# Factors Affecting Biology Lesson Motivation in Secondary School Students

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## Abstract

Motivation is a theoretical construct used to explain the initiations, direction, intensity, persistence and quantity of behaviour. It is an important determinant of learning and its outcomes, as expressed in academic performances. The proper study of motivational factors is a prerequisite for students' effective motivation toward learning. So, a teacher should accept the effect of motivation in the instructional process and should keep knowledge of factors influencing motivation during the learning process. Hence, this study evaluates the factors affecting biology lesson motivation in secondary level students under quantitative research design. The sample of the study was randomly selected 200 students (51.5% girls and 48.5% boys) from grades nine and ten from five government-managed secondary schools. The research data was collected using a questionnaire developed by Glynn and Koballa (2006) as a science lesson motivation questionnaire and adapted by Ekici (2009) as a biology lesson motivation questionnaire. The data were analyzed by applying quantitative procedures using Statistical Program for the Social Sciences. The result generally indicates that students feel biology is an interesting subject with practical value relevant to their lives. Though the students were not confident on their Biology tests and were not receiving grade motivation, they were not greatly worried about the biology tests. Self-determination is the major motivating factor with the highest mean score of 4.170, followed by career motivation (3.890), intrinsic motivation, and personal relevance. Grade motivation has least role in Biology lesson motivation. Moreover, there is a significant correlation (r= 0.592) of intrinsic motivation and personal relevance with self-efficacy and assessment anxiety. There is low correlation between Self-efficacy and assessment anxiety and Self-determination but is significant.

**Keywords:** Achievement, Biology, motivation, Science, self-determination

## Introduction

Teaching is a process of providing stimulus situations for learners and of selecting the behavioural response sought as objectives by the teacher who evaluated the learning situation. The most important point of the whole act of teaching is the effort to determine the kind of responses that are made in all the experiences in which pupils engage under the direction of schools; that is what learned is. "It is an extremely complex process which means of a variety of things giving and imparting knowledge as well as asking questions, setting tasks and organizing the steps for accomplishing those creating models of thought, part of the transactional process which includes student's response" (Alexander and Sylor, 1966).

The improvement in teaching performance becomes possible when the teacher gains knowledge of a situation of his teaching behaviour, fully understands the consequences of his teaching behaviour and finally accepts a perceived need for this changing behaviour and students are formerly motivated. The English word 'Motivation' is derived from the Latin word Movere which means 'to move' or 'to activate'. In this sense, the fact that initiates a person to move or activate some need is called motivation. Motivation is related to wonder, interest and completion, and fundamental human needs. There are many views of different psychologists about motivation. Motivation is a psychological concept trying to explain the effort and quality of behaviors shown in different activities (Watters and Ginns, 2000; