them such as independent study or learning that can be an option for differentiating instruction for these students (Sandra, 2006).

Because of the unique characteristics gifted students possess, teachers need to be aware of the ways in which these attributes manifest themselves in observable classroom behaviors. Some behaviors can be troubling to the classroom teacher; however, being aware of their root causes will help teachers to better meet the needs of gifted students and build positive relationships vital to meaningful classroom experiences (Sandra, 2006).

It is an honorable challenge for educators now that the need of each student has to be addressed. It is undoubted that every learner requires all the opportunities to learn, grow, and be challenged, yet every one of them differ in their learning needs. Students who are identified as exceptional, gifted, and talented definitely require specific attention. With proper nurturing and optimal education, gifted and talented students shall be able to make unique contribution to their communities and the world. Davis and Rimm (2004) stated that, “when this does not happen, the price we pay is the lost of academic growth, creative potential and sometimes enthusiasm for educational success and eventual professional achievements and substantial contributions to society” (p.?).

Meeting the diverse needs of gifted and talented mathematics students can be achieved using many different strategies. Based on Christine (2013), one of the support for the gifted learners is compacting curriculum. Curriculum compacting - where learning is pre-assessed and content compacted or streamlined to eliminate repetition or allow for faster pace of progress through new or more advanced materials (Christine, 2013).

This method compacts all the topics of a syllabus into one or lesser units. In a normal school in malaysia , the syllabus for Algebra I, II and III are taught at different levels, which they are taught based on the age of the students. As an example, for Algebra I, the syllabus is taught during Form 1 which are at the age of 13 while Algebra II at the age of 14 and Algebra III at the age of 15. For the purpose of this study, all these Algebra syllabus are compacted for the gifted learners . This compacted syllabus was taught within one month to the Form 1, or 12 and 13 years old gifted students. The main purpose of this study is to know the level of understanding of gifted learners in learning Algebra with the higher level of difficulty, which is normally taught to form 2 and form 3 students, using the compacted syllabus. Students are evaluated based on their

test results in order to know their understanding. The students' results indicate their degree of understanding and achievement .

## **1.2 Objective**

The objectives of this study are:

- To investigate the difference in the test results according age.
- To investigate the difference in the test results according gender.
- To examine the relationship between the test results and age.
- To examine the relationship between the test results and gender.
- To know the overall understanding of gifted learners in learning algebra

## **2. Literature Review**

Gifted learners have the ability to generalise, to work with abstract ideas, and to synthesise diverse relationships more than non-gifted students (Clark, 1992). Gifted learners also display persistence in an area of interest, have an unusually well-developed memory, early language development, curiosity, preference for independent work, and the ability to generate original ideas (Baska, 1989). Gifted learners possess particular intellectual and affective needs that necessitate a special education program (Chessman, 2007). Not only that, Chessman (2007) also mentioned that gifted learners do not only think differently but also feel differently.

Other compacting methods are needed for situations where the curriculum is new, but students who are highly able or gifted and talented can learn it much more quickly compared to other students of similar age (Christine, 2013).

Curriculum compacting is one of the differentiation techniques. It allows teachers to tailor a particular given curriculum in accordance with students' current ability, or readiness levels. After determining the areas or topics mastered by the students, teachers can replace those areas or topics with more advanced ones, or provide enrichment content or activities.

Curriculum compacting is a technique for differentiating instruction that allows teachers to make adjustments to curriculum for students who have already mastered the material to be learned, replacing content students know with new content, enrichment options, or other activities. According to Renzulli and Reis (2014), teachers can first identify the expected goals or outcomes of a particular unit or lesson provided in the syllabus, followed with assessing the

students' mastery levels, and this information will assist teachers in making decision of what topics or units of the syllabus to be omitted and replaced.

In effect, curriculum compacting contributes to positive outcome of students' performance. In reality, gifted students do not receive actual or sufficient lesson differentiation and this leads to redundancy in learning i.e. doing what they have already mastered, hence the boredom effect or static performance. Thus, curriculum compacting is the channel whereby teachers play the role in preparing a syllabus with optimal units or topics designed based on the students' information while simultaneously ensures equal learning opportunity for every student. Research has shown that students will end up with frustration, boredom and, ultimately, underachievement if they were given what they already know (Renzulli & Reis, 2014).

