

The Effects of Enrichment Programme on Achievement of Gifted and Talented Students

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Abstract.

Enrichment is one of the methods used in the teaching and learning of gifted and talented students. This method offers an opportunity for the gifted and talented students to deepen their knowledge beyond the curriculum provided and develop their abilities in lifelong learning. The purpose of this paper is to explore the academic achievements of gifted and talented students who attended the School Holiday Camp Programme (PPCS) organized by GENIUS@Pintar National Centre, The National University of Malaysia. The study was conducted on 48 students aged between 10 to 12 years old who attended the Logical Reasoning course. Data was obtained from the pre- and post-testing taken by the students during PPCS activities. The data was then analysed to make a comparison of the pre- and post-Logical Reasoning course scores using SPSS software. Findings suggest that there was an improvement in terms of students' academic achievement from before and after attending the camp. The study also found that there was no academic achievement differences among the students based on gender. Some implication of enrichment methods for gifted and talented students will also be discussed in this paper.

Keywords: Enrichment, Gifted and Talented, Mathematics, Gender Difference

1. Introduction

Enrichment describes the experience gained from both the inside and outside of the classroom, which offers the students the opportunity to learn more than the normal available curriculum that is taught to the same age group of students. It enables a student to understand a concept more in depth than what is offered by the curriculum. Teare (1997) defined enrichment as the high quality of work compared to the normal age group, in depth understanding, broader learning experience, higher level of thinking, inclusion of various matters and additional activities, as well as the use of supporting materials and aids that are beyond the normal range of resources. Renzulli & Reis (1997) described enrichment as a learning activity that is designed to encourage creative learning outcomes from the students. Enrichment can be performed as a supplemental activity after the normal learning period or on the weekends. Examples of enrichment are research mentoring programme, additional courses on offer by non-school educational institutions such as the university and school holiday camps that focus on a curriculum beyond mainstream courses.

The purpose of an enrichment programme is to expand knowledge and experience, as well as further reinforcing a skill that is being learnt. Students' involvement in this programme enables them to further develop their curiosity, interest, creativity, self-reliance and leadership qualities. It also gives them the chance to be involved in making decisions for themselves, their group and community. Harry, Ansie & Johann (2017) found that several goals for an enrichment programme which are keep students enthusiastic and alleviate boredom; offer a challenge to students; provide an opportunity for self-activity; provide deeper mathematical understanding; help students discover their potential and stimulate personal growth; and raise appreciation of mathematics. Around the world, the enrichment programme is one of the approaches used to plan a curriculum for gifted and talented students. This is because gifted and talented students require a challenging curriculum that can fulfil their needs that are different compared to other students, one that suits their unique and exploratory nature. Furthermore, this programme also helps the teachers in planning teaching strategies that are suitable with the ability level of gifted and talented students.

2. Concept of Enrichment

A study conducted by Kulik (2003) found that accelerated and enrichment programmes for gifted and talented students have long been introduced to schools in North America. Different to an accelerated programme, the enrichment programme offered to gifted and talented students does not involve skipping grades. According to Olszewski-Kubilius & Lee (2004) and Schenkel (2002), in addition to the enrichment programme conducted in class, other enriched co-curricular activities provide more advanced learning opportunities to the gifted and talented students. Schiever and Maker (2003) stated that an enrichment programme needs to be comprehensively designed to encourage the development of students' abilities and talents.

Based on a study conducted by Echo (2013), it is imperative for the school to recognize students' needs and plan how to implement an enrichment programme. This is because, through various enrichment programmes planned by the school, the programme should be providing opportunities to students to develop expertise in certain subjects, which will ultimately improve their achievements (Roberts, 2005). A study by Suhail (2014) on gifted and talented students in Jordan found that an enrichment programme can improve their academic achievement. However, there was no apparent difference in academic achievement between the male and female students. Based on previous studies, an enrichment programme provides gifted and talented students the chance to expand their knowledge, and ultimately, develop their talents and abilities. And so, this study was conducted to observe the effectiveness of the enrichment programme on the academic achievements of gifted and talented students in Malaysia.

