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Measuring Current Attitude towards Science of Matriculation Students involved in Innovation Competition through Project-based Learning in Malaysia.

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Abstract: Project-based learning (PjBL) through innovation competition and science project is a form of approach that requires students to tackle problems by producing some sort of product as their learning artifact. Through this artifact, students act as problem-solvers, decision makers, researcher and innovators. PjBL is a type of inquiry-based learning that is motivated mainly by the curiosity of students and the search for the truth. The aim of this study is to (i) measure the attitude towards science of matriculation students that involved themselves in innovation competitions and (ii) compare the level of attitude towards science of students involved in innovation competition in matriculation colleges versus the national average for Malaysian matriculation students in general. The five dimensions measured are (i)students' perception of their science teacher, (ii)anxiety towards science, (iii)enjoyment in science, (iv)the importance of science in society and (v)student' self-efficacy. A total of 32 participants were chosen by random sampling from matriculation colleges in Malaysia. The data was collected using questionnaire and were then analyzed by using SPSS software version 23. The findings reveal that the level of attitude towards science is positively moderate in all dimensions measured. There are also differences between the level of attitude towards science of matriculation students who involves themselves in innovation competitions versus the national average in matriculation colleges. Furthermore, there are positive correlations between all the dimensions measured in relative with each other. As a conclusion, it is in our students' best interest that PjBL approach is integrated in our national curriculum in order to generate innovative students. Important stakeholders such as school leaders have to play their part in promoting PjBL as an important learning avenues.

Key words: *Scientific attitude, Attitude towards science, Matriculation students in Malaysia, Innovation Competition*

INTRODUCTION

In the past recent years, Malaysia has undergone an unprecedented economical and structural changes in the likes of nothing this country had ever seen before. Over the last decade, the country's economy has changed radically which leads to failure in achieving a developed nation status as outlined in Vision 2020. 2030 Shared Prosperity Vision is the new initiative that has been proposed by the current government to rectify this situation. In short, Shared Prosperity is defined as an effort to make Malaysia a country that could be continuously developed sustainably in line with equitable growth at all levels of the supply chain, class, race and geography and to create a sense of harmony and stability among the people by 2030 [1]. There are seven strategic cores that Malaysia must overcome in order to achieve 2030 Shared Vision Prosperity. One of the catalyst that has been identified to ensure that the objectives of the strategic cores can be achieved is high value education production. High education production, particularly for Science and Mathematics requires an emphasis on practical applications of knowledge through project-based learning that works in tandem with Malaysia Education Blueprint 2013-2025 [2].

Project based learning (PjBL) is one of the avenues as how our country is planning to fulfill the challenges of 21st century learning design. Students are required to solve problems through scientific observation, logical reasoning, and comprehensive reasoning. Through PjBL, students have the opportunity to exercise autonomous learning where

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they act as the decision maker, inventor, problem-solver and researcher. PjBL is categorized by as inquiry-based learning and it is motivated by students' curiosity [3] [4].

Although there is relatively little research directly assessing the effect of PjBL, studies have shown that PjBL approaches positively impact students' performance and retention across elementary, secondary and postsecondary levels [5] [6]. A 2016 study by Torres and his colleagues has shown that students who had chosen an elective PjBL course on engineering design were more likely to persist on to earn an engineering degree than its counterpart. Research also suggests that even though PjBL may take time away from course lectures, it does not lessen students' understanding of the course content. Boeler (1998) examined the effects of PjBL learners were equivalent in their learning ability to answer multiple-choice content questions on a final exam, but the PjPL learners has been proven to be more flexible in answering and adapting their knowledge to conceptual questions.

A research in 2014 by Lima et al. suggested that PjPL is generally positively accepted by students and educators when assessing their attitude towards PjPL [7]. Moreover, it is also shown that students enjoy the experience of participating in authentic projects and find value in the projects associated with PjBL courses [8].

Although studies have suggested the positive effects of PjBL on students' self-efficacy, the results are mixed and more research is needed [9]. This paper examines the effect of PjBL on the attitude towards science of matriculation students in Malaysia who have had experience of participating in any type of PjBL situations throughout their learning progress.

