World Academy of Science, Engineering and Technology
International Journal of Educational and Pedagogical Sciences
Vol:12, No:10, 2018

Gender Differences in Biology Academic Performances among Foundation Students of PERMATApintar® National Gifted Center

N. Nor Azman, M. F. Kamarudin, S. I. Ong, N. Maaulot

Abstract**—**PERMATApintar® National Gifted Center is, to the author's best of knowledge, the first center in Malaysia that provides a platform for Malaysian talented students with high ability in thinking. This center has built a teaching and learning biology curriculum that suits the ability of these gifted students. The level of PERMATApintar® biology curriculum is basically higher than the national biology curriculum. Here, the foundation students are exposed to the PERMATApintar® biology curriculum at the age of as early as 11 years old. This center practices a 4-time-a-year examination system to monitor the academic performances of the students. Generally, most of the time, male students show no or low interest towards biology subject compared to female students. This study is to investigate the association of students' gender and their academic performances in biology examination. A total of 39 students' scores in twelve sets of biology examinations in 3 years have been collected and analyzed by using the statistical analysis. Based on the analysis, there are no significant differences between male and female students against the biology academic performances with a significant level of $p = 0.05$. This indicates that gender is not associated with the scores of biology examinations among the students. Another result showed that the average score for male studenta was higher than the female students. Future research can be done by comparing the biology academic achievement in Malaysian National Examination (Sijil Pelajaran Malaysia, SPM) between the Foundation 3 students (Grade 9) and Level 2 students (Grade 11) with similar PERMATApintar® biology curriculum.

Keywords**—**Academic performances, biology, gender differences, gifted students.

I. Introduction

GIFTEDNESS is often defined as high intelligence of thinking. However, it is not limited and focused only on intelligence, but includes a range of giftedness from other domains of ability [1]. Students, who have been identified as gifted and talented, have different ways of thinking and learning [2]. PERMATApintar® National Gifted Center of Malaysia has designed a special education program to suit the needs of Malaysian gifted students. This center emphasizes on a science, technology, engineering, mathematic (STEM) education as it is parallel to our mission - to be a fountain of inspiration for STEM and research in gifted and talented education. This center prepares students to experience the culture of studying at higher education institution [3], [4].

A. School Biology Curriculum

Most of the students who enrolled into this program showed excellence in academic results from their previous schools and they are also fast learners. From record, the youngest student in this enrollment was at the age of 11. The enrollment of these students is based on the identification and selection through three standardized assessments including the online intelligence test [3], [4]. The current national curriculum offers the STEM subjects; Biology, Physic, Chemistry, Mathematics only at Form 4 level, that is, at the students' age of 16. To fulfill the learning needs of these gifted students, this center provides a challenging and extended curriculum by offering the STEM subjects during Foundation 1 using the national curriculum as the core. A standard science curriculum that is currently used in the normal school may not be sufficient for the gifted students, as they need more challenging curriculum to fit and encourage their ability.

In the context of biology subject, most of the Foundation 1 students have basic knowledge of science in their former primary schools. From our observation, most of the students have faced difficulty to learn and understand the concept of biology in the first 3 months. This might due to the time needed to adapt with the transition between different languages (Malay to English) especially when involving the usage of scientific terms. This is parallel to the research conducted by Noriah et al., which claimed that the students were struggling to cater the subjects that were taught in English [4]. Besides that, learning biology at an early age requires them to imagine and visualize about the idea of a particular topic, for example, in the topic of the structure of a cell and its organelle, students learnt through making a model of a cell and explained the functions of organelle, instead of memorizing it all. This is also a challenge to the teacher in order to facilitate and guide the students to learn biology in a smart and fun way. As mentioned by Osman and Yunus, it is crucial to consider the students' needs in planning the curriculum that can well-suit into their level of performances and capabilities, which they may not receive in any other ordinary school [5].

