

Malaysian Pre-University Students' Level Of Intellectual Quality

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Abstract—This study identifies the level of intellectual quality of pre-university students in Malaysia. A mixed method approach is adapted to acquire data and information from the samples and informants. A total of 500 sixth form pre-university students from 38 secondary schools in Penang was selected quantitatively. Classroom observations of pre-university classes of 8 students from 8 schools in Penang were done to obtain information for qualitative method. Data analysis using descriptive statistics and thematic analysis were used. The research findings show that the intellectual quality of pre-university students is at a moderate level with girls showing higher intellectual level than boys for all six dimensions of intellectual quality. Meanwhile, the Higher Order Thinking Skills (HOTS) and Problem Solving Skills dimensions have the most number of students at a high level compared to other dimensions. The study also showed that the students who major in religious studies shown a higher intellectual quality for all dimensions compared to those who major in science and arts. Information gain through qualitative study also found that students shows an interest in learning the subject when the teachers integrated the usage of ICT during teaching and learning session. This enhanced the students to apply HOTS as well as Problem Solving Skills. Information gathered through this study will provide new understanding and knowledge to teachers and researchers related to intellectual thoughts and pedagogical practices that can be used to improve sixth form pre-university students intellectual quality and hence help improve students' intellectual capital to keep abreast with the rapid developing country in the 21st century.

Keywords- *Intellectual Quality; Sixth Form Pre-University; Productive Pedagogy*

I. INTRODUCTION

The education system in Malaysia emphasized on the intellectual aspect as one of the learning outcomes with the goal to develop the intellectual and spiritual power of students to the maximum level (Education Development Plan, 2013). Curriculum Planning Division, Ministry of Education (CPC, KPM) (2011) focuses on building students' intellectual capacity through school curriculum that provide opportunities and encourage students to ask questions and find answers to any queries concerning the content of the subject. The content of the curriculum also encourages students to look at the relationship, anticipate events that will occur, to speculate about the possibilities, explore ideas, think literally, and constantly reflect critically about ideas, actions and outcomes of learning. Higher-order thinking skills (HOTS) has been

emphasized in the education curriculum and also in the Education Development Plan 2013-2025, which requires students to possess and apply the test hypotheses, gather data, draw conclusions and make statements skills in the learning process in the classroom.

Intellectual ability is the ability of individuals to acquire and develop the knowledge, practice and relate them to the issues and problems that arise in daily life by thinking rationally, and to deal with the problem effectively (Saifuddin Anwar, 2002; Gunarsa & Julia, 1991). In the context of human capital development, young people need intellectual ability to be more to successful and excellent as practitioners in academic, work and life field (Falk & Millar, 2002; Hambur, Rowe & Luc, 2002, Lublin, 2003). Intellectual ability have to be applied and shared by all students in sixth form pre-university level as the intellectual aspects must be owned by all students at the tertiary level (Yusliza Mohd Yusoff, 2011). This is in line with the Ministry of Education in the New Curriculum for Sixth Form Pre-University which requires teachers able to produce students who are critical thinkers, creative, critical and possess analytical mind and have a high mind exploration (Malaysian Examination Council, 2012). Intellectual aspects that need to be implemented which include communication skills, teamwork, leadership, critical thinking, problem solving, management and ethics information (Malaysian Examination Council, 2012). Previous studies found that there is a relationship between intellectual skills and academic achievement in the subjects (Poh Bee Sheen & Melissa Ng Lee Yen Abdullah, 2008; Lingard et al., 2005; Newman & Wehlage, 1996).

The relevant fact is seen in the context of pre-university students will be moved into the realm of higher education, which requires students to be more competitive. This is in line with the country's main intention in the MOE's objectives and goals of producing quality human capital in all aspects of life with a way of thinking and rational action, high civic awareness and conscious of its role to the state, society and religion (Baha 2009). Undergraduate educationers such as Battaglini and Schenkat (1987) and Katung et al., (1999) stated that learning in pre-university level is a place that requires understanding and complex ideas challenge by students. Based on studies conducted in the west, in Asia and in Malaysia in particular, the focus on increasing the intellectual skills especially critical and creative thinking skills and problem solving skills not only focused on educational institutions in

