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Motivation and Engagement as a Predictor of Students' Science Achievement Satisfaction of Malaysian of Secondary School Students

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Abstract

Psychologists consider student engagement as a primary pathway by which motivational processes contribute to students' learning and development (Connell & Wellborn, 1991). Academically engaged students self-regulate their learning, make plans for upcoming tasks, and persist when encountering obstacles and challenges. The present study intends to analyse the relationship between students' motivation and engagement and their academic satisfaction and test the effect of some variables (gender, class) on that relation. To accomplish these purposes, this study intends to investigate Malaysian primary school students' motivation, engagement and achievement satisfaction as predictors of achievement satisfaction in science and test the effect of some variables (gender, grade) on that relation. The students - 460 students (43% male, 57% female) of secondary school- responded to the Self-Developed Academic Satisfaction Questionnaire, Students' Engagement Questionnaire and Science Motivation Questionnaire. All the questionnaires are valid and reliable according to the Cronbach's Alpha value. A Multiple linear regression analysis has been used to predict the achievement satisfaction of Science based on the level of students' motivation and level of engagement in Science classroom. The findings showed that students have a good level of motivation, engagement and achievement satisfaction. Even though students' motivation is significantly predicted students' achievement, but neither students' engagement nor achievement satisfaction are a significant predictor of students' achievement.

Keywords: Motivation, Engagement, Achievement, Academic Satisfaction, Science Education secondary school.

Introduction

One of the key outcomes of schooling is the development of students' personal and social skills, as well as positive self-concept, self-discipline and self-worth. As well, students who develop positive relationships with school community are more likely to become lifelong learners. Most of the research on school effectiveness has focused on outcomes in terms of academic achievement; less attention has been paid to how well schools motivate and engage students in learning and in school life and how this affects students' performance on school and the future (Fullarton, 2002).

Theoretical Framework

Motivation is one of the important components to cognition. It plays an important role in their conceptual change processes (Lee & Brophy, 1996) critical thinking, learning strategies (Wolters, 1998) and achievement (Napier & Riley, 1985). Students' motivation is affecting positively their learning outcomes (Martin, 2003) (Yeung & McInerney, 2005). Motivation is crucial for effective learning, It is argued that students with better motivation usually perform better in school grades (Pintrich, 2003). Williams and Williams (2011) also stress that motivation is probably the most important factor that educators can target in order to improve learning. Moreover, based on the social-cognitive motivation theories, it is presumed that students' motivational beliefs mediate the relation between students' perceived classroom environment and their engagement (Li, 2013).

Sanfeliz and Stalzer (2003) think that there are three components for the motivation: intrinsic motivation, self-efficacy and self-determination. Glynn and Koballa (2006) also think that motivation is constructed of intrinsic motivation, extrinsic motivation, goal orientation, self-determination, self-efficacy and assessment anxiety.

Glynn, Taasobshirazi, and Brickman (2009) have their own thought about motivation components, which are intrinsic motivation, extrinsic motivation, personal relevance, self-determination, self-efficacy and assessment anxiety. Intrinsic motivation involves learning for its own sake and can be defined as doing an activity for itself and to the pleasure and satisfaction derived from participation" (Sevinc, Ozmen, & Yigit, 2011).

Recently, the concept of school engagement has been receiving increased attention from researchers, policy makers and educators because they consider it an important precursor of positive school outcomes. According to J. A. Fredericks, Blumenfeld, and Paris (2004) there has been a substantial variation regarding the terminology of engagement in research. Engagement often appears with other words as shown in the terms: "school engagement", "academic engagement", and "student engagement" ("student engagement in academic work" and "student engagement in/with school") (J. A. Fredericks et al., 2004). With regard to the use of the terms of "student engagement" and "school engagement", Appleton, Christenson and Furlong (2008) argued that "school engagement" accentuates only the role of school context, not the influences of other contexts such as family and community. Alternatively, "student engagement" is applied in terms of both school settings and academic work in classroom contexts. They observed that student engagement includes academic engagement (e.g., time on academic task), cognitive (e.g., the use of self-regulation and meta-cognition strategies), behavioral (e.g., attendance and participation in both curricular and extra-curricular activities) and psychological engagement (e.g., identification). Thus, "student engagement" can be used to represent both "school engagement" and "academic engagement" (Appleton, Christenson, & Furlong, 2008).