NorAzman, N. is with the PERMATApintar® National Gifted Center of Malaysia in National University of Malaysia (phone: +603-89217572; fax: +603-89217525; e-mail: nurulnisa@ukm.edu.my).

Kamarudin, M.F. is with the PERMATApintar® National Gifted Center of Malaysia in National University of Malaysia (phone: +603-89217568; fax: +603-89217525; e-mail: fadzil_kamrudin@ukm.edu.my).

Ong, S.I. is with the PERMATApintar® National Gifted Center of Malaysia in National University of Malaysia (phone; +603 – 8921 7517; fax: +603-8921 7525; email: ongsying@ukm.edu.my)

Maaulot, N.is with the PERMATApintar® National Gifted Center of Malaysia in National University of Malaysia (phone; +603 – 8921 7565; fax: +603-8921 7525; email: noorlinmaaulot@yahoo.com)

A differentiated learning approach is implemented to nurture the education needs for gifted student in PERMATApintar. The basic idea of differentiating learning strategy is that the students are grouped according to their level of knowledge of that topic, prior to that, the students will sit for pre-test for each topic [3]. Table I shows an example of lesson plan in differentiating the biology curriculum. Every student will be grouped based on their understanding of the topics. This kind of approach gives opportunity to the students to increase their learning of higher order skills which preferably match the students' cognitive strength [6]. The teachers received a special pedagogical training on differentiated teaching strategy for gifted learners. The differentiating strategy not just focuses on the content, but it includes all the teaching and learning components such as the teaching process, the learning outcomes or the learning environment depending on the students' level of understanding [4].

B. School Examination System

This center practices 4-time-a-year examination system conducted in March, May, September and November. This kind of examination system is to monitor the students' academic performances throughout the year, as supported by Noriah et al. [4]. This system allows teachers to gauge the students' capabilities in the topics and implement academic interventions. The interventions are not limited to underachievers only, but are also necessary for gifted students with outstanding academic performance as well. Underachiever is always related to low potential of performing at an expected level of academic performances [7].

TABLE I
EXAMPLE OF THE LESSON PLAN: DIFFERENTIATING THE BIOLOGY CURRICULUM

Chapter: Inheritance

Modified Outcome	Core Outcome	Extended Outcome 1	Extended Outcome 2
At the end of the lesson, students should be able to: • solve the problem of inheritance pattern of ABO blood group and the presence Rhesus factor	At the end of the lesson, student should be able to: • construct the schematic diagram on the inheritance of ABO blood type and Rhesus factor. • Explain the effects of having Rhesus factor in human blood.	At the end of the lesson, student should be able to: • consider the blood type transfusion with the presence of Rhesus factor (blood compatibility)	At the end of the lesson, student should be able to: • propose the good and bad of having Rhesus factor • compare the occurrence of human population that having Rhesus factor. • describe the historical background of the antigen D (Rhesus antigen)

Orientation Phase: Students will be showing a video on antigen and antibody reaction. Teacher will get the feedback from the students what they understand from the video.

Modified Activity	Core Activity	Extended Activity 1	Extended Activity 2
1. Students will be given the tutorial questions on ABO blood group and Rhesus factor.	1. Students will be given 6 different cards labelled as A, B, O (represent the allele for blood group) and (+) and (-) for rhesus factor. 2. The card will be placed randomly in a box. 3. Students will be asked to take 4 cards each randomly and pair both cards. 4. The 4 cards represent the parents' allele (genotype) 5. From the parent' genotype, students will be asked to predict the blood type of the offspring by making schematic diagram following the Mendel 1st Law. 6. The same steps are repeated with Rhesus factor. 7. Students will be asked to discuss on the disease "erythroblastocysts fetalis".	1. Students will be given the worksheet of the blood compatibility as per attached. 2. Students will be asked to conduct the activity in the worksheet. 3. Students will be asked to answer the questions on the blood transfusion based on the activity conducted.	• Students will be asked to do a search from the website of this following issues: a) Rhesus monkey vs human Rhesus b) Worldwide populations on Rhesus positive c) The nature of antigen-D and its function

Concluding Activity: Instructor will summarize and comment all the group activities.