Malaysia but also for educational institutions abroad. Both of these skills are across the curriculum skills that should be mastered by all students (Rodiah Idris, Siti Rohayah Ariffin & Noriah Mohd Ishak, 2009). Study by Hazri, Nordin, Zohir, Fadhilah and Mohd Nor Isman (2009) found that students are less involved with higher-order thinking because many teachers do not encourage students to think deeply and actively involved in the classroom. Students only receive and listen to the information given by teachers in a passive state. Study findings by Nor Asniza by Ishak (2010) and Nor Asniza Ishak, Azman Mohd Noh, Saliza Kadir and Siti Noor Daud @ Othman (2012) on the pedagogical practices of Science teachers and lecturers in Penang Matriculation College showed teachers focus less on intellectual quality dimension in TnL.

A. *Dimensions in Intellectual Quality*

In carrying out a study to assess the level of intellectual quality of sixth form pre-university students, six constructs will be used based on the intellectual quality dimensions in the productive pedagogy framework (QSRLS, 2001; Lingard et al., 2001). Description of each construct are discussed in this sub topic. Six sub dimensions contained in the intellectual quality dimension of the productive pedagogical framework are (i) high order thinking skills; (ii) deep knowledge; (iii) deep understanding; (iv) constructive discussion; (v) problem solving; and (vi) metalanguage. The six sub dimensions specified are later modified by aspects contained in generic skills based on a study conducted by (Kember, 2009; Rodiah Idris, Siti Rahayah Ariffin & Noriah Mohd Ishak, 2009; Halizah Awang 2010).

B. *Research Questions*

Based on the purpose of the study, which is to investigate the intellectual quality of sixth form pre-university students, some research questions are posed:

1. What is the level of sixth form pre-university students intellectual quality?
 - 1.1 What are the sixth form pre-university students intellectual quality level for each dimension of intellectual quality?
 - 1.2 What are the sixth form pre-university students intellectual quality level when based on gender and specialization streams?

II. METHODOLOGY

A. *Research Procedures*

In this study, quantitative methods using the survey method are used to identify the intellectual quality level among sixth form pre-university students involving numbers of sample. Information obtained from the sample through questionnaires intended to collect quantitative research data. Ary and Jacob (1990) argued that the use of questionnaires could involve more respondents with greater and comprehensive coverage. In addition, the usage of a questionnaire is simpler to be administered after being well constructed and the data is also easily processed to be

analyzed (Mohamad Najib, 1999). As for the qualitative study, and observation using check list were done to identify how does the students respond towards teachers' pedagogical practices in enhancing the students' intellectual quality. Data were also collected for the purpose of triangulation with the quantitative data.

B. *Research Sampling*

Student population consists of all sixth form pre-university students from each stream that is Science, Art and Religious Studies streams in Penang. Total number of sixth form pre-university students are 3186 people (JPN Penang, 2014). Given the number of sixth form pre-university students are 3186 students (JPN Penang, 2014), by referring to Number of Samples Determination Table built by Krejcie and Morgan (1970), if the number of population is 3186 people, the number of students required is 346 students. But taking into account the concerns of the failure to recover the survey, the total sample of students was increased to 500 students. 500 sixth form pre-university students from science, art and religious studies streams were chosen using random sampling techniques for the purpose of quantitative study. As for the qualitative study, 8 students were chosen from different streams of 8 different schools in Penang using purposive sampling.

C. *Research Instruments*

Students' Intellectual Quality Survey instrument was built by modifying questionnaire developed by Lingard et al., (2001), Fields (2002), Sabaria Juremi (2003) Mills & Goos (2007), Halizah Awang (2008), Mohd Azman Zainal (2011) and Nurul Alyan Zahri (2012) related to the level of intellectual quality of students in the classroom. Researcher has modified the questions to get the correct feedback on the sixth form pre-university students' intellectual quality. Each questionnaire item is divided into six dimensions based on productive pedagogy; i) Higher Order Thinking skills; ii) Deep Knowledge; iii) Deep Understanding; iv) Constructive Discussion; v) Problem Solving; vi) and Metalanguage. The questionnaire consisted of 51 questions based on Likert scale (1 to 5). Table 1 shows the dimensions in the questionnaire together with the description and number of items for each of the dimensions. As for the qualitative study, a check list were used during the classroom observation. The check list was developed by adapting the dimensions of Intellectual Quality based on Productive Pedagogy.