Reis et al. (1993) conducted a national study on curriculum compacting and revealed that the group of students who received compacting in science and mathematics performed significantly better in the post tests than the students in the control group. This suggests that curriculum compacting contributes to increase in the standardized achievement assessments. Additionally, the study also revealed that the students felt that the newly given curriculum was more challenging (Reis et al., 1993).

Gifted and talented students are diverse learners who learn things differently. They have their own learning styles, abilities and interest towards the subject. Due to this diversity in learning profile, it creates a challenge for teachers to cater the needs of these gifted learners. The quality of instruction and activities in the classroom are the keys to challenge the capability of the gifted and talented students. Besides, the gifted and talented students also have the high ability to understand the information very quickly and easily, in which it might create unexciting learning environment if the lesson is too easy for them. It is also worrisome if the gifted and talented students find the lesson too hard. Thus, it is the role of the teachers to implement and apply Differentiated in the classroom. Differentiated Instruction has a strong theoretical basis that includes constructivist theory, brain-based research and multiple intelligences (Felder & Soloman, 2004; Gardner, 1993; Vygotsky, 1978, as cited in Jane, Moustapha & Alberta, 2017). Tomlinson has introduced the term Differentiated Instruction in 1999 and Tomlinson (2001) has mentioned Differentiated Instruction as a teaching philosophy that provides different avenues in presenting the content, making sense of ideas and assessing learning outcomes. According to Tomlinson (1999), Tomlinson (2001) and Tomlinson & Imbeau (2010) in their studies, students'

readiness, interest and learning profile are the major factors that must take into consideration in applying Differentiated Instruction?

### **3. Methodology**

This study was conducted at PERMATApintar® National Gifted Centre located in the campus of the Universiti Kebangsaan Malaysia in Bangi, Selangor. The compacted syllabus of Algebra was taught within one month. In order to come up with the the compacted syllabus, teachers differentiate the original syllabus i.e. Algebra I, II, and III through pre-assessments. From these pre-assessments, the students' readiness levels towards the sillabi were gauged providing teachers with necessary information to select and compile appropriate Algebra units, or content, into a whole compacted syllabus.

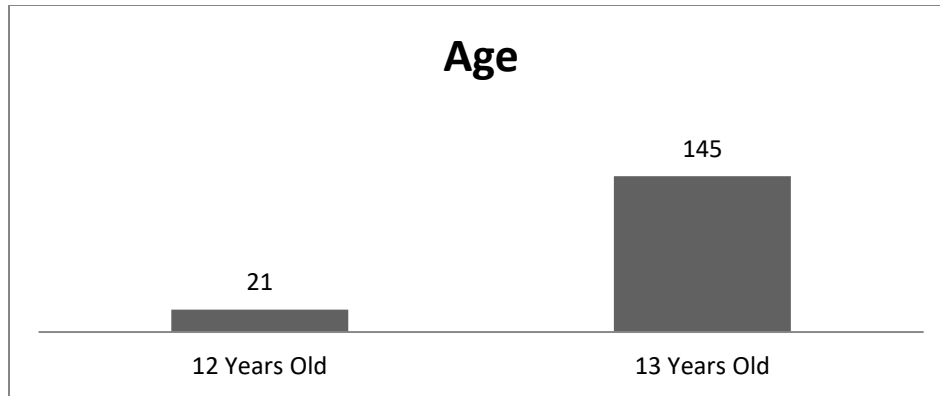
A sample of 166 students of gifted learners were selected for this study. These 166 students were divided into 10 classes and all classes were exposed to the compacted syllabus, 3 hours per week, within one month teaching and learning period. At the end of the study, the students sat for a test developed based on the compacted syllabus. The results of the test provide the degree of the students' understanding or achievement.

