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Students' motivation toward science learning in secondary schools in Oman and Malaysia: A comparative study

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The purpose of this research was to compare the Omani and Malaysian students' motivation toward science learning in secondary schools. Motivation is an important component from any teaching and learning process. The results of previous studies revealed that students with better motivation usually perform better in school grades. The sample size is 359 students: 37.6% of them were Malaysian (135 students) while 62.4% were Omani (224 students). The 30-item Science Motivation Questionnaire (SMQ) was used in this research. It was developed by Glynn, Taasoobshirazi and Brickman. The results showed that the students had a "moderate" motivation in general. Regarding the subcategories, the students had "high Extrinsically Motivation" while they had a "moderate" level of motivation in the other subcategories or motivational factors. An independent-samples t-test was conducted to compare the motivation towards science scores of Omani and Malaysians. This finding implied that the Omani students were more motivated to science learning than the Malaysian students. On the other hand, the result showed that there was a significant difference between male and female whereas the females were highly motivated to science learning in general, but both of them had the same level of self-efficacy.

Keywords: **S**cience, motivation, learning, comparative study, secondary schools.

Introduction

Motivation is a complex concept in psychology that attempts to explain behavior and the effort at different activities. Palmer (2005) thinks that motivation can be applied to any process that activates and maintains learning behavior. Many definitions were made for motivation. For instance, Motivation is defined as "a factor which lead to behavior starting and determines the direction, force and insistence of it" (Sevinc, Ozmen & Yigit, 2011: 218). Motivation also can be defined as "an internal state that arouses, directs, and sustains students' behavior" (Glynn & Koballa, 2007: 25). Some researchers view

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motivation as an internal process that activates, guides and maintains behavior over time (Pintrich, 2003, Stipek, 2002). Brophy (1988: 205-206) define motivation to learn as "as student tendency to find academic activities meaningful and worthwhile and to try to derive the intended academic benefits from them". It is very clear from these definitions that motivation is very important to make sure that learning is effectively happened.

In science education, Bolat (2007) defined motivation toward science learning as a desire of science learning. Results of Guvercin, Tekkaya and Sungur (2010) reaearch showed that motivation toward science learning declined as the grade level increase and girls had a higher motivation toward science learning than boys.

Motivation is an important component from any teaching and learning process. Sanfeliz and Stalzer (2003) think that helping students to foster their motivation to learn science is one of the most important role for them in the education process. According to Sanfeliz and Stalzer, students will enjoy learning science, believe in their ability to learn, and take responsibility for their learning if there are motivated. Young students will benefit from motivation to learn science to aspire them to be future scientist (Bryan; Glynn; Kittleson, 2011). Moreover motivation to learn science will benefit all students by fostering their scientific literacy. This will make them to understand scientific knowledge (Bryan & others, 2011).

Enhancing students' scientific literacy is one main goal for science education. This will help the students to understanding the essential science concepts and the nature of science, to be aware about the relevance of science and technology to their lives, and willingly continue their science study in school and beyond school (National Research Council [NRC], 1996).

Students' motivation is affecting positively their learning outcomes (Martin, 2003; Yeung & Mclnerney, 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. Olson (1997) is argued that motivation is the most important factor that educators can target to improve learning.

One of the important components to cognition is motivation. This is because students' motivation plays an important role in their conceptual change processes (Lee and Brophy, 1996) critical thinking, learning strategies (Wolters, 1999) and science learning achievement (Napier and Riley, 1985).

There are many attempts to specify the motivation's components. Many researchers (Fantana, 1995; Moore, 2007; Sprinthall and Sprinthall, 1990) think that motivation is consists of intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to do something for its own sake and extrinsic motivation is to do something as a means to an end (Mazlo et al, 2002; Pintrich & Schunk, 2002). Moore (2007: 265) defined extrinsic motivation as "originates outside the individual and is concerned with external, environmental factors that help shape students' behaviors" and Intrinsic motivation as "what the learners bring to the learning environment, that is, their internal attributes, attitudes, values, needs and personality factors. Moore (2007) thinks also that it is often difficult to change the intrinsic motives and if they change they are usually happened slowly. It is argued (Sprinthall & Sprinthall, 1990) that intrinsic motives are those that are satisfied by internal reinforcers and are thus not dependent on external goals. They also think that extrinsic motives, depend on needs that must be satisfied by external reinforcers.

There are other attempts suggested more than two component for motivation. For example, Sanfeliz & Stalzer (2003) think that there are three components for the motivation: intrinsic motivation, self-efficacy and self-determination. Glynn & Koballa (2006) also think that motivation is constructed of: intrinsic motivation, extrinsic motivation, goal orientation, self-determination, self-efficacy, and assessment anxiety.