TABLE 1. Students' Intellectual Quality Dimension

Dimension	Dimension Description	Item
High Order Thinking	The extent to which students involve modification of information and ideas. These modifications occur when students combine facts and ideas and able to synthesize, generalize, explain, hypothesized or concluded and translation.	7
Deep Knowledge & Deep Understanding	The extent to which students focus on idea that focus on idea or disciplines that are considered important. Students can create complex relationships between centred concepts on a topic or discipline. Students can form new information by finding relationships, solve problems, form description and make conclusions	8
Constructive Discussion	The extent to which there is a good interaction between teachers and students on the topics discussed. Interactions exist are bilateral in nature and create a shared understanding.	7
Problem Solving Skills	The extent to which students can solve problems related to a particular topic, issue or discipline given by the teacher in the classroom.	13
Metalanguage	The extent to which students use correct grammar (vocabulary, specific technical word) in the process of conversation and writing for a subject in the classroom.	5

A pilot study was conducted on 100 sixth form pre-university students in Penang. All 100 students involved in the pilot test were not involved in the actual study. Data obtained from the pilot study were analyzed using Statistical Package for Social Science (SPSS) version 22.0. Reliability test using Cronbach Alpha was conducted to see the internal consistency of the items constructed as shown in Table 2.

TABLE 2. Summary of each construct reliability in the Survey of Students' Intellectual Quality

Construct	Reliability	Conclusion
1. High Order Thinking	Alpha Cronbach = 0.74	This instrument has good reliability
2. Deep Knowledge and Deep Understanding	Alpha Cronbach = 0.81	This instrument has very good reliability
3. Constructive Discussion	Alpha Cronbach = 0.84	This instrument has very good reliability
4. Problem Solving Skills	Alpha Cronbach = 0.93	This instrument has the best reliability
5. Metalanguage	Alpha Cronbach = 0.79	This instrument has good reliability

III. RESEARCH FINDINGS

A. Demographics Findings

Table 3 shows the demographic information of students involved in this study.

TABLE 3. Demographic Information on Sixth Form Pre-university Students (Quantitative Study)

Variable	Category	Number	Percentage %
		N = 500	
Gender	Male	236	47.2
	Female	264	52.8
Race	Malay	305	61.0
	Chinese	184	36.8
	Indian	11	2.2
Type of School	SMK	179	35.8
	SMJK	170	34.0
	SMKA	151	30.2
Age	18 Years	258	51.6
	19 Years	242	48.4
Form 6	Upper	239	47.8
	Lower	261	52.2
Stream	Science	194	38.8
	Arts	148	29.6
	Religious Studies	158	31.6

Table 3 shows the 500 sixth form pre-university students who answered the questionnaire, a total of 236 people (47.2 percent) were male students and the remaining 264 (52.8 per cent) were female students. Table 3 also shows that in terms of race, a total of 305 students (61.0 percent) were Malays, 184 people (36.8 per cent) were Chinese and 11 people (2.2 percent) were Indians. Of the total respondents, 179 students (35.8 percent) were Secondary School (SMK) students, 170 students (34.0 percent) students in SMJK and 151 students (30.2 per cent) in the Religious School (SMKA).

In terms of age, there were 258 students aged 18 (51.6 percent) and the remainder, 242 students (48.4 percent) was 19 years old. A total of 239 students (47.8 percent) are the upper six form students and 261 students (52.2 percent) is lower six form students. Table 3.20 also shows that a total of 194 people (38.3 per cent) were students of science stream, 148 students (29.6 percent) from the Art stream and 158 students (31.6 percent) of the Religious studies stream.

Table 4 shows students' information for qualitative study.