Evaluation

Core Outcome Group	:	Students' presentation on the activity of ABO and Rheses inheritance pattern
Modified Group	:	Students' answer on the question in the activity worksheet.
Extended 1 Group	:	Students' answer on the activity worksheet of blood transfusion.
Extended 2 Group	:	Students' handwritten summarization on the Rhesus factor

In addition to low level of academic performances, they also demonstrate a negative attitude such as not submitting the assignment or not completing the task within the specific time given [7]. Hence, the teachers should review their teaching approaches to cater these underachievers. Intervention for gifted students with excellent academic performance can be done, for example, through the acceleration learning program, that is, when the students meet at least two criteria: 1) the students can gain and process information expeditiously than their peers and 2) they have catered outstandingly the advanced levels of content in subject areas [8]. Research conducted by Naik and Prabodhini implemented the acceleration program in Mathematic and English, which follows the Curriculum Model of Schieve and Maker, 2003 [9]. An interesting finding by Rayneri et al. [10] demonstrated that gifted trained and knowledgeable teachers created an

appropriate and flexible learning environment that meets the students' need, which this is the one of learning styles that excel the students to higher performance level.

Each examination score comprises of 80% of summative assessment and 20% of formative assessment. Table II summarizes the construct of each assessment.

TABLE II
SUMMATIVE AND FORMATIVE ASSESSMENT CONSTRUCT

Type of assessment	Construct	Percentage (%)
Summative	Students are given the examination question set comprises of multiple choice and open-ended question to be answered within two hours [8].	80
Formative	It is a form of continuous assessment. The task might vary according to the students' ability and topics' needed. Examples of assessment: i. Laboratory report ii. Group presentation iii. Individual task iv. Quiz/Post Test	20%
Total Score		100

TABLE III
NUMBER OF EXAMINATION AND LIST OF BIOLOGY TOPICS

Year/ Foundation	Examination	Biology Topics
2013 Foundation 1	**1**	Introduction to Biology
		Cell Structure and Organization
	2	Movement of Substances Across Plasma Membrane
		Chemical Composition of the Cell
	3	Cell Division
		Inheritance: Mendel's Law
	4	Inheritance : Sex-linked
		Variation
2014 Foundation 2	**1**	Nutrition
		Respiration
	2	Locomotion and Support
		Transport System
	3	Nervous System Part I
		Nervous System Part II
	4	Sensory System
		Reproduction and Growth
2015 Foundation 3	**1**	Plant Nutrition
		Respiration in Plants
		Plant Transport System
	2	Plant Support System
		Plant Response and Hormones
		Reproduction and Growth in Plant
	3	Dynamic Ecosystem
	4	Endangered Ecosystem

Table III shows the number of examinations and the biology topics covered in each examination. As shown in Table III, we can see that the difficulty of biology topics increased over the 3 years. As mentioned earlier, students were struggling during the first year to understand the basic concepts of biology, including the usage of English for scientific terms. When it comes to second year, we observed that students are more comfortable with biology subject, not just its content but also the assessments given to them.

C. Research Problem

Students have the perception that biology is about memorizing facts and hence it is a difficult subject [11]. This statement can be supported by the research conducted by Noriah et al. that showed majority of the students chose memorization as their main mode of learning [4]. Teacher has to play a role in creating a fun and attractive way of learning biology in class, in order to get the students' attraction, so that we can deny their misconception towards the biology subject. A research conducted by Nasr [12] found that students had increased their positive attitudes towards biology when being exposed to the fun atmosphere in class, in fact, their academic biology achievement also showed improvements.