Taasoobshirazi & Brickman (2009) have their own thought about motivation components linked to learning science, which are: intrinsic motivation, extrinsic motivation, personal relevance, self-determination, self-efficacy and assessment anxiety. Intrinsic motivation involves learning science 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: 219). Extrinsic motivation is about learning science as a mean to an end and it concentrates on the external rewards such as the desire to obtain high grades and complete the program (Watters & Ginns, 2000). The personal relevance is the relevance of science to students' goals. Self-determination refers to the control students believe they have over their learning of science and the ability of individuals to have choices and some degree of control over what we do and how we do it (Reeve et al, 2003). Self-efficacy is about students' confidence that they can achieve well in science and refers to the individual's perception of his ability in accomplishing learning tasks (Pajares, 1996). In science education it refers to the confidence a student has about his ability to succeed in science (Glynn & Koballa, 2006). Zusho and Pintrich (2003) found that self-efficacy was the best predictor of grades in an introductory college chemistry course. Assessment anxiety is tension some students experience in association with grading in science. Cassady &Johnson (2002) argued that a moderate level of anxiety helps motivate learning.

Research show that motivation to learn science is affected by many factors like: gender, parental education level, academic success, participating laboratory activities and taking private courses (Sevinc, Ozmen & Yigit, 2011). Cavas (2011) studied the factors effecting the motivation of Turkish primary students for science learning. He used students' motivation toward science learning (SMTSL) questionnaire in 376 students from 5 primary schools in Izmir. He found that Turkish primary students' science motivation differed significantly in terms of their gender and grade level. The results of Tuan, Chin and Shieh (2005), show that there is a significant correlation between students' motivation toward science and science achievement. Britner (2008) found that self-efficacy is related to high school students' science grades. Karaarslan and Sungur (2011) find out in their study that there is no significant difference across grade level and gender.

Malaysian's vision to be a developed country by 2020 has put science and technology to be important subjects to excel in. This is so as science and technology is perceived as the fundamental forces behind the economic development in any industrialized country. Reports on the performance in science learning and especially students' lack of interest as well as their declining ability to do science (Kong, 1993; MOE, 1998; Lee 2001) led to much concern on achieving the above goals. This is further exuberated by the fact that enrolment in the sciences as compared to the arts stream at secondary level is less than the expected 60:40 percent ratio (EPU, 2006).

Science education in Malaysian schools commenced as early as kindergarden, primary and right up to secondary, a total of approximately 11 years schooling. The science curriculum outlines a very comprehensive and ambitious outcome to promote a scientifically literate Malaysian citizen in order to meet the nation's aspiration of a developed and industrious nation. Since 1972, science was taught in the national

language, Bahasa Malaysia until 2006 when the former Prime Minister Tun Mahathir Mohamed introduced the teaching of Mathematics and Science in English. This is to ensure that the country's workforce is competent in English so that the Foreign Direct Investment-source of employment (FDIs) will not continue to bypass the country's qualified graduates.

For the past twenty years, many research conducted on the factors that influence science learning focused primarily on the cognitive domain, particularly investigations on conceptual understanding and misconceptions held of science learning. However, in recent years, more focus is put on how students affective, social and value domain affect their science learning outcomes (Weiner, 1979; Bloom, 1992; 1995).

The current implementation of the country's strategic plan puts high expectation on the science students to achieve Malaysian's vision and mission especially in the area of science and technology. Thus, it is timely to conduct more research on the affective domain particularly investigations on students' motivation to science learning which incorporates their beliefs, values, interests, attitudes, self-efficacy, self-determination, and anxiety.

In Oman, Ministry of Education started a reform in education system, which includes science thirteen years ago. A first patch of the new system was graduated last years and the time is come now to evaluate science education in the new system. One of the most important issues in science is the motivation to learn science, since it benefits all students by fostering their scientific literacy and making them understanding scientific knowledge (Bryan & others, 2011).

A comparative study of students' motivation to science learning between Malaysian and Omani students is a good start to determine Malaysian's stand in the global world and to find out if the new system in Oman motivates students to learn science. Moreover, the different environmental context, education system, science curriculum, mode of assessment and the students themselves are determining factors of motivation to science learning.

Research Questions

The findings will answer the following research questions and hypotheses:

1 What are the students' motivation towards science learning in Oman and Malaysia?
2 Is there a difference between Omani and Malaysian students in motivation towards Science learning?
3 Is there a difference between male and female students in motivation towards Science learning?

Methodology

The researchers use the "Multi-stage" sampling method because it is more practical and economical than the other techniques. In this research the entire population was divided into groups, or clusters and a random sample of these clusters were selected. All observations in the selected clusters were included in the sample.