Student engagement is often conceptualized as a multidimensional construct (Appleton et al., 2008; Fredricks et al., 2004) (Hoff & Lopus, 2014) (Veiga, 2012). However, there are some disagreements across the different conceptualizations in relation to the number of dimensions of engagement. In the literature, three dimensions of student engagement are typically described: cognitive engagement, behavioral engagement and emotional. J. A. Fredericks et al. (2004) propose a framework for considering engagement that distinguishes between cognitive, behavioural and emotional engagement (Figure 1).

Cognitive engagement, which refer to students' personal commitment with their learning. It can be understood as students' psychological investment in their own learning. When cognitively engaged, students concentrate, focus on achieving goals, are flexible in their work and cope with failure. This is different from high performance: a student who is performing well may still be disengaged if they are coasting and not motivated to exert themselves more than is necessary to get by.

Behavioural engagement, which represents students' participation in classroom, school and after-school activities. This includes adhering to behaviour rules, attending lessons as required and arriving at classes on time. Importantly, behavioural engagement refers to the learning behaviours that are important for high student performance, which may include collaboration and communication with peers.

Emotional engagement (also as affective engagement), which reflects students' affective reactions to school, teachers and peers. This has also been called 'identification' with school and learning practices. Students are engaged when they feel included in the school and feel an emotional bond with the school, its teachers and their peers.

Overall, there is an agreement that student engagement is a multidimensional construct. All three dimensions of student engagement (behavioral, cognitive, and emotional engagement) are considered as imperative components in student learning.

The positive consequences of the engagement can be felt on psychological development and on the general well-being of the student (J. A. Fredericks et al., 2004). There are a number of benefits of students' engagement with school. For example, (Fullarton, 2002)

- Young people who have positive feelings towards school and who are active participants in a variety of school activities are more likely to stay in school and are more likely to become independent learners.
- Other studies have found positive relationships between a student's engagement and academic achievement and with other educational outcomes, including better attendance and aspirations to higher levels of education.

While dissatisfaction with aspects of school life has been demonstrated to be a key issue for non-completion of secondary school.

It is evident that motivation and engagement are considered as one construct, and the differentiation between these two constructs are ambiguous. In a very recent research, motivation and engagement were differentiated, and respectively defined as "individual energy and drive to learn, work effectively, and achieve to their potential," and "the behaviors aligned with this energy and drive" (Martin, 2010) (Liem & Martin, 2011).

Statement of Problem

Rural students are more likely to drop out or discontinue their educations prematurely than similar non-rural peers. The drop-out rate for Malaysian secondary schools was given as 9.3% in urban areas and 16.7% in rural areas, these kind of school failure and dropout may represent the low student academic motivation in classroom (WEI & ELIAS, 2011).

Much of psychological literature and theory argues for generalizability of human motivation across contexts. much of past rural research has argued for an entirely local perspective, based on the uniqueness of rural places and the potential influence of social, cultural, and geographic context characteristics on individuals and subgroups (Hardré & Hennessey, 2010). Likewise, compared to urban settings and to K-12 schools little systematic research is done that focuses on and occurs in rural schools (Hardré & Hennessey, 2010). Therefore, the researchers will use the developed and adopted research questionnaire to collect data in two different urban and rural cities in Malaysia, namely, Wilayah Persekutuan (Kuala Lumpur) and Tanjong Malim (state of Perak).

Because of increased focus on standardized test scores, most research on school effectiveness has focused on academic achievement and less attention has been paid to how schools motivate and engage their students in the learning process and in school life. However, motivation and engagement have been consistently associated with, and are presumed to be a precursor of, student achievement, therefore, should be evaluated with the same commitment (Echeverria, 2006).