2.1 School Holiday Camp Programme

The School Holiday Camp Programme is one of the enrichment programmes planned to meet the needs of gifted and talented students in Malaysia. In line with the National Education Philosophy, the objectives of this programme is to develop students' current talents and abilities, holistically refine students' potential, develop students' skills and instil lifelong learning. The enrichment programme is conducted for three weeks at the GENIUS@Pintar National Centre, The National University of Malaysia. Throughout the camp, students are exposed to various academic activities, co-curricular activities such as sports and arts,

spiritual programmes according to their respective religions and class trips. Selected students are between 9 - 15 years old, of diverse ethnicity and sociocultural background, and passed PERMATApintar® UKM1 and UKM2 Screening Tests.

The programme offers courses that challenges the interest of gifted and talented students, which are not taught in schools. The courses are divided into two, namely the primary level and secondary level. In the primary level, courses on offer are Computer Programming, Becoming a Scientist, Introduction to Cryptology, Crime Scene Investigation, Fast-Paced Biology, Design, Logical Reasoning and Introduction to Robotics. Whereas in the secondary level, the courses on offer are DNA Barcoding, Camera & Telescope, Probability & Game Theory, Genetic Engineering, Cryptology, Crystal & Polymer, Statistics, Star Rangers, Clinical Lab Science, Forensic Science and Green Technology.

Each course is managed by an instructor experienced in the subject and is helped by a teaching assistant in each class. The classes begin at 8.30 a.m. and finish at 4.30 p.m. In the late afternoon, students do recreational activities with the teaching assistants. Apart from that, to enhance students' knowledge, they are also taken on trips to places such as the National Science Centre, Planetarium, Petrosains, and Taman Paku Pakis of The National University of Malaysia.

2.2 Methods

This study was conducted on 48 gifted and talented students who attended the Logical Reasoning course. The students were randomly divided into three classes, with each class consisting of 16 students. Before starting the teaching and learning process, students were required to take a pre-test. The test was done to determine their level of knowledge. A total of seven (7) topics were taught to the students, namely recursive and explicit formula, inductive and deductive reasoning, syllogism, axiomatic systems, proofs, paradox, and symbolic logic. The time allocated was three weeks. Student-based learning was used during the teaching and learning process, which consisted of group discussion, presentation of topic comprehension, and use of information technology to improve students' understanding. An assessment test, as the post-test, was given to the students every week to gauge their performance.

2.2.1 Population and sample

The study was conducted on 48 gifted and talented Malaysian students aged between 10 to 12 years old. The students' demography is presented in Table 1.

Table 1: Demography of Respondents

Demography	Profile	N	Percentage (%)
Gender	Male	20	41.67
	Female	28	58.33
Age	10 years	7	14.58
	11 years	13	27.08
	12 years	28	58.33

2.2.2 Study location

GENIUS@Pintar National Centre, The National University of Malaysia.

2.2.3 Study instruments

The instruments used in this study were pre- and post-test papers, which were used as an assessment test given every week for the three weeks that the camp was held. Students were given structured questions and 40 minutes to answer the questions.

2.2.4 Data analysis

The data obtained in the study was analysed using IBM's Statistical Packages for Social Science (SPSS) v23 software. The study was conducted using a quantitative method, where data was collected from the implemented assessments. Collected data was then analysed using descriptive analysis, t-test and One-way ANOVA test.

2.3 Results

This section will discuss the data obtained in the study to see whether or not there is a score difference before and after the teaching and learning process took place, between the genders, and based on the students' age.

Table 2: T-test for Pre-test and Post-test Scores

Test	N	Mean	Standard Deviation	Mean Difference	t-value	Significant Value
Pre	48	32.15	7.579	-24.159	-13.767	0.000
Post	48	56.31	11.210			

Based on Table 2, the mean pre-test score was 32.15 and the mean post-test score was 56.31. Study findings showed that the mean post-test score was higher than the mean pre-test score. It was found that the *t*-value for comparing the pre-test and post-test scores was -13.767 and the level of significance, $p = 0.000$. The significant value was less than 0.05 ($p < 0.05$). And so, there was a significant difference for the pre-test and post-test scores.

Table 3: T-test for Score Difference based on Students' Gender

Gender	N	Mean	Standard Deviation	t-value	Significant Value
Male	20	54.70	9.592	0.840	0.234
Female	28	57.46	12.276		

Based on Table 3, the mean score for male students was 54.70 and for female students, 57.46. Study findings showed that the mean score for female students was higher than the male students. It was found that the *t*-value for comparing the scores of male and female students was 0.840, and the significant value, $p = 0.234$. The significant value was more than 0.05 ($p > 0.05$). And so, there wasn't a significant difference for the scores between male and female students.