The participants in this study randomly selected from two populations. The first one is the Malaysian secondary schools, and the second one is the Omani secondary school in Sohar. The sample size is 359 students; 37.6% of them are Malaysian (135

students) while 62.4% are Omani (224 students). Table 1 illustrates the research sample in terms of gender and nationality.

Table 1. The sample

		Nationality				Total	
		Omani		Malay			
		count	%	count	%	count	%
Gender	male	104	46.4%	71	52.6%	175	48.8%
	female	120	53.6%	64	47.4%	184	51.3%
Total		224	62.40%	135	37.60%	359	100.0%

The percent of males and females students are almost equal in the sample. With regard to nationality, the percentage of Omani in the sample (62.4%) is larger than the percentage of Malaysian students (37.6%). The high percent of the Malay sample (52.6%) are males, while the high percent of the Omani sample (53.6%) are females.

Science Motivation Questionnaire

The 30-item Science Motivation Questionnaire (SMQ) used in this research. It developed by Glynn, Taasoobshirazi and Brickman. These 30 items were tested with science and nonscience majors and found to be reliable and valid. The Cronbach coefficient alpha was 0.93. (Glynn, Taasoobshirazi and Brickman, 2007). The items are strongly worded, unambiguous declarative statements in the form of short, simple sentences without jargon. 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).

A five-point Likert-type scale of temporal frequency ranging from 1 (never) to 5 (always) implemented in the SMQ. 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 questionnaire consists of two-part (A and B). In part A, the researchers gathered background information. In Part B, the researchers asked the students to respond to the 30 items of the Science Motivation Questionnaire. The items were presented without the questionnaire title and with the instructions.

Results

1. Motivation towards science learning for Malaysian and Omani students

The purpose of this research is to measure the students' motivation towards science. When all subjects (N=359) were lumped together regardless of their nationality (Malaysian/Omani) or gender (Male/Female), the following mean scores and standard deviations were obtained (Table 2).

Table 2. Mean and SD of students' motivation towards science learning

	Mean	Std. Dev.	The Motivation's Rate[1]
Intrinsically	19.80	3.85	moderate Intrinsically Motivated
Extrinsically	21.55	3.51	high Extrinsically Motivated
Personal	19.80	3.78	moderate Personal Relevance
Self-Determination	18.75	3.67	moderate Self-Determination
Self-Efficacy	19.37	4.03	moderate Self-Efficacy
Anxiety	12.23	4.16	moderate Anxiety
Motivation	111.50	15.91	moderate motivation

Referring to table 2, it is clear that the students have a "moderate" motivation in general (M = 111.5, SD = 15.9). Regarding the subcategories, the students have "high Extrinsically Motivation" (M = 21.55, SD = 3.85) while they have a "moderate" level of motivation in the other subcategories or motivational factors (M = 12.23-19.8, SD = 4.16-3.85).

2. T-test to determine the difference between Omani and Malaysian in motivation to science learning

Table 3. Results of t-Test between Omani and Malaysian students of motivation towards science

Motivational factors	Mean		Std. Dev.		t-value	df	p	eta squared
	Omani	Malaysian	Omani	Malaysian				
Intrinsically	20.38	18.83	3.32	4.44	3.50	224	0.00	0.03
Extrinsically	22.67	19.70	2.28	4.33	7.36	179	0.00	0.13
Personal	20.48	18.67	3.29	4.24	4.24	231	0.00	0.05
Self-Determination	19.90	16.84	2.94	3.96	7.79	223	0.00	0.15
Self-Efficacy	19.84	18.59	3.46	4.75	2.68	220	0.01	0.02
Anxiety	11.72	13.07	3.81	4.58	2.87	244	0.00	0.02
Overall Motivation	114.99	105.70	13.16	18.27	5.16	218	0.00	0.07

[1] The interpretation of the motivation results is according to Glynn, Taasoobshirazi and Brickman (2007) classification of motivation towards science.

An independent-samples t-test was conducted to compare the motivation toward science scores of Omani and Malaysian (Table 3). There was a significant difference in scores for Omani (M=114.99, SD=13.16) and Malay (M=105.7, SD=18.27); t (5.16), df=218, p=.00]. The magnitude of the differences in the means was moderate (eta squared=.07)."

Regarding the motivational factors (except Anxiety), the Omani students with statistically significant differences are higher in their motivation in general in all the factors. The results indicate that the Omani students have a "high" level of motivation with respect to the first three variables (Intrinsically, Extrinsically and Personal) while the Malaysian students have a "moderate" level of motivation.