Another reason that comes across our mind is that, girls' participation in the biology field is more than boys. As we can see nowadays, girls dominate the biology courses offered in higher institution as well as the biology-related career [11]. A review by Osborne et al. found out that boys demonstrated positive attitudes towards physics compared to biology [11]. In our research, we aim to investigate the effects of gender on students' biology academic achievement among the Foundation students of PERMATApintar® Gifted. This research comes with two following hypotheses:

- H_0: There are no significance differences between male and female students with biology academic performance based on gender
- H_1: There are significance differences of biology academic performance based on gender

The finding of this study will help the college organization especially the teachers to identify the factors that will influence students' achievements and therefore a better academic planning can be done based on students' learning preferences. Consequently, this can improve the students' performances in biology [13]. Besides that, this research could also help in the improvement of the biology curriculum that can suit the ability of the gifted students.

II. LITERATURE REVIEW

A. School Curriculum

Based on Tomlinson et al., there are multiples elements need to be considered in designing effective curriculum especially for gifted students, which include: i) lead the students to master the key information, ideas, and the basic skills of the field, ii) provide complex and critical issues and problems iii) enable to drive the students from beginner to the expert level iv) help the students to face and grasp the challenge in learning and v) prepare the students for a real world situations as the knowledge grows, changes at a complicated pace [14].

The curriculum for most gifted students has been designated using different model and approaches. The first gifted center in Malaysia, PERMATApintar® is practicing the Development Model for Gifted and Talented (DMGT) as one of the comprehensive model that could lead to the transformation of giftedness to talented [3]. This model categorized the giftedness (natural abilities) as Intellectual, Creative, Social,

Perceptual, Muscular and Motor Control [3].

The PERMATApintar® curriculum system is implementing the differentiated teaching and learning, which the learning instruction is based on the student's abilities and capabilities [4], [15]. Differentiated teaching is applied based on the higher level of Bloom Taxonomy, differentiating the curriculum is suited the needs of gifted students or individuals students to have different approaches of learning [4].

B. Gender Differences in Academic Performances

Several recent studies have taken into account the issue of gender differences in the context of science education. In general, below are the list of some factors that play a main role regarding the issue of gender equity in science education. This is in line with a research conducted by Din et al. which reviewed that [16]:

i) Stated by Browne and Ross (1991) and Murphy (1997), at the early age, boys and girls showed the contrastive interest and expectations which later may influence their perceptions of self-competence in various school subjects, consecutively, may affect their performance in science academic achievement

ii) Finding by Murphy (1991) stated that girls favor the contextual features rather than boys that lead to the issue in isolation; hence girls usually work out for more complex multivariable investigations; and finally, it leads to the misunderstanding and inability in science.

iii) Boys and girls also demonstrated the different styles of learning as mentioned by Gorman et al. (1988). At the age of 15, more boys choose to read books as books can provide them with accurate facts, while girls read to help them understand matters. The research by Olszewski-Kubilius and Turner also supports that the girl students in their sample of elementary gifted school have a strong positive attitude towards verbal subjects such as reading, more often than mathematic or science subject [17].

iv) Reviewed by Din et al. on a research by Kimbell et al. (1991) said that girls favor to collaborate with others through discussion while boys go for working independently and quickly [16].

In terms of cognitive ability, 'brain research' by Eliot (2013) as stated by Buckley, showed that male and female have differences in learning [18]. In addition, citation in the report by Buckley about the research by Burgaleta et al. (2012), investigated that male has a larger brain, and it seems to be one of the factors attributes to the males' intelligence. However, the theory revealing on brain structure was remained unclear [18].

III. Methodology

This study was conducted by collecting all the Biology Examination Scores of 39 students from 2013 to 2015. There were 4 examinations per year and a total of 12 scores for each student. The results have been analyzed by using SPSS to determine the mean differences and the association between the gender and biology academic performances of these 39 foundation students.

A. Sample

This study was conducted on a sample of 39 foundation students of PERMATApintar® Gifted School by collecting and recording the examination results in each year. Table IV shows the demographic data of the students.