Therefore, the present research attempts to measure students' motivation and engagement as well as educational outcomes (i.e., academic achievement, academic satisfaction). Furthermore, examining predictable factors of students' achievement in science.

The research aimed to answer following questions:

- 1- What is the level of motivation and engagement of Secondary School students?
- 2- Is there any significant correlation between motivation, engagement, and academic achievement of the Secondary School students?
- 3- How well does the students' motivation and engagement predict their achievement in science?
- 4- What is the role of some dependent variables (age and gender) on predicting students' achievement in science?

RESEARCH METHODS

Research design

This research will be a descriptive research in nature; the descriptive research describes and interprets what is. It is concerned with conditions or relationships that exist. This approach allows researchers to answer the research questions comprehensively and provide wide explanations for the phenomena in their natural setting.

Research Instruments

The study is aimed to collect data about: (1) students' achievement in Science, (2) students' engagement in Science classroom and (3) students' motivation in Science.

Self-Developed Academic Satisfaction Questionnaire (SASQ): This scale was developed by Li, Xueyan. (2013), it is a 5 point Likert Type scale with response options: (1) never, (2) rarely, (3) sometimes, (4) usually, and (5) always. SASQ scale composed of 10 items, five of them were positive and five of them were negative. The results of reliability indicate that an alpha coefficient of .816 and split-half reliability test of .918 was found on the instrument. George and Mallery (2003) proposed that Cronbach's alpha of 0.7–0.8 is acceptable; 0.8–0.9 is good; and ≥ 0.9 is excellent (George & Mallery, 2003). The Cronbach's alpha of 0.766, 0.844 and 0.751 respectively, are higher than the values suggested by George and Mallery (2003). Therefore, the validity and reliability of the instruments were considered to be acceptable. It was clear that the instrument is reliable and could be used to measure the students' satisfaction about academic achievement in Science.

Students' Engagement Questionnaire (SEQ)

One of the most prominent problems in the scientific research of engagement is the lack of instruments, with psychometric and semantic qualities for its evaluation (Veiga, 2012). Thus, student self-report measures may be the most valid and reliable way to capture these latter two types of engagement (Furlong & Christenson, 2008).

In the present Study, School Engagement Scale - Behavioral, Emotional and Cognitive Engagement developed by J.A. Fredericks, Blumenfeld, Friedel, and Paris (2005). The scale included items about student engagement (4 items for behavioral, 5 items for emotional, and 6 items cognitive engagement. All of the items were on Likert scales from 1 to 3 (1 = never, 2 = some time, 3 = always), two of the items are negatively worded; so that they have been reversed from negative to positive.

Developers report Cronbach's alpha of 0.77 for behavioral engagement, 0.86 for emotional engagement, and 0.82 for cognitive engagement (Blumenfeld, Friedel, & Paris, 2005; J.A. Fredericks et al., 2005). Other researchers report similar reliabilities for the three scales (Goldschmidt, 2008). Regarding the validity, developers report several analyses that inform the construct validity of measurement. A factor analysis of items resulted in three subscales (behavioral engagement, emotional engagement, and cognitive engagement (Blumenfeld et al., 2005; J.A. Fredericks et al., 2005).

Since the instrument originally developed in Western culture and have not been used in the Malaysian cultural background before. Therefore, the researcher retest the reliability using a sample of (120) students, the results of Cronbach's alpha for the sub-categories and the instrument itself indicate that Cronbach's alpha of 0.74 for behavioral engagement, 0.705 for emotional engagement, 0.769 for cognitive engagement and 0.805 for the engagement scale. Those results are similar to the results reported by the developers. It is clear that the instrument is reliable and can be used to measure the students' engagement.

Science Motivation Questionnaire (SMQ)

The 30-item Science Motivation Questionnaire (SMQ) was developed by Shawn M. Glynn and Thomas R. Koballa, Jr. (2006). It is a 5 point Likert Type scale with response options: (1) never, (2) rarely, (3) sometimes, (4) usually, and (5) always. SMQ scale composed of 30 items, 25 of them were positive and five of them were negative.