TABLE 4. Students' Information (Qualitative Study)

Students	Gender	Specialization Stream
1	Male	Art
2	Female	Art
3	Female	Science
4	Male	Art
5	Male	Science
6	Female	Religious Study
7	Male	Science
8	Female	Religious Study

B. Mean Score and the Sixth Form Pre-University Intellectual Quality Level

The first objective of the study was to identify the level of intellectual quality of sixth form pre-university students. The intellectual quality of students can be divided into; (i) high order thinking ; (ii) deep knowledge; (iii) deep understanding; (iv) constructive discussion skills; (v) problem solving skills; and (vi) metalanguage. The discussion in this subtopic led to the overall level of intellectual quality, intellectual quality level comparison for each dimension of intellectual quality and comparison of the mean and intellectual quality level by sex and stream specialization. Appropriate mean score is used in analyzing the mean of questionnaires having Likert scale of 1-5. This is because the mean score takes into account the total score for all items within the same group involving scale items (Cresswell, 2014; Antonious, 2013; Hair, 2010; Chua Yan Piaw, 2009; Field, 2005; Pallant, 2001; Cohen, 1998). Total score refers to the of respondents score divided by the number of items that tested the same construct (Cresswell, 2014; Pallant, 2001)

Based on descriptive analysis it is found that the total mean score for intellectual quality of students is 147.7 (SD = 15.1). This finding shows that the mean score is approaching the maximum score value that gave the interpretation that the students studied have a high intellectual level. Table 5 presents the analysis findings of the mean scores of the intellectual quality for sixth form pre-university students. The mean and standard deviation of the data are used to obtain the three groups level to construct a questionnaire which is at low level, medium level and high level. The value of each level is obtained by using the mean score value and standard deviation gained from the analysis of univariate data.

TABLE 5. Mean Scores For Pre-University Students' Intellectual Quality In Overall And Based On Each Dimension (N = 500)

Construct and Dimension	Mean Score	Standard Deviation (SD)	Minimum Score	Maximum Score
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Overall Form university Students' Intellectual Quality	147.7	15.1	81	187
HOTS	25.8	3.1	15	35
Deep knowledge and Deep understanding	29.7	3.5	16	38
Constructive Discussion	25.3	3.4	10	35
Problem Solving Skills	48.1	6.3	20	65
Metalanguage	18.8	2.6	8	25

The analysis showed that the mean score of higher order thinking skills was 25.8 (SD = 3.1), while the mean score for deep knowledge and deep understanding are 29.7 (SD = 3.5). Moreover, mean score obtained by students in the constructive discussion skills dimension was 25.3 (SD = 3.4), the mean score of problem-solving skills dimension was 48.1 (SD = 6.3) and the last dimension of metalanguage mean score is 18.8 (SD = 2.6). These findings show that students have a good intellectual quality with the highest mean scores were for problem-solving skills dimension and the lowest mean score was for the metalanguage aspect.

Based on the mean score value and the standard deviation data, the three groups level for intellectual quality construct that is low, moderate and high levels are submitted. The value of each level is obtained by using the mean score and standard deviation values as the results from the analysis of univariate data. Students who score above 1 standard deviation (+ 1SD) from mean is in high-level group, while students who score below 1 standard deviation (-1SD) from mean is operated as a low-level group. Groups that score between 1 standard deviation above the mean and one standard deviation below the mean are the average group. Table 6 and Figure 1 describes the intellectual level quality for sixth form pre-university students groups based on three analysed levels.

TABLE 6. Students' Intellectual Quality Level (N=500)

Intellectual Quality dimension Level	Frequency	Percentage (%)
Level 1, Low (<132.6)	81	16.2
Level 2, Medium (132.6<X>162.8)	346	69.2
Level 3, High (>162.8)	73	14.6

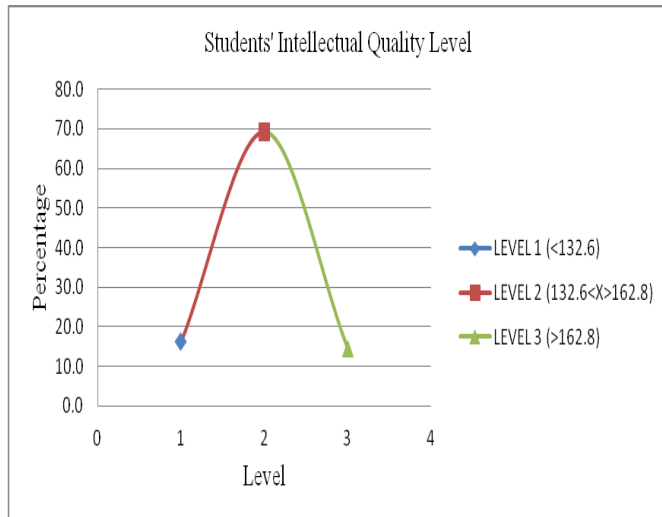


FIGURE 1. Percentage of Students' Intellectual Quality Level

Analysis showed that the majority of sixth form pre-university students that became the sample of study were at level 2 ($132.6 < X < 162.8$), which is at the average level of intellectual quality. The analysis also shows the number of sixth form pre-university students who have the high level intellectual quality is 73 students (14.6%). This shows that, there are only a few sixth form pre-university students who possess intellectual quality level that can be proud of.