TABLE IV
Demographic Data

Demography		Frequency	Percentage (%)
Gender	Male	22	43.6
	Female	17	56.4
Total		100.0	100.0

Based on Table IV, there are 22 male students and 17 female students that enrolled into the Biology examination starting from 2014 until 2016.

B. Procedures

Scores for each examination were collected and analyzed by using SPSS. The data were collected based on the examination biology result. The normality of the data was first tested by using Shapiro-Wilk test. The t-test was used to determine the mean differences and the relationship between the gender and biology academic performances. The Pearson Biserial Correlation was conducted to determine the correlation between gender and biology academic performance.

IV. Result And Discussion

Table V illustrates the mean for each examination between male and female students.

By referring to Table V, it can be seen that the mean of students' scores for each examination is different between male and female. Surprisingly, most of the examination results indicate that the male students have a higher average biology academic achievement than female students. A similar result was also demonstrated in a study conducted by Preckel et al. on mathematics [19]. They found the performance of male gifted students on a test of mathematical literacy was better than female students. Another research that could support our finding is from Din et al. [16]. They examined the gender differences in assessing students' performance in scientific literacy through Programme for International Student Assessment (PISA), and they found out that male students outperformed the female students for most of the participating countries. Similar result also indicated in the PISA assessment for mathematical literacy in 15 years old male students [19]. Many studies also revealed that boys have greater achievement in science than girls [20], [21].

To assess the normality of the data, the Shapiro-Wilk test was used as shown in Table VI. From Table VI, it shows that most of the significance values of the Shapiro-Wilk Test are greater than 0.05, thus the null hypothesis that the data came from a normally distributed population should not be rejected. There are also some significance values that are below than 0.05 indicating that the data significantly deviate from a

normal distribution.

TABLE V
MEAN OF BIOLOGY ACADEMIC PERFORMANCE IN EACH EXAMINATION

Foundation	Examination	Mean		Standard Deviation	
		Female	Male	Female	Male
1	1	68.41	62.64	12.07	13.67
	2	72.82	71.50	8.43	8.52
	3	66.65	69.27	8.25	14.03
	4	68.06	72.50	11.59	10.56
2	1	73.40	74.14	7.89	7.78
	2	75.59	79.18	7.96	7.79
	3	71.06	75.59	10.37	8.51
	4	82.00	81.59	9.63	8.45
3	1	68.24	72.50	10.35	10.23
	2	68.47	70.05	9.05	10.39
	3	67.71	69.55	10.92	13.79
	4	68.24	71.91	10.02	9.93

TABLE VI
TEST OF NORMALITY USING SHAPIRO-WILK TEST

Foundation	Examination	Sig.	
		Male	Female
1	1	0.069	0.831
	2	0.176	0.633
	3	0.780	0.293
	4	0.644	0.393
2	1	0.067	0.473
	2	0.072	0.036
	3	0.071	0.100
	4	0.027	0.012
3	1	0.188	0.151
	2	0.116	0.982
	3	0.017	0.237
	4	0.124	0.824

Table VII shows the independent sample T-test result of students in biology achievement based on gender.

The Mann-Whitney U Test is carried out to determine the significance differences between the gender and biology academic performance among the data which deviate from normal distribution as shown in Table VIII.

TABLE VII
INDEPENDENT SAMPLES T-TEST OF ACADEMIC PERFORMANCES IN BIOLOGY EXAMINATION BASED ON GENDER

Fdn.	Ex.	Mean		Standard Deviation		Sig.(2-tailed)
		Female	Male	Female	Male	
1	1	68.41	62.64	12.07	13.67	0.177
	2	72.82	71.50	8.43	8.52	0.632
	3	66.65	69.27	8.25	14.03	0.498
	4	68.06	72.50	11.59	10.56	0.220
2	1	73.40	74.14	7.89	7.78	0.776
	3	71.06	75.59	10.37	8.51	0.142
3	1	68.24	72.50	10.35	10.23	0.207
	2	68.47	70.05	9.05	10.39	0.623
	4	68.24	71.91	10.02	9.93	0.261