The researchers translated the questionnaire into Arabic and Malay languages. The motivational components and their associated items included intrinsically motivated science learning (items 1, 16, 22, 27, and 30), extrinsically motivated science learning (items 3, 7, 10, 15, and 17), personal relevance of learning science (items 2, 11, 19, 23, and 25), self-determination (responsibility) for learning science (items 5, 8, 9, 20, and 26), self-efficacy (confidence) in learning science (items 12, 21, 24, 28, and 29), and anxiety about science assessment (items 4, 6, 13, 14, and 18). The anxiety about science assessment items are reverse scored when added to the total, so a higher score on this component means less anxiety. The Science Motivation Questionnaire maximum total score is 150 and the minimum is 30. Students who score

from 30 to 59 are "never to rarely" motivated, 60-89 are "rarely to sometimes" motivated, 90-119 are "sometimes to often" motivated, and 120-150 are "often to always" motivated.

The results of reliability indicate that an alpha coefficient of .818 and split-half reliability test of .724 was found on the instrument. It was clear that the instrument is reliable and could be used to measure the students' opinions about the students' motivation in Science.

The Sample

The population of this study is secondary school students aged 12-17 years old from two populations Wilayah Persekutuan (Kuala Lumpur) and Tanjong Malim (state of Perak). The researchers used the "Multi-stage" sampling method because it is more practical and economical than the other techniques. In this research, the entire population divided into groups, or clusters and a random sample of these clusters has been selected. All observations in the selected clusters will be included in the sample.

The sample in this study consists of 460 secondary school students (form 1 to form 3). Table (1) illustrates the research sample in terms of gender and class:

The sample consisted of 460 students; the percent of male students are 43.3% and the percent of females are 56.7%. Regarding the city, 61% of the students are from Kuala Lumpur, and around 40% of the students from Tanjong Malim (Perak State). The percent of male and female students within the two cities almost so close.

RESEARCH RESULTS

The aims of this research are to investigate if a student's achievement in science could be predicted by a linear combination of student's motivation, achievement satisfaction, engagement style, age and gender. Therefore, a multiple linear regression analysis was conducted to predict student's achievement in science from the predictor variables. Descriptive statistics for the quantitative predictor variables can be found in Table 2.

The results in table 2 show that students have a moderate level of achievement satisfaction with a percent of 73.8% ($M=3.692$, $SD=0.768$). Concerning their engagement level, the mean percent is 63.6% reveal that a lower level of engagement ($M= 3.182$, $SD= 0.532$). Students' emotional engagement has the highest level of engagement with a percent of 66.2% ($M= 3.222$, $SD= 0.581$) while cognitive engagement has the lowest level of engagement with a percent of 60.6% ($M= 3.032$, $SD= 0.814$).

The results about students' motivation do not differ a lot. The results show that students are "sometimes to often" motivated with a percent of 66.4% ($M=3.321$, $SD=0.583$). The mean for all the motivation component (except anxiety) range from 3.378 to 3.463 which mean that students are "sometimes to often" motivated. The results for anxiety show that the students have low anxiety ($M=2.639$, $SD= 0.833$).

Full model entry was employed to regress all predictor variables onto the dependent variable simultaneously. A standard multiple regression analysis was employed to predict achievement in science. Table 3 displays the correlations between the variables.

Each variable has a positive significant correlation with each other variable with no any Multicollinearity. To get more information about the goodness of fit of a model, the results about R Square is presented in Table 4.

In this case the R^2 of 0.134 indicates that 13.4% of the variation in achievement is explained by the regression variables. The adjusted R^2 value of 0.124 indicates that a little percent of the variability in achievement could be predicted by motivation, achievement satisfaction, engagement, gender and city of residence.

For more information about the model, Table 5 shows the regression ANOVA, which tests for a linear relationship between the variables.

The results in the ANOVA Table ($F(5, 454) = 14.064, p < .001$) indicate that the value of F is significant beyond the 0.01 level. The full model R^2 was significantly greater than zero, $R^2 = 13.4\%$.

On the second step all of the predictors were entered simultaneously, resulting the "Coefficients", that provides the estimates of the regression coefficients (table 6).