C. Level of Sixth Form Pre-University Student's Intellectual Quality For Each Dimensions

This section reports the level of students' intellectual quality for each dimension contained in the construct of intellectual quality; (a) high order thinking skills; (b) deep knowledge; (c) deep understanding; (d) constructive discussion skills; (e) problem-solving skills; and (f) metalanguage based on the mean score for each dimension.

Table 7 shows a summary of the intellectual quality level of sixth form pre-university students for each of the six dimensions of the quality intellectual constructs based on mean and standard deviation.

TABLE 7. Summary Of Students' Intellectual Quality Level For Each Intellectual Quality Dimensions Table

Dimension	M	SD	Group Level	Score Range	Frequency	Percentage (%)
Higher Order Thinking Skills (HOTS)	25.8	3.1	Low Level	<22.7	83	16.6
			Medium Level	$22.7 < X < 56.8$	339	67.8
			High Level	>56.8	78	15.6

Deep knowledge and deep understanding	29.7	3.5	Low Level	<26.2	64	12.8
			Medium Level	$26.2 < X < 33.2$	376	75.2
			High Level	>33.2	60	12
Constructive Discussion	25.3	3.4	Low Level	<21.9	56	11.2
			Medium Level	$21.9 < X < 28.7$	378	75.6
			High Level	>28.7	66	13.2
Problem Solving Skills	48.1	6.3	Low Level	<41.8	67	13.4
			Medium Level	$41.8 < X < 55.0$	360	72
			High Level	>55.0	73	14.6
Metalanguage	18.8	2.6	Low Level	<16.2	65	13
			Medium Level	$16.2 < X < 21.4$	375	75
			High Level	>21.4	60	12

Based on Table 6, the analysis shows a pattern in which the level of each dimension in the intellectual quality; (i) higher-order thinking skills; (ii) deep knowledge; (iii) deep understanding; (iv) constructive discussion skills; (v) problem solving skills; and (vi) metalanguage are focused on the average group. These findings explain that the majority of sixth form pre-university students studied possess a moderate level of all six levels of intellectual ability in the classroom. Comparison of the intellectual quality dimension shows that HOTS dimension has the most high level students' percentage (15.6%) and problem solving skills (14.6%) and the percentage of the lowest high level is of deep knowledge dimension (12%), the dimension of deep understanding (12%) and the dimension of metalanguage (12%). These findings are consistent with the findings of the overall mean score for students' intellectual quality level as reported previously.

D. Sixth Form Pre-University Students' Intellectual Quality Level by Gender and Specialization Streams

This part presents the analysis findings of the mean score for the sixth form pre-university students' intellectual quality based on gender and specialization stream. Table 7 shows comparison of the mean scores of sixth form pre-university students' intellectual quality based on gender and specialization streams.

Analysis of differences in mean scores for each dimension of intellectual quality based on gender showed no significant difference in all dimensions between male students and female students. The pattern of findings suggests that the intellectual quality among female students is higher than male students. Meanwhile, comparison pattern on each intellectual quality dimensions based on specialization stream found that students who take religious studies stream showed a higher intellectual level than the arts and science stream students (HOTS, $M = 22.8$, $SD = 2.8$; deep knowledge and deep understanding, $M = 26.8$, $SD = 3.1$; constructive discussion skills, $M = 22.8$, $SD = 2.9$; problem-solving skills, $M = 44.8$, $SD = 6.2$; metalanguage, $M = 16.0$, $SD = 2.2$).