Note: Fdn=Foundation, Ex=Examination

TABLE VIII
MANN-WHITNEY U TEST

Fdn.	Ex.	Standard Deviation	Sig.(2-tailed)	
		Mean	Male	Female
2	2	77.62	7.78	0.776
	4	81.77	8.51	0.142
3	3	68.74	10.23	0.207

Note: Fdn=Foundation, Ex=Examination

Both Tables VII and VIII show that there are no significant differences on biology academic achievement based on gender since the p-values are more than 0.05 ($p>0.05$) for all examinations. Thus, we do not reject the null hypothesis. In brief, the mean score for male and female students is not significantly different. Besides that, the average score for male students was lower than the average score for female students in the first two examination results. This is because, when they were in Foundation 1, from our observation, the female students were very concerned and took their biology examination grade seriously. This is in accordance with the nature of girls to always compete among peers to be outstanding in class. However, this kind of competition is not clearly seen in boys as during this time, boys were not showing their maturity yet. Hence, most of the male students targeted to pass their biology examinations with only a good grade (A – or B+). On the contrary, the rest of the examination results, that is Foundation 2 and Foundation 3, showed that average score for male students was higher than the average score for female students.

As we can see in Tables VII and VIII, male students show the highest mean values and standard deviation than female students. This shows that, biology academic achievement of male students is higher than female students. However, the mean differences are not significant. Therefore, it is confirmed that there are no significant differences in biology academic achievement based on gender.

A research conducted by Azhari et al. found that significant differences existed between the students' physical level and biology academic performances based on gender [22]. Male students showed to possess higher physical level compared to female students, which showed positive association with the biology academic performances. Students with higher physical level were scoring higher in the biology examination [22].

The result from this research is exactly similar to the study conducted by Oludipe and Daniel, who found out that, there was no significant difference in academic achievement of male and female students corresponding to the cooperative learning strategy in basic science [23]. They also suggested that intervention could be implemented to increase the interest of female students in science subjects. Nonetheless, some researches contradict with these findings as they found significant differences do exist in the achievement between female and male students. As an example, the research done by Amedu, O.I revealed that, male students performed better than female when being exposed to cooperative learning method through jigsaw method [24]. Halpern in her writing, mentioned that boys and girls have almost equal scores of math and science achievement test in the United States [13].

To confirm the association between gender and biology academic performances, the Pearson Biserial Correlation test was computed as shown in Table IX. It is clearly shown in Table IX that there were no relationship between gender and students' biology academic performances ($r \leq 0.2, p > 0.05$). Since the significance p-value is greater than 0.05 (significance level at α= 0.05), it fails to reject the null hypothesis. This indicated that there were no any influences between gender and students' academic performances in biology. This result is supported by a report from Education, Audiovisual and Culture Executive Agency (EACEA P9 Eurydice) [18], that generally, small differences did exist between male and female students, compared to the similarities, especially in the achievement of science subjects [25]. Besides, a research on the impact of differentiated learning on the PERMATApintar® gifted students by Hissam et al. revealed that the motivational level between male and female students is not statistically different, which tells that the motivational level between the male and female students are at the same level, however, male showed higher motivational level compared to the female students [26].

TABLE IX
THE CORRELATION BETWEEN GENDER AND THE STUDENTS' BIOLOGY ACADEMIC PERFORMANCES

Foundation	Examination	Pearson Correlation	Sig. (2-tailed)
1	1	0.221	0.177
	2	0.79	0.632
	3	-0.112	0.498
	4	-0.201	0.220
2	1	-0.047	0.776
	2	-0.227	0.165
	3	-0.239	0.142
	4	0.023	0.889
3	1	-0.207	0.207
	2	-0.081	0.623
	3	-0.074	0.655
	4	-0.184	0.261

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

This research revealed that there were no significant differences existed in the biology academic performances based on gender among the Foundation 1 of the Malaysian gifted students. Hence, it is shown that there were no associations between the biology academic performance and gender. However, it seems that male students performed better in 10 out of 12 examinations, compared to the female students.