OBJECTIVE OF STUDY

This study is designed to: i) measure the level of attitude towards science of innovative matriculation student in Malaysia and ii) determine and compare the level of attitude towards science of students involved in innovation competition in matriculation colleges versus the national average for Malaysian matriculation students in general.

EXPERIMENT

Participants

To ensure that our sample reflects the current population, random sampling was used to a group of students that had involved themselves in an innovation competition organized by the Ministry of Education in Malaysia. The study was conducted at Kolej Matrikulasi Pulau Pinang in Malaysia. The competition is highly selective with only one team to represent their respective states. They had undergone a selection process at their corresponding colleges before they were given the opportunity to represent their institutions. This shows that the students were inclined to engage in innovative activities that develops their own understanding of concepts and principles by showcasing their project at a national level. All the students came from science-related background which means that they are enrolled in Chemistry, Physic and Biology subjects during matriculation. Therefore, the students have prior tendency to purse higher education in science-related vocations.

About 30 students were chosen randomly and the students' age ranges from 19 to 20 years old. The students came from (i) Kolej Matrikulasi Perlis, (ii) Kolej Matrikulasi Kedah, (iii) Kolej Matrikulasi Perak, (iv) Kolej Matrikulasi Selangor, (v) Kolej Matrikulasi Melaka, (vi) Kolej Matrikulasi Pahang, (viii) Kolej Matrikulasi Kelantan and (vx) Kolej Matrikulasi Pulau Pinang. The research was analyzed qualitatively by using semi-structured interview questions and quantitatively by using Statistical Package for the Social Sciences (SPSS).

Procedure

The main data-gathering instrument in this study is a questionnaire which includes an adaptation of attitude towards science questionnaire developed by Gogolin and Swartz **[10]**. The format used for this study is the five-point Likert Scale format with 48 questionnaire questions and the options for the answers are 1= Strongly Disagree, 2= Agree, 3= Undecided, 4= Agree and 5= Strongly Agree. The attitude towards science instrument is a 48-item inventory with high construct validity, according to Gogolin & Swartz in 1992 **[10]**. By nature, this inventory is multidimensional, which is desirable when one assesses multivariate subjects like attitude. The five dimensions measured are (i)students' perception of their science teacher, (ii)anxiety towards science, (iii)enjoyment in science, (iv)the importance of science in society and (v)student' self-efficacy.

Table 1: Attitude towards science and its reliability measures

Dimension	Description	Croubach Alpha
Students' perception of their science teacher	Refer to attitude towards science teachers' teaching inside and outside formal classroom	0.85
Anxiety towards science	This attitude is manifested by worries, pressure, as well as possessing negative inclination towards science	0.79
Enjoyment in science	Refers to enjoyment in learning science as well as conducting science related activities	0.73
The importance of science in society	Can be inferred by the importance and needs of science in everyday life experience	0.56
Students' self-efficacy	This attitude is reflected by students' attitude while learning science as well as outside the science classroom. This will include their strong confident towards the subject as well as being proactive in any science related activities.	0.67

The instructor had emphasized that the students will remained anonymous and only consenting students

need to complete the questionnaire. The students have had the option to not participate in this study. Once the students completed the survey, the results were eligible for statistical analysis.

RESUTS AND DISCUSSION

The results were analyzed in accordance to the aims of the experiment, which are to measure the attitude towards science of matriculation students that involved themselves in innovation competitions and to compare the level of attitude towards science of students involved in innovation competition in matriculation colleges versus the national average for Malaysian matriculation students in general. The correlations between all the constructs in relative with each other was also inadvertently measured.

Table 2: Mean and standard deviation for each dimension

Dimension	N	M	SD
Science in society	30	2.7852	0.93689
Enjoyment of science	30	2.7175	0.67846
Science teacher	30	2.9375	0.83029
Students' self-efficacy	30	2.7667	0.82246
Anxiety in science	30	2.8125	1.03482

Based on table 2 and according to Jamil Ahmad (2002) [11], all the dimensions has shown a moderately positive level of students' attitude towards science with science teacher showing the highest value (M=2.9375, SD=0.83029). Moreover, enjoyment in science has recorded the lowest value (M=2.7175, SD= 0.67846).