Table 4: Frequency Distribution, Mean and Standard Deviation of Score Based on Students' Age

Age	N	Mean	Standard Deviation
10 years	7	57.71	9.069
11 years	13	50.00	11.150
12 years	28	58.59	10.891
Total	48	56.31	11.210

Based on Table 4, the mean score for students aged 10 years old was 57.71, students aged 11 years old, 50.00, and students aged 12 years old, 58.59. Study findings showed that students aged 12 years old had the highest mean score.

Table 5: One-way ANOVA Test for Difference in Score and Students' Age

Age-Based Score	Sum of Squares	Degree of Independence	Mean Square	Value of F	Significant Value
Between Groups	718.205	2	359.103	3.115	0.054
Within Group	5188.107	45	115.291		

Based on Table 5, it was found that p was 0.054. This significant value was more than 0.05 ($p > 0.05$). And so, there wasn't a significant difference in the score and students' age.

2.4 Discussion

This study discussed the academic achievements of gifted and talented students who attended an enrichment programme in a course called Logical Reasoning for three weeks in the School Holiday Camp Programme. Based on the study conducted it was found that there was indeed a difference in students' academic achievement before and after attending the enrichment programme. Improvement on students' performance in the post-test shows that the planned activities for this particular School Holiday Camp Programme had helped them to acquire more knowledge and enhanced their talent in Mathematics. In the course of the programme, the students were continually given brain-racking questions and challenging activities that required them to work as a team to solve a Mathematical problem. This ultimately helped them to think critically and to think outside of the box.

Additionally, the instructor and teaching assistant also played an important role in the teaching and learning process, where they had to always be aware of the gifted and talented students' needs, and to always keep an open mind when talking about something. This is in line with the view of Stake and Mars (2001), the effectiveness of an enrichment activity and programme rely on the ability of the teaching faculty in conducting the programme.

3 Conclusion

The implementation of an enrichment programme provides the students with opportunities to explore new ideas and knowledge that are not learnt in regular curriculum. This can enhance their comprehension and help them apply more Mathematical knowledge in their daily lives. It is hoped that such enrichment programmes can be applied by educators everywhere in the teaching and learning process as to develop the potential of gifted and talented students.

References

- Echo H. Wu (2013). *Enrichment and Acceleration: Best Practice for Gifted and Talented*. Gifted Education Press Quarterly, 27, 1 – 8.

- Harry Wiggins, Ansie Harding & Johann Engelbrecht (2017). *Student enrichment in mathematics : a case study with first year university students*. International Journal of Mathematics Education in Science and Technology. vol. 48, pp. 16 – 29.
- Kulik, J.A. (2003). *Grouping and Tracking*. In N. Colangelo & G.A. Davis (EDS), Handbook of Gifted Education (3rd ed., pp. 219 – 228). Boston, MA : Allyn & Bacon.
- Olszewski-Kubilius, P. & Lee, S. (2004). *Parent perception of The Effects of The Saturday Enrichment Program on Gifted Students' Talent*. In N. Colangelo & G.A. Davis (EDS), Handbook of Gifted Education (3rd ed., pp. 219 – 228). Boston, MA : Allyn & Bacon.
- Roberts, J. (2005). *Enrichment Opportunities for Gifted Learners*. Prufrock Press.
- Schenkel, L.A. (2002). *Hands on and Feet First: Linking High-Ability Students To a Marine Scientist*. The Journal of Secondary Gifted Education, vol. 13, pp. 173 – 191.
- Stake, J, & Mares, K. (2001). *Science Enrichment Program for Gifted High School Girls and Boys*. Journal of Research in Science Teaching, vol. 38, 1065 – 1088.
- Suhail Mahmoud Al-Zaubi (2014). *Effects of Enrichment Programs on the Academic Achievement of Gifted and Talented Students*, Journal for the Education of the Young Scientist and Giftedness, vol. 2, pp. 22 – 27.
- Teare, B. (1997). *Effective Provision For Able and Talented Children*. Stafford: Network Education Press.