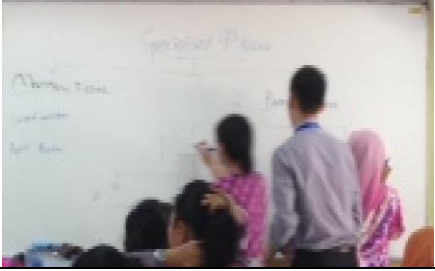

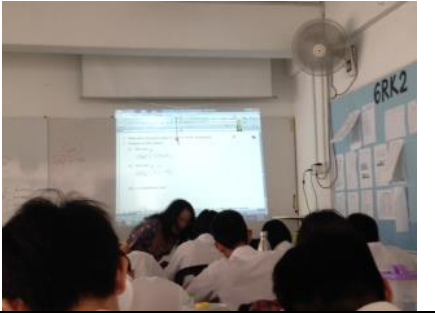

The study also makes a comparative analysis to determine the level of students' intellectual quality for each dimension by gender and specialization stream. Table 9 (see APPENDIX) shows that the level of intellectual quality among sixth form pre-university students by gender and specialization stream for the six dimensions is at a moderate level. Comparison of the number of students who are at a high level for each dimension based on gender revealed that female students have higher intellectual quality level than male students. The number of male students who have a high level of dimension at most is 41 people for HOTS dimension while the dimensions of deep knowledge and deep understanding with the fewest number of male students in the high level which is 25 people. For female students, the problem solving skills dimension shows the most number of female students at a high level with a total of 47 people while the metalanguage dimension has the least number of female students at a high level which is 29 people. In terms of specialization, the analysis found that students who took religious studies have the highest number of high intellectual quality level for each dimension of intellectual quality, followed by science and the arts stream last.

E. Qualitative Results

Information gathered from qualitative study using observation and check list shows that students respond well and managed to developed their intellectual quality during teaching and learning process.

From the check list, information shows that students shows Higher Order Thinking Skills and Problem Solving Skills the most when teachers integrated ICT in teaching and learning process. Table 8 shows photograph on some of the activities that enhanced the students HOTS and Problem Solving Skills.

TABLE 8. Photograph of Students Participation In Classroom

Photograph	Description
	Students were very good in solving problems through mind mapping and concep mapping.
	Students managed to analysed situation based on the problem given by the teachers. Students also abled to communicate well in from of the class.
	Teachers rectified misconceptions among students and assisted students for answering the questions by using ICT.
	Teacher integrated the usage of ICT in enhancing the students HOTS and Problem Solving Skills as well as introduced group discussion in the classroom.

Through qualitative data analysis, it is found that most students shows enthusiasm and have interest in learning the topic learnt in the classroom when the teachers apply the usage of ICT and giving them the opportunity to express their ideas in group discussion. This data triangulated the data found from the quantitative data analysis.

IV. CONCLUSION AND DISCUSSION

The study findings show that the sixth form pre-university students intellectual quality is at a moderate level with female students showing higher intellectual level than male students for all six dimensions of intellectual quality. Preliminary studies related to self-fulfilling prophecy, and studies related to streaming and tracking (Oakes, Gamoran &

Page, 1992), suggests that one of the main causes some students are not able to use higher order thinking skills is due to the school or educational institution do not always focus on or ask students to show good outcomes in terms of intellectual quality.

Meanwhile, the dimension of the Higher Order Thinking Skills (HOTS) and Problem Solving Skills dimensions shows the most number of students at a high level compared to other dimensions. This may be due to the content of the sixth form pre-university curriculum modified by MOE that has better content of HOTS elements and solving problems through research assignments and presentations. Students are required to prepare assignments and present the findings of the study as one of the requirements to obtain coursework marks. It is MOE's intention that through this curriculum, students can enhance the skills to analyze, synthesize, create new ideas and able to effectively communicate during discussions and presentations in class. Support from teachers is found to have successfully make students more focused in using thinking skills in the classroom.

The study also showed that the level of intellectual quality of students who took the religious studies stream is higher for all dimensions of intellectual quality than those who took the science and arts streams. Kearns (2001) study findings also show that the intellectual capacity of students can be applied or integrated into teaching and learning based on the subject taught by the teacher. Gardner (2000) stated, a teacher must be sensitive in helping students to develop multidisciplinary thinking in the areas of interest of students to make students more productive. In line with the philosophy of Islamic Education, Ministry of Education wishes to make Islamic education as an ongoing effort to deliver the knowledge, skills and appreciation of Islam based on the Quran and the Sunnah in order to mold attitudes, skills, personality and outlook on life as a servant of Allah who has the responsibility to develop themselves, society, the environment and the country towards achieving good in this world and eternal peace in the lifeafter (Ahmad Mohd Salleh, 2011). Spirit of excellence is instilled in students in the thinking, knowledge and skills form as good as possible. And also, awareness towards loving kindness and peace in the world and well-being in the lifeafter.