For normality test, Shapiro Wilk analysis was applied to all dimensions and the results are shown in the tables below.

Table 3:Shapiro-Wilk normality test for each dimension

	Shapiro-Wilk		
Dimension	Statistic	df	Sig.
Science in society	0.964	30	0.399
Enjoyment of science	0.895	30	0.006
Science teacher	0.937	30	0..77
Students' self-efficacy	0.944	30	0.118
Anxiety in science	0.923	30	0.032

The normality test has shown that the distribution of sample for three dimensions (science in society, science teacher, and students' self-efficacy) are normal (p>.05). For the other two dimensions (enjoyment of science and anxiety in science), the skewness and kurtosis was then further analyzed.

Table 4:Skewness and kurtosis values

Dimension	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Enjoyment of science	1.167	0.427	1.013	0.833
Anxiety in science	0.547	0.427	-0.748	0.833

The error values for both construct ranges from -3 to +3 which means that the sample distribution are considered as normal. Hence, parametric test can be conducted in this study.

One sample t-test was then used to identify the difference between the attitude towards science of the sample and the matriculation population. The test has shown that there is significant difference in three dimensions, which are (i)enjoyment in science ($t(30) = -5.025$, $p<0.05$) (ii)science in society ($t(30) = -3.653$, $p<0.05$) and (iii)anxiety in science ($t(30) = 6.312$, $p<0.005$). For the remaining two dimensions, which are students' self-efficacy and science teacher the analysis has shown that there is no significant difference between the sample and the general population.

Table 5:One sample t-test of the difference between the attitude towards science of innovative matriculation students versus general matriculation students

Dimension	N	M	SD	t	df	Sig.
Science in society	30	2.7852	0.93689	-3.653	29	0.001
Enjoyment of science	30	2.7175	0.67846	-5.025	29	0.000
Science teacher	30	2.9375	0.83029	-1.402	29	0.172
Students' self-efficacy	30	2.7667	0.82246	-1.021	29	0.316
Anxiety in science	30	2.8125	1.03482	6.312	29	0.000

Correlation test was then administered to identify the relationships between all the dimensions in relative with each other. Pearson correlation was chosen due to the nature of the sample.

Table 6:Correlations between dimensions in relative with each other

Relationship	Science in society		Enjoyment of science		Science teacher		Students' self-efficacy		Anxiety in science	
	r	Sig.	r	Sig.	r	Sig.	r	Sig.	r	Sig.
Science in society	1		0.836	0.000	0.642	0.000	0.553	0.002	0.784	0.000
Enjoyment of science	0.836	0.000	1		0.728	0.000	0.740	0.000	0.824	0.000
Science teacher	0.642	0.000	0.728	0.000	1		0.518	0.003	0.747	0.000
Students' self-efficacy	0.553	0.000	0740	0.000	0.518	0.003	1		0.538	0.002
Anxiety in science	0.784	0.000	0.824	0.000	0.747	0.000	0.538	0.002	1	

Table 6 shows positive r values for all the constructs with respect to each other (p<.05). The r values have shown that there are strong and positive relationships between all construct in relative with each other.

CONCLUSION

Through this study, it was found that matriculation students that involve themselves with innovative activities have moderately positive attitude. The study also shown that there are differences in the level of attitude towards science between innovative matriculation students versus the general Malaysian matriculation students in most dimensions. There are also significant positive correlations between all the

dimensions in respect to each other. Upon further analysis, it is also discovered that students' cultural background has significant impact upon their attitude towards science. It is certainly interesting to discuss how their environment outside of formal classroom situations shape their scientific views. This paper has provided a viable information about the current status of science education in Malaysia. This is because it does not only reflect the effectiveness of the Malaysian science curriculum, but also as a reminder to science teacher whereby they need to reflect upon their content knowledge as well as their pedagogical knowledge.

This study has shown that PjBL strategy has the capabilities to produce creative and innovative students, in tandem with our 2030 shared Prosperity Vision. With that in mind, hopefully educators throughout this region will feel motivated to adopt this learning strategy and encourage their students to participate actively in any innovation project and exhibition. It is with great desire that that through active PjBL, our future generations will be the ones who pioneer the development of scientific and technological civilization in the coming years.

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