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School-Prompted Interest in Science Learning at High School Level

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Abstract

The main purpose of this study was to investigate the effects of students' and teachers' motivation on school-prompted interest in science learning at high school level. A total of 432 grade ten students participated in this study. The Students' Own and Perceived Motivation towards Science Learning Questionnaire and Semi-structured Interviews were used to collect the required data from students. According to the survey data, the mean score of students' mastery goals was highest in every science subject and the mean score of school-prompted interest was highest in biology. Independent sample t-test results revealed that female students were significantly higher than male students in school-prompted interest and mastery goals in all science subjects. Then school-prompted interest, mastery goals, self-efficacy, teachers' autonomy support and teachers' mastery goals were positively and significantly correlated with each other at $p < 0.01$ in all science subjects. Finally, hierarchical regression analyses revealed that students' perceptions of teachers' autonomy support predicted the significant amount of variance accounted for school-prompted interest above and beyond the influence of students' mastery goals and self-efficacy in all science subjects. Whereas students' perceptions of teachers' mastery goals predicted the significant little amount of variance accounted for school-prompted interest above and beyond the influence of students' mastery goals and self-efficacy in chemistry and physics, but were not a significant predictor in biology.

Key Words : school-prompted interest, self-efficacy, mastery goals, autonomy support

Introduction

In societies that are becoming increasingly complex, education must be a continuous thing, not something which stops at a given grade level nor something that is contained exclusively in an institution such as a school. Thus, it may well be more important for the school to foster the continued willingness of students to learn than it is to insure the fact that they have

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learned some particular facts or acquired certain skills at any given point in time. According to this important point, it has been argued that if students can pass tests but do not like learning and do not use their school knowledge outside of school, the educational enterprise has failed (Maehr, 1976; Pugh & Bergin, 2005). Although some educators argue that the goal of education is to influence out-of-school learning activity, little research examines the relationship between what occurs in the classroom and students' motivation to continue their learning beyond the confines of the school and how teachers can help students develop an interest in a topic and continue that interest outside of school.

Students' school-prompted interest in academic learning. is an underexplored area of educational research (Ciani, Ferguson, Bergin, & Hilpert, 2010). Again, McCoy, Quail and Smyth (2012) also stated that although there is emerging research internationally that shows how children's activities outside school can enhance or hinder their learning, there has been little focus on whether school-based learning can spark children's interest in pursuing certain hobbies and activities outside school.

Purpose of the Study

The purpose of this study is to investigate the effects of students' and teachers' motivation on school-prompted interest in science learning at high school level.

Scope of the Study

In this study, 432 high school students chosen the combination of subjects (Myanmar, English, Mathematics, Chemistry, Physics, and Biology) in grade ten were selected by simple random sampling technique from six high schools in Yangon city development area. These selected students completed the questionnaire consisting of five scales: school-prompted interest, their mastery goals, their self-efficacy, their perceptions of teachers' autonomy support and their perceptions of teachers' mastery goals. Then, a follow up program of qualitative study was carried out by semi-structured individual interviews to students with highest level of school-prompted interest and those with lowest level of it in three science subjects (chemistry, physics and biology) to get the reliable information about how and why they got school-prompted interest.

Definitions of Key Terms

School-prompted interest. School-prompted interest is the students' propensity to pursue classroom content outside of the classroom on their own (Bergin, 1996).

Self-efficacy. Self-efficacy refers to a person's belief in his/her ability to organize and execute a required course of action to achieve a desired result (Bandura, 1997).

Mastery goals. Mastery goals, also called learning goals, focus on gaining competence or mastering a new set of knowledge or skills (Ames, 1992).

Autonomy support. Autonomy support refers to the amount of freedom a teacher gives to a student so that the student can connect his or her behavior to personal goals, interests, and values (Reeve, 1998).

Review of Related Literature

About 35 years ago, Maehr (1976) pointed out that a key outcome of schooling should be *continuing motivation*. *School-prompted interest* is a subset of continuing motivation and occurs when students develop an interest in a topic through school learning and continue to pursue that interest outside of school. He also recommended that human progress often stems from an accumulation of interest in a given field, that is, the purposeful desire to return to the same problem or topic again and again. From an educational perspective, continuing motivation is an important but seldom considered outcome of education.