The teachers can also moved towards ICT savvy by integrating appropriate pedagogy in enhancing the students intellectual quality. Teachers perhaps can apply blended learning using mobile technology, online learning and social networking. Apart from that considering cooperative learning using ICT would also help enhancing the students intellectual quality in the classroom.

Thus, it is hoped, the information obtained through this study can provide understanding and new knowledge to teachers and researchers related to intellectual thoughts and pedagogical practices that can be used to improve the sixth form pre-university students intellectual quality, ultimately improving students' intellectual capital in order to par with the rapid developing countries in the 21st century.

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REFERENCES

- [1] Ahmad Mohd Salleh. (2003). Pendidikan Islam, falsafah, sejarah dan kaedah pengajaran pembelajaran. Shah Alam: Penerbit Fajar Bakti Sdn. Bhd./57.
- [2] Battaglini, D. J & Schenkat, R. J. (1987). Implications of the Perry model for classroom instruction Battaglini and Schenkat (1987).
- [3] Education Development Plan 2013-2025
- [4] Falk, I, and Millar, P. (2002). Non/Working Lives: Implications of 'non-standard for higher education (GESIHE). Conference of the Pacific Rim Objective.
- [5] Field, A. (2009). Discovering statistics using SPSS. Third Edition. London: SAGE Publications Ltd.
- [6] Gardner, H. (2000). The disciplined mind: beyond facts and standardized tests, the K-12 education that every child deserves. New York: Penguin Group.
- [7] Gunarsa, S.D. & Yulia, S.D. (1991). Psikologi praktis: Anak, remaja, dan keluarga. Jakarta: PT BPK Gunung Mulia.
- [8] Halizah Awang. (2010). Kesan pembelajaran berasaskan masalah dalam kemahiran generik di Politeknik Malaysia. Unpublished PhD Thesis. Universiti Sains Malaysia.
- [9] Hambur, S., Rowe, K. & Luc, L. T. (2002). Graduates skills assessment, commonwealth of Australia. Retrived from <http://link.springer.com/article/10.1007%2Fs10734-010-9308-8> on 16 th September 2014.
- [10] Hazri Jamil, Nordin Abdul Razak, Fadzilah Abd. Rahman, Mohammad Zohir Ahmad @ Saari & Mohd Nor Isman Ismail. (2009). Productive pedagogies for Malaysian education system: Investigating the classroom practice of Malaysian secondary school teacher. Seminar JPPG09. School of Cognitive Science and Human Development, Universiti Pendidikan Sultan Idris.
- [11] Katung, M., Johnstone, A.H., and Downie, J.R. (1999). Monitoring attitude change in students to teaching and learning in a university setting: a study using Perry's developmental model. *Teaching in Higher Education*, 4 (1): 43-60.
- [12] Kearns, P. (2001). Review of research: Generic skills for the new economy. NCVER. Adelaide.
- [13] Kember, D. (2009). Promoting student-centred forms of learning across an entire university. *Higher Education*, 58(1), ms 1-13.
- [14] Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*. 30(3): 607-610.
- [15] Lingard, B. & Ladwig, J. (2001). School Reform Longitudinal Study: Final report, vol 1, Report prepared for Educational Queensland by the School of Education. The University of Queensland.
- [16] Lingard, B., Ladwig, J., Mills, M., Bahr, M., Chant, D. Warry, M., Ailwood, J., Capeness, R., Christie, P. Gore, J., Hayes, D. and Luke, A. (2001). The Queensland School Reform Longitudinal Study. Vols. 1 and 2. Brisbane: Education Queensland.
- [17] Lingard, B. (2005). Socially just pedagogies in changing times. *International Studies in Sociology of Education*, 15(2), 165-186.
- [18] Lublin, J. (2003). Generic objectives and transferable skills: Centre for teaching and learning: Good Practice in teaching and learning. *Engineering Science and Education Journal*, 8 (4), 161-168.
- [19] Mills, M. & Goos, M. (2007). Productive Pedagogies: working in disciplines and teacher and student voices. Paper presented at 'Annual Conference of the Australian Association for Research in Education.
- [20] Nor Asniza Ishak. (2010). Amalan pedagogi produktif dalam kalangan guru Sains. Unpublished Master dissertation. Universiti Sains Malaysia.
- [21] Nor Asniza Ishak, Azman Mohd Noh, Saliza Kadir dan Siti Noor Daud @ Othman. (2012). Amalan pedagogi produktif pensyarah Sains di Kolej Matrikulasi Pulau Pinang. Prosiding Seminar Penyelidikan