The data like the students' demographic information such as age and gender, and the students' test results, were keyed in to SPSS V.20. Descriptive statistics of these data were computed, providing the average, percentage, and correlations in relation to age and gender of the students. Independent sample t-test was employed to determine whether there is a statistically significant difference in the mean score for age 12 and 13 and between males and females.

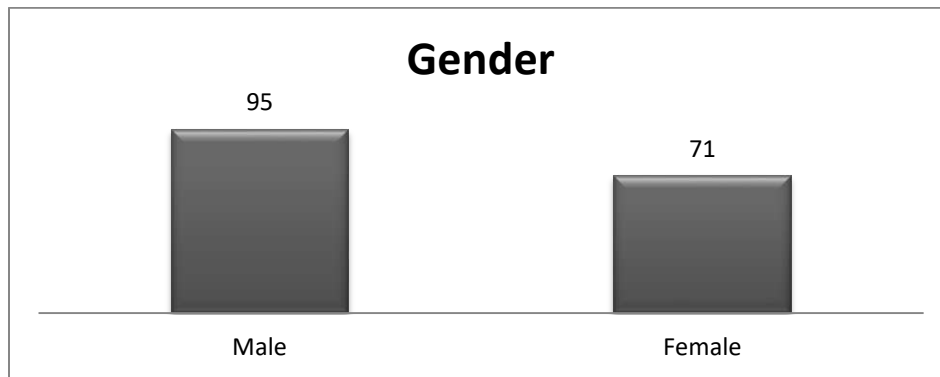
## **4. Results**

### **4.1 Demography**

This study was conducted on a sample of 166 students of gifted learners. Respondent demography can be seen in Figure 1 and 2.



**Figure 1:** Respondent Demography According to Age



**Figure 2:** Respondent Demography According to Gender

#### 4.2 Independent Sample t-test

**Table 1:** Independent Sample t-test according to age

Age	N	Percent (%)	Mean	Std. Dev	t-value	df	Sig.
12	21	13%	79.10	17.170	0.203	164	0.825
13	145	87%	78.33	15.947			

An independent samples t-test was conducted to compare the algebra marks scores for age 12 and 13. Based on the result with t-value=0.203 and sig = 0.825 ( $p > 0.05$ ), meaning that there was no significant difference in algebra marks for 12 and 13 years old. From the mean value, we can conclude that, age 12 (mean = 79.10, s.d=17.17) and age 13 (mean=78.33,s.d=15.95), there are no different mean between both age.

**Table 2: Independent Sample t-test According to Gender**

Gender	N	Percent (%)	Mean	Std. Dev	t-value	df	Sig.
Male	95	57%	78.61	16.80	0.162	164	0.351
Female	71	43%	78.20	15.109			

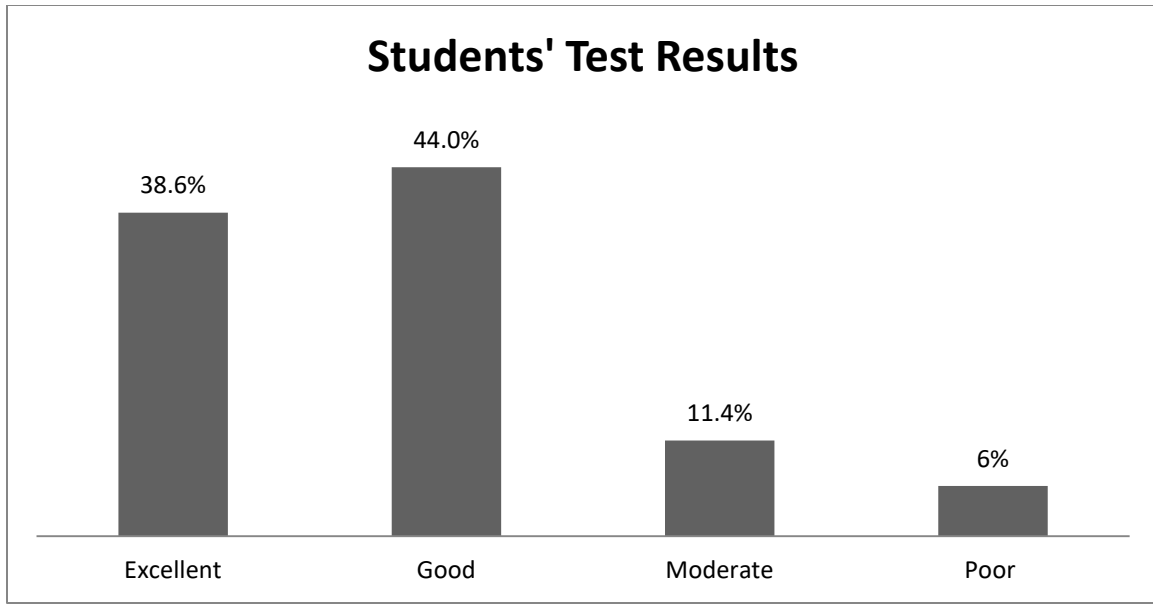
Another independent samples t-test was conducted to compare the algebra marks scores for gender males and females. Based on the result with t-value=0.162 and sig = 0.351 ( $p > 0.05$ ), meaning that there was no significant difference in algebra marks for males and females. From the mean value, we can conclude that, males (mean = 78.62, s.d=16.80) and females (mean=78.33,s.d=15.95), there are no different mean between gender.