Analysis of regression coefficients (Table 6) indicated that student's achievement was predicted by motivational level ($Beta = 0.342, p < .01$), and city of residence ($Beta = 0.173, p < .01$). It is clear that those variables predicted significantly 13.4% of the variance in achievement. The other variables (city, achievement satisfaction, and engagement) are a significant predictor. The overall model fit was $R^2 = 0.134$. Thus, staying in Kuala Lumpur and the stronger a student's motivation the greater a student's achievement in science.

DISCUSSION

Student's engagement and motivation have been a major concern for teachers who want students to achieve better in class. As a result, teachers commonly attempt to motivate and encourage student's participation in indoor and outdoor learning activities. Thus, the present study employed a multiple regression analysis to determine if the student's motivation, achievement satisfaction, engagement, gender and city of residence could be predictors of student's achievement in science. The results indicate that a linear combination of the predictor variables is able to account for a significant amount of variance in a student's achievement in science.

The findings further indicate that the predictor variables (motivation and city) predict a significant amount of variance in student's achievement in science. Contrary to this, students' engagement, achievement satisfaction and gender did not individually; predict a significant amount of variance in achievement.

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Figure 1: Framework for understanding engagement

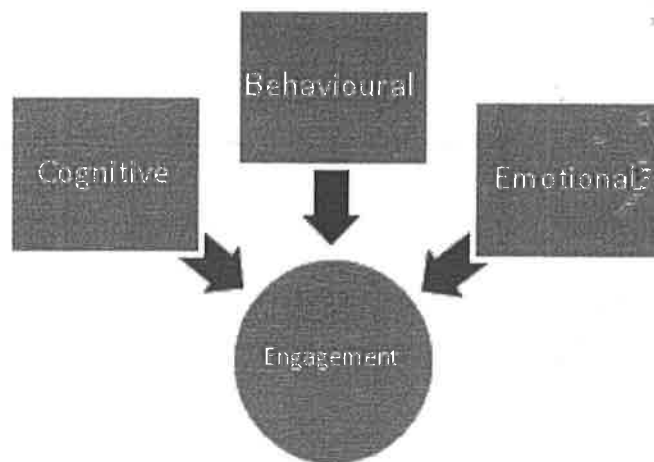


Table 1. The Sample

City	Gender				Row Totals	
	male		female			
Tanjong Malim	83	41.7%	96	36.8%	179	38.9%
Kuala Lumpur	116	58.3%	165	63.2%	281	61.1%
All	199	43.3%	261	56.7%	460	

Table 2. Basic Descriptive Statistics

	Mean	Mean %	Std.Dev.
Achievement satisfaction	3.692	73.8%	0.768
Engagement	3.182	63.6%	0.532
Behavioral	3.308	66.2%	0.517
Emotional	3.222	64.4%	0.581
Cognitive	3.032	60.6%	0.814
Motivation	3.321	66.4%	0.583
Intrinsic	3.463	69.3%	0.890
Extrinsic	3.573	71.5%	0.890
Personal Relevance	3.387	67.7%	0.841
Self-Determination	3.387	67.7%	0.819
Self-Efficacy	3.477	69.5%	0.906
Anxiety	2.639	52.8%	0.833

Table 3. Correlations Between Predictor Variables

	Achievement satisfaction	engagement	Motivation
Achievement satisfaction	1	.716*	.634*
engagement	.716*	1	.625*
Motivation	.634*	.625*	1

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

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.366	.134	.124	10.968

Table 5. The regression ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	101.7598	5	20.35196	14.064	.000
Residual	656.9771	454	1.44709		
Total	758.7370				

Table 6. Regression output (Regression Coefficients)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.719	0.420		11.223	0.000
Gender	-0.102	0.116	-0.039	-0.882	0.378
City	0.456	0.117	0.173	3.910	0.000
Achievement satisfaction	-0.108	0.112	-0.064	-0.962	0.336
engagement	0.185	0.160	0.077	1.153	0.249
Motivation	-0.755	0.132	0.342	5.699	0.000