- Pendidikan Peringkat Kebangsaan Bahagian Matrikulasi Tahun 2012. Hotel Langkasuka, Langkawi.
- [22] Oaks J., Gamorans A. & Page, R. (1992). Curriculum differentiation. Opportunities outcomes and meanings. In P. W. Jackson. (Ed.). Handbook of Research on Curriculum, 570-608. New York: Macmillan.
- [23] Poh Bee Thee & Melissa Ng Lee Yen Abdullah. (2008). Kesan faktor jantina, etnik dan gaya kognitif ke atas pencapaian pengajian am. Jurnal Pendidik dan Pendidikan, Jil. 23, 123-140, 2008.
- [24] Poh Swee Hiang. (2000). KBKK Kemahiran berfikir secara kreatif dan kritis. Selangor: Kumpulan Budiman Sdn.Bhd.
- [25] Queensland Shool Reform Longitudinal Study (QSRLS). (2001). School Reform Longitudinal Study. Brisbane: The State of Queensland (Department Education).
- [26] Rodiah Idris, Siti Rahayah Ariffin & Noriah Mohd Ishak. (2009). Pengaruh kemahiran generik dalam kemahiran pemikiran kritikal, penyelesaian masalah dan komunikasi pelajar Universiti Kebangsaan Malaysia. Malaysian Journal of Learning Instruction (MJLI). Vol. 6.
- [27] Sabaria Juremi. (2003). Kesan penggunaan kaedah pembelajaran berasaskan masalah dalam meningkatkan kemahiran berfikir kritis dan kreatif, kemahiran proses sains serta pencapaian Biologi. Tesis Ijazah Doktor Falsafah. Universiti Sains Malaysia.
- [28] Saifuddin Azwar. (2002). Pengantar psikologi inteligensi. Yogyakarta: Pustaka Pelajar.
- [29] Yusliza Mohd Yusof (2011). Minda Intel: AUKU melahirkan mahasiswa berfikir kritis. Retrived from http://www.bharian.com.my/bharian/articles/MindaIntel_AUKUmelahirkanmahasiswaberfikirankritis/Article/index on 2nd April 2013.

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TABLE 9. Student Intellectual Quality Level Based on Gender and Specialization Stream

Dimension	Mean	SD	Level Group	Score Range	Gender		Specialization Stream		
					Male	Female	Science	Arts	Religious Studies
					Frequency	Frequency	Frequency	Frequency	Frequency
High Order Thinking	25.8	3.1	Low Level	<22.7	40	43	36	24	23
			Medium Level	22.7<X>56.8	155	184	129	101	109
			High Level	>56.8	41	37	29	23	26
Deep knowledge and deep understanding	29.7	3.5	Low Level	<26.2	37	27	27	19	18
			Medium Level	26.2<X>33.2	174	202	149	109	118
			High Level	>33.2	25	35	18	20	22
Constructive Discussion	25.3	3.4	Low Level	<21.9	30	26	24	19	13
			Medium Level	21.9<X>28.7	177	201	150	109	119
			High Level	>28.7	29	37	20	20	26
Problem Solving	48.1	6.3	Low Level	<41.8	40	27	24	21	22
			Medium Level	41.8<X>55.0	170	190	146	103	111
			High Level	>55.0	26	47	24	24	25
Metalanguage	18.8	2.6	Low Level	<16.2	40	25	29	22	14
			Medium Level	16.2<X>21.4	165	210	140	110	125
			High Level	>21.4	31	29	25	16	19