Again, Barron (2006) argued for the importance of understanding learning across home, school, community, work, and neighborhood life spaces, and argued that interest is the key to that understanding. Because adolescents often pursue learning opportunities both in and outside school once they become interested in a topic. Studies of learning typically take place in school settings or labs, focus on school subject domains, and are bound to narrow time frames. By focusing on schools and labs as primary research sites, the researchers miss opportunities to investigate learning when it flows from the initiatives of the learner and his or her companions across time and settings. Again, a student's continuing interest in a topic initially encountered in the classroom is one important marker of successful

learning (Jackson, 1968, cited in Shernoff & Hoogstra, 2001). Genuine interest in an academic subject may lead to the desire to pursue related activities for their own sake.

Continuing motivation incorporates qualities of intrinsic motivation, including continued interest and enjoyment of a subject, but also encompassing continuing behavior, i.e., a specific behavior of choosing to continue participating in an activity rather than in a number of other possible alternative activities (Anguiano, 2006). He also stated that continuing motivation differs from intrinsic motivation, in that the former encompasses both students' intent to continue, i.e., when the student displays intent to continue their education in a subject at a future time or place, possibly in a different context. In the later, the student displays or acts upon their intent to continue by engaging in an activity in that subject. Continuing behavior is a specific observable behavior where a student chooses to engage in a task or subject matter in which they previously participated. This return to a task may occur in a different context time in the future from the previous task engagement, and takes place when the individual chooses among options (Maehr, 1976).

Many studies have identified factors associated with student continuing motivation. These factors fall into the categories of teacher-related factors, classroom climate-related factors and student-related factors. One teacher-related factor is the teacher's motivation style, including supporting students' autonomy for learning (Reeve, 2006). Students' perceptions of their teacher's motivational style related to their adoption of a particular motivational orientation (Reeve, Bolt, & Cai, 1999). The quality of teacher interaction with students is either positively or negatively related to students' level of autonomous motivation (Reeve, 1998). Teachers engage in an autonomy-supportive style when they promote students' three basic needs of perceived competence, autonomy and relatedness (Ryan & Deci, 2000). These teachers provide a certain amount of choice through educational activities and promote perceptions of student competence (Black & Deci, 2000), by endorsing active engagement in learning.

Method and Procedures

Both quantitative and qualitative approaches were adopted to collect data and information. For the quantitative part, Students' Own and

Perceived Motivation towards Science Learning Questionnaire (SOPMSLQ) which aimed to assess students' school-prompted interest, self-efficacy and mastery goals, and their perceptions of teachers' motivation (teachers' autonomy support and teachers' mastery goals) was implemented. In the qualitative part, semi-structured interviews with students were conducted to make qualitative in-depth analysis and interpretation of the quantitative results.

Participants

A total of 432 students (216 males and 216 females) participated in this study. Moreover, the next part of this study involved a sub-sample of these students who were selected for intensive study. This study focused in greater depth on six students with highest level of school-prompted interest and six students with lowest level of it selected by using purposive sampling technique for semi-structured individual interviews.

Instruments

This study was mainly based on the responses of the students to survey questionnaire and data obtained from interviews with students. The Students' Own and Perceived Motivation towards Science Learning Questionnaire (SOPMSLQ) (see Appendix A) was comprised of 34 items assessing five variables such as school-prompted interest as the outcome variable, teachers' autonomy support, teachers' mastery goals, students' mastery goals and self-efficacy. The students were asked to circle the numbers on the questionnaire. They indicated the extent to which they agreed or disagreed with the statement using a five-point Likert-type scale ranging from 1= "strongly disagree" to 5= "strongly agree" when answering all of 34 items in the questionnaire.

Results

To find out the correlations among all five scales in Students' Own and Perceived Motivation towards Science Learning Questionnaire, the correlation coefficients were calculated separately in all science subjects (see Table 1, Table 2 and Table 3).

Table 1. Correlation Matrix for Students' Own and Perceived Motivation towards Science Learning Questionnaire in Chemistry (N=432)

No	Scales	1	2	3	4	5
1.	School-prompted interest	1.00	–	–	–	–
2.	Teachers' autonomy support	.368**	1.00	–	–	–
3.	Teachers' mastery goals	.258**	.661**	1.00	–	–
4.	Mastery goals	.359**	.391**	.397**	1.00	–
5.	Self-efficacy	.358**	.344**	.359**	.471**	1.00

**p< .01

Table 2. Correlation Matrix for Students' Own and Perceived Motivation towards Science Learning Questionnaire in Physics (N=432)

No	Scales	1	2	3	4	5
1.	School-prompted interest	1.00	–	–	–	–
2.	Teachers' autonomy support	.399**	1.00	–	–	–
3.	Teachers' mastery goals	.351**	.613**	1.00	–	–
4.	Mastery goals	.453**	.438**	.454**	1.00	–
5.	Self-efficacy	.539**	.339**	.393**	.457**	1.00