#### 4.3 Overall Performance on Student's Understanding

**Table 3: Students' Test Results**

Age	Excellent ( 85-100 )	Good ( 65-84 )	Moderate (50-64 )	Poor ( 0-49 )	Total
12	9	9	1	2	21
13	55	64	18	8	145
<b>Total</b>	<b>64</b>	<b>73</b>	<b>19</b>	<b>10</b>	<b>166</b>
<b>Percentage</b>	<b>38.6 %</b>	<b>44.0 %</b>	<b>11.4 %</b>	<b>6.0 %</b>	<b>100</b>





**Figure 3:** *Students' Test Results*

As shown in Table 3 and Figure 3, show that the 38.6% students achieved excellent test results (Marks between 85-100), 44% achieved good test results (marks between 65-84), 11.4% achieved moderate test results (marks between 50-64) and only 6% achieved poor test results (Marks between 0-49). From this study, we can conclude that, 82.6% of students have better understanding with the Algebra syllabus even though the syllabus is quite difficult to understand by these students of 12 and 13 years old. From this results, we can also conclude that curriculum compacting is one of the differentiated strategies that can be used and suitable for gifted students in learning Algebra.

## 5. Conclusion

The results of this study highlight that curriculum compacting is one of the possible differentiation strategies that can be used in teaching gifted students. If the students can cope with this method, it suggests that gifted students can be exposed to advanced syllabus even at the earlier stage. Besides meeting the needs of gifted students and challenging them, curriculum compacting reduce boredom, increase enrichment, and the likelihood that students will pursue their interests hence advance in their learning faster.

This study concludes that the implication of the use of differentiation through curriculum compacting among the younger gifted students resulted in positive impact and encouraging

learning experience, thus students show outstanding achievements in *Algebra* fields. This compacted teaching thus maximises their actual learning potential, offers added experience which eventually support students' academic skills and set higher expectations for them.

Findings from the result showed that 82.6% of the students have good understanding on the compacted Algebra syllabus. This finding proves that compacted curriculum benefits gifted students particularly in developing their higher order thinking skills. Therefore, differentiation through curriculum compacting should be practiced in teaching gifted students towards in providing equal learning opportunity and realizing their actual potentials.

As a whole, differentiation has proven to be a solution for the issues that persist in both curriculum and pedagogy. Differentiation per se filters what should and should not go on with the students. While curriculum differentiation serves learners with appropriate syllabus content, differentiated instruction applied in a single lesson caters further into specific needs of every learner. Indeed, some studies have indicated the benefits of differentiation. Nonetheless, more studies need to be conducted, on a larger scale, broader scopes, on all academic subjects as well. In addition, although existing studies have shown the positive outcomes of differentiated instruction on achievement, however, more studies looking into its impact on student motivation are needed and this shall raise differentiation a level higher.

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