Based on the observations made during teaching and learning process, most of the male students faced problems in terms of commitment and attitude compared with female students. But their academic performances in biology are always better than female students. Therefore, it is suggested to find out what are the characteristics of male students that support their achievement in biology's subject compared to female students for next study.

V. CONCLUSION

This study focused only on the Foundation 1 to Foundation 3 examination results of the same students. Stronger findings could be achieved if researchers use a large population of gifted students and more numbers of examination results. This study can be connected to the learning style of the gifted students, the interest in biology subjects, and modes of teaching in the context of gender differences. The factor of cognitive ability between Malaysian gifted students can be implied in the next research to see a clear reason of gender equality in biology education.

ACKNOWLEDGMENT

The authors are thankful to the Yayasan PERMATA and Pusat PERMATApintar® Negara for funding this research. We also acknowledge the dedicated Unit of Examination as giving us full cooperation in collecting the data. Special acknowledgment goes to our Director of Pusat PERMATApintar® Negara as giving us support and endless help in completing this research.

REFERENCES

[1] Gross, M.U.M., Macleod, B, and Pretorius, M. (2007). Gifted Students in Secondary Schools Differentiating the Curriculum (2nd Ed). GERRIC. The University of New South Wales, Sydney.
[2] Sulaiman, N.A., Yunus, M.M., and Radzi, A.M. (2014). Cognitive Style in Language Learning Strategies Among Malaysian Gifted Students. *Proceedings International Conference on Gifted and Talented Education*, 86-96.
[3] Yassin, S.F.M., Ishak, N.M., Yunus, M.M., and Majid, R.A. (2012). The Identification of Gifted and Talented Students. *Procedia-Social and Bahavioral Sciences*, 55 (2012), Pp: 585-593.
[4] Ishak, N.M., Abdullah, R.T., Hassan, S.A., Simin, N., Zakaria, N.D., Hazir, N.S.M and Shah, M.S.M. (2014). Nurturing Academic Performance and Higher Order Thinking of Gifted Students through the PERMATApintar Education Program. *Proceedings International Conference on Gifted and Talented Education*, 187 – 197.
[5] Osman, W. S. W. and Yunus, M.M. (2014). The Heart, Mind and Soul of Language Learning For The Gifted. *Proceedings International Conference on Gifted and Talented Education*, 141 – 147.
[6] Van Tassel-Baska, J. What Works in Curriculum for the Gifted. *Asia Pacific Conference on the Gifted*. 18 July 2008. Keynote address.
[7] Mofield, E., Peters, M.P., and Ghosh, S.C. (2016). Perfectionism, Coping, and Underachievement in Gifted Adolescent: Avoidance vs. Approach Orientions, *Education Sciences*, 6(21).
[8] Subotnik, R.F., Kubilius, P.O., and Worrel, F.C. (2011). Rethinking Giftedness and Gifted Education: A Proposed Direction Forward Based on Psychological Science. *Psychological Science in the Public Interest*, 12 (1), 3-54. Retrieved from sagepub.com/journalsPermissions.nav
[9] Naik, M., and Prabodhini, J. (2014). "Does Accelerated Learning Work? For Which Students?" P*roceedings International Conference on Gifted and Talented Education*, 171 – 177.
[10] Rayneri, L.J., Gerber, B.L. and Wiley, L.P. (2006). The Relationship Between Classroom Environment and the Learning Style Preferences of Gifted Middle School Students and The Impact on Levels of Performance, *Gifted Child Quarterly*, Vol. 50 (2), 104 – 118.
[11] Osborne, J., Simon, S., and Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education*, Vol.25 (9), 1049-1079.
[12] Nasr, A.R. (2011). Attitude Towards Biology and Its Effects on Student's Achievement. *International Journal of Biology*, Vol.3(4), 100 – 104.
[13] Halpern, D.F. (2012). Sex Differences in Cognitive Abilities (4th Ed.) (ebook) Psychology Press Taylor and Francis Group, New York. Available at https://books.google.com.my/books?hl=en&lr=&id=ocl5AgAAQBAJ&

oi=fnd&pg=PP1&dq=halpern+sex+differences&ots=WCcPw9qofm&sig=i5tPsZ7Yfrl8cIJDL4ZD9lO878M#v=onepage&q=halpern%20sex%20differences&f=false (Accessed 3 April 2018).