**p< .01

Table 3. Correlation Matrix for Students' Own and Perceived Motivation towards Science Learning Questionnaire in Biology (N=432)

No	Scales	1	2	3	4	5
1.	School-prompted interest	1.00	–	–	–	–
2.	Teachers' autonomy support	.392**	1.00	–	–	–
3.	Teachers' mastery goals	.262**	.654**	1.00	–	–
4.	Mastery goals	.446**	.346**	.383**	1.00	–
5.	Self-efficacy	.358**	.416**	.384**	.491**	1.00

**p< .01

Based on the above three tables, the results showed that although the values of the correlation coefficients of all five scales were different in each subject, all five scales were positively and significantly correlated with each other at $p<0.01$ in all science subjects. The highest significant correlations with school-prompted interest were teachers' autonomy support (r=.368) in

chemistry, self-efficacy (r=.539) in physics and mastery goals (r=.446) in biology respectively.

Since the main research questions in this study were whether students' perceptions of teachers' autonomy support can predict the amount of variance accounted for school-prompted interest above and beyond that which is accounted for by students' own motivation (self-efficacy and mastery goals) in each science subject and whether students' perceptions of teachers' mastery goals can also predict the amount of variance accounted for school-prompted interest above and beyond that which is accounted for by self-efficacy and mastery goals, two separate hierarchical regression analyses were conducted in chemistry (Table 4), physics (Table 5) and biology (Table 6) respectively.

Table 4. Hierarchical Regression Analysis for School-Prompted Interest in Chemistry

Steps and scales	β	R^2	Adjusted R^2	ΔR^2	F	ΔF
Step 1		.142	.138		35.56	
Mastery goals	.33***					
Self-efficacy	.13**					
Step 2a		.203	.198	.061***	36.42	32.87
Mastery goals	.23***					
Self-efficacy	.12**					
Teachers' autonomy support	.27***					
Step 2b		.159	.153	.016**	26.88	8.32
Mastery goals	.28***					
Self-efficacy	.12**					
Teachers' mastery goals	.14**					

**p< .01; ***p< .001 for β and ΔR^2

At step 1 in each model, mastery goals and self-efficacy accounted for a statistically significant portion of variance in school-prompted interest (R^2 = 0.142, F(2, 429) = 35.56, p<0.001) indicating that 14% of the variance in school-prompted interest in chemistry was explained by student motivation. Both mastery goals and self-efficacy were positive and significant predictors of school-prompted interest, β = .33, p<0.001 for mastery goals and β = .13, p<0.01 for self-efficacy (see Table 4, Step 1).

At step 2 in the first model, when teachers' autonomy support was added to the model, there was significant improvement in the prediction of

school-prompted interest (ΔR^2 = 0.061, ΔF (1, 428) = 32.865, $p<0.001$). This result explained that teachers' autonomy support accounted for 6% of variance in school-prompted interest in chemistry that is over and beyond the variance accounted for by mastery goals and self-efficacy. This step indicated that teachers' autonomy support (β = .27, $p<0.001$) had the strongest influence on school-prompted interest followed by mastery goals (β = .23, $p<0.001$) and self-efficacy (β = .12, $p<0.01$).

At step 2 in the second model, the model was significant ($p<0.01$). With the addition of teachers' mastery goals, R^2 increased to 0.159, which was a significant increase with (ΔR^2 = 0.016, ΔF (1, 428) = 8.32, $p<0.01$). This result explained that teachers' mastery goals accounted for nearly 2% of variance in school-prompted interest in chemistry that is over and beyond the variance accounted for by mastery goals and self-efficacy. This step indicated that mastery goals (β = .28, $p<0.001$) had the strongest influence on school-prompted interest followed by teachers' mastery goals (β = .14, $p<0.01$) and self-efficacy (β = .12, $p<0.01$).

Table 5. Hierarchical Regression Analysis for School-Prompted Interest in Physics

Steps and scales	β	R^2	Adjusted R^2	ΔR^2	F	ΔF
Step 1		.345	.342		112.89	
Mastery goals	.26***					
Self-efficacy	.42***					
Step 2a		.371	.366	.026***	83.99	17.51
Mastery goals	.20***					
Self-efficacy	.39***					
Teachers' autonomy support	.18***					
Step 2b		.351	.346	.006*	77.14	4.045
Mastery goals	.23***					
Self-efficacy	.40***					
Teachers' mastery goals	.09*					

*p< .05; ***p< .001 for β and ΔR^2.