On the other hand, there was a significant difference in "Anxiety" factor scores for Malaysian (M=13.07, SD=4.58) and Omani (M=11.72, SD=3.81); t (2.87), df=244, p=.00]. The eta squared statistic (.02) indicated a small effect size. This result is consistent with previous findings that Omani students' motivation to study science is higher than their Malaysian students.

This finding implied that the Omani students are more motivated to science learning than the Malaysian students.

3. T-test to determine the difference between male and female in motivation to science learning

Table 4. Results of t-Test between male and female students of motivation towards science

	Mean		Std. Dev.		t-value	df	p	eta
	female	male	female	male				squared
Intrinsically	20.71	18.83	3.00	4.39	4.71	305	0.00	0.06
Extrinsically	22.20	20.87	2.83	4.00	3.63	312	0.00	0.04
Personal	20.51	19.06	3.29	4.10	3.69	333	0.00	0.04
Self-Determination	19.78	17.66	3.03	3.97	5.67	325	0.00	0.08
Self-Efficacy	19.73	18.99	3.65	4.38	1.75	339	0.08	0.01
Anxiety	11.60	12.88	3.43	4.74	-2.91	316	0.00	0.02
Motivation	114.54	108.29	13.14	17.87	3.76	319	0.00	0.04

An independent-samples t-test was conducted to compare the motivation toward science scores of Male and Female (Table 4). Except one factor (Self-Efficacy), there were a significant difference in scores for Females (M=114.54, SD=13.14) and Males (M=108.29, SD=17.87); t (3.76), df=319, p=.00]. The eta squared statistic (.02) indicated a small effect size. On the other hand, there was a significant difference in "Anxiety" factor scores for Males (M=12.88, SD=4.74) and females (M=11.60, SD=3.43); t (2.91), df=316, p=.00]. The eta squared statistic (.02) indicated a small effect size.

Discussion and Conclusion

The objectives of this study is to explore the secondary students' motivation to science learning in Oman and Malaysia and to determine whether there is any significance difference between male and female. To achieve the objectives, three research questions were addressed:

1 What are the students' motivation towards science learning in Oman and Malaysia?
2 Is there a difference between Omani and Malaysian students in motivation towards Science learning?
3 Is there a difference between male and female students in motivation towards Science learning?

Overall Motivation towards science learning for Malaysian and Omani students.

As shown in Table 2, the overall motivation towards science learning among the students in both countries showed an average motivation (M = 111.5, SD = 15.9) as indicated in the score of the Science Motivation Scale (Glynn, Taasoobshirazi & Brickman, 2007). This finding may be related to some resemblance in the students' cultural background and the Islamic religion that both countries uphold. An extension to this comparative study of motivation in science learning pertaining to more demographical distribution and attributes could be addressed in future research of this kind.

Despite the finding that students from both countries are moderately motivated in science learning in general, the *extrinsically motivated* item has the highest mean score (M = 21.55, SD = 3.51) compared to the other five items studied (Table 2). Perhaps by awarding rewards and other means of reinforcement to students, they are extrinsically motivated to learn science.

Comparison of Motivation towards science learning between Malaysian and Omani students.

Table 3 shows the mean score for the overall motivation of Omani students which is 114.99 and that of the Malaysian students is 105.70. Despite the finding that students from both countries are moderately motivated in science, the Omani students are more motivated than their Malaysian counterparts. This could be explained by the low number of Malaysian students opting for science as compared to the arts stream. In terms of the six motivational factors studied which contributed to the overall motivation in science learning, the mean value calculated showed a higher score in the Omani students than the Malaysian students. The Omani students are highly motivated intrinsically, extrinsically, personally, in self-determination and self-efficacy than their Malaysian counterparts. However, the Malaysian students recorded a higher mean score in anxiety (M = 13.07, SD = 4.58) compared to the Omani students. Thus, they are more motivated than the Omani students when in anxiety. This clearly explains why Malaysian students are less motivated to learn science since their anxiety level is higher than the Omani students.

Difference between male and female students in motivation to learn science.

The t-score calculated between males and females showed similar results. There is a significant difference in overall motivation to science learning between male and female students. All six motivational factors studied showed a significant different between students in Malaysia and Oman except for self-efficacy. Thus, the result shows that there is a difference between male and female in their motivation to science learning in general, but both of them have the same level of self-efficacy. It can be concluded that both gender are moderately motivated to science learning, however, females are more motivated than their male counterparts.

This finding is in accordance with the research conducted by Guvercin, Tekkaya and Sungur (2010) which showed that girls has a higher motivation toward science learning than boys.

As anticipated, the results above can be explained by the differences in context, education system, modes of assessment and the teaching and learning methods conducted in the two respective countries.

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