[14] Tomlinson, C, A., Kaplan, S.N., Renzulli, J.S., Purcell, J., Leppien, J., and Burns, D. (2002). The Parallel Curriculum A Design to Develop High Potential and Challenge High-Ability Learners. Corwin Press, Inc. United States of America.

[15] Latip, N.A., Lani, N.N., Joli, N.S., Hissam, F.A.B., Badib, A. and Ariffin, S.A. (2014). Analysis of Differentiated Teaching and Learning Method In Additional Mathematics Among Gifted Students Using Rasch Measurement Model, Proceedings International Conference on Gifted and Talented Education, 129 – 136.

[16] Din, Y.P., Ming, M.C., and Esther, S.C.H. (2004). Hong Kong Student Achievement in OECD-PISA Study: Gender Differences in Science content, Literacy Skills, and Test Item Formats, International Journal of Science and Mathematics Education, 2, 91-106.

[17] Olszewski-Kubilius and Turner, D. (2002). Gender Differences among Elementary School-Aged Gifted Students in Achievement, Perceptions of Ability, and Subject Prefeence. Journal for the Education of the Gifted, Vol. 25 (3), 233-268.

[18] Buckley, S. Gender and sex differences in students participation, achievement and engagement in mathematics. (2016). Australian Council for Educational Research (ACER). Retrieved from http://research.acer.edu.au/learning_processes/18

[19] Preckel, F., Goetz, T., Pekrun, R., and Kleine, M. (2008). Gender Differences in Gifted and Average-Ability Students-Comparing Girls' and Boys' Achievment, Self-Concept, Interest, and Motivation in Mathematics. Gifted Child Quarterly, 52, 146 – 159.

[20] Hola, I.A. (2005). Uncovering Gender Differences in Science Achievement and Attitudes towards Science for Jordanian Primary Pupils. Damascus University Journal, Vol, 21(1), 19-53.

[21] Cakiroglu, J. (1999). Gender Difference in the Science Classroom. Journal of Education. 16-17 : 127-133.

[22] Azhari, A.M., Kamarulzaman, M.H., Faisal, R.A., Hazir, N.M., Esrati, M.Z., Lim, M.R., Joli, N.S., and Ishak, N.M. (2017). Tahap Kecergasan Fizikal Di Kalangan Pelajar Pintar dan Berbakat, E-proceeding of the 6th Global Summit on Education 2017 (GSE 2017), 187 – 197.

[23] Oludipe and Daniel I. (2012). Gender Differences in Nigerian Junior Secondary Students' Academic Achievement in Basic Science. Journal of Educational and Social Research, Vol. 2(1), Pp: 93 – 99.

[24] Amedu, O.I. (2015). The Effect of Gender on the Achievement of Students in Biology Using the Jigsaw Method. Journal of Education and Practice, Vol. 6 (17), Pp: 176 – 179.

[25] (2009). Gender Differences in Educational Outcomes: Study on the Measures Taken and the Current Situation in Europe. Education, Audiovisual and Culture Executive Agency (EACEA P9 Eurydice)

[26] Hissam, F.A.B., Kamarulzaman, M.H., Joli, N.S., and Ishak, N.M. (2017). Impak Pengajaran Terbeza Ke Atas Motivasi Pelajar Pintar Dan Berbakat Di Dalam Pengajaran Dan Pembelajaran Subjek Biologi, E-proceeding of the 6th Global Summit on Education 2017 (GSE 2017), 174 – 185.