At step 1 in each model, mastery goals and self-efficacy accounted for approximately 35% of the variance in school-prompted in physics with (R^2 = 0.345, F(2, 429) = 112.89, $p<0.001$). Both mastery goals and self-efficacy were positive and significant predictors of school-prompted interest, β = .26, $p<0.001$ for mastery goals and β = .42, $p<0.001$ for self-efficacy (see Table 5, Step 1).

At step 2 in the first model, when teachers' autonomy support was added, there was a significant improvement in the prediction of school-prompted interest (ΔR^2 =0.026, ΔF (1, 428) = 17.51, $p<0.001$). This result explained that teachers' autonomy support accounted for 2.6% of variance in school-prompted interest in physics that is over and beyond the variance accounted for by mastery goals and self-efficacy. This step indicated that the strongest positive predictor of school-prompted interest is self-efficacy (β = .39, $p<0.001$) followed by mastery goals (β = .20, $p<0.001$) and teachers' autonomy support (β = 0.18, $p<0.001$).

At step 2 in the second model, when teachers' mastery goals was added, there was a significant improvement in the prediction of school-prompted interest (ΔR^2 = 0.006, ΔF (1, 428) = 4.05, $p<0.05$). This result explained that teachers' mastery goals accounted for 1% of variance in school-prompted interest in physics that is over and beyond the variance accounted for by mastery goals and self-efficacy. This step indicated that self-efficacy (β = .40, $p<0.001$) had the strongest influence on school-prompted interest and followed by mastery goals (β=.23, $p<0.001$) and teachers' mastery goals (β= .09, $p<0.05$).

Table 6. Hierarchical Regression Analysis for School-Prompted Interest in Biology

Steps and scales	β	R^2	Adjusted R^2	ΔR^2	F	ΔF
Step 1		.225	.221		62.15	
Mastery goals	.36***					
Self-efficacy	.18***					
Step 2a		.271	.266	.046***	53.01	27.15
Mastery goals	.31***					
Self-efficacy	.11*					
Teachers' autonomy support	.24***					
Step 2b		.228	.228	.004	42.24	2.10
Mastery goals	.24***					
Self-efficacy	.17**					
Teachers' mastery goals	.07					

*p< .05; **p< .01; ***p< .001 for β and ΔR^2.

At step 1 in each model, mastery goals and self-efficacy accounted for a statistically significant portion of variance in school-prompted interest (R^2 = 0.225, F(2, 429) = 62.15, $p<0.001$) indicating that 23% of the

variance in school-prompted interest in biology was explained by student motivation. Both mastery goals and self-efficacy were positive and significant predictors of school-prompted interest, $\beta = .36$, $p<0.001$ for mastery goals and $\beta = .18$, $p<0.001$ for self-efficacy (see Table 6, Step 1).

Interestingly, it was found that the amount of variance in school-prompted interest that was explained by only student motivation, by the composite of student motivation and teachers' autonomy support, and by the composite of student motivation and teachers' mastery goals were highest in physics. Moreover, in all science subjects, teachers' autonomy support can significantly predict school-prompted interest with greater amount of variance than prediction from teachers' mastery goals when controlling for students' self-efficacy and mastery goals. According to the interview results, it was found that school-prompted interest was quite related with students' own motivation (self-efficacy and mastery goals) and their perceptions of teachers' motivation (teachers' autonomy support and teachers' mastery goals).

Conclusion

The researcher conducted an investigation by using the quantitative and qualitative methods. Based on the responses from the Students' Own and Perceived Motivation towards Science Learning Questionnaire, the means and standard deviations for the whole sample were 3.53 and 0.45 in chemistry, 3.58 and 0.46 in physics and 3.84 and 0.45 in biology. When the mean scores of five scales; school-prompted interest, teachers' autonomy support, teachers' mastery goals, mastery goals, self-efficacy were compared, it was found that the mean score of all the scales were above 3.0 and especially, mastery goals was highest among them in every science subject. As an interesting result, it was found that the mean score of school-prompted interest was highest in biology. Then independent sample t-tests were conducted separately in each subject to examine if there was a statistically significant difference between male and female students. To be specific, female students were significantly higher than male students in school-prompted interest and mastery goals in all science subjects.

It was found that the findings of interviews were supported the results of quantitative study; suggesting that students with highest level of school-prompted interest were more self-efficacious, showed more mastery-

oriented behaviors, and were more motivated by their teachers' autonomy-supportive and mastery oriented instructional practices in the class than those with lowest level of school-prompted interest in learning science subjects. The information obtained from a follow up study of interviews supported the findings of the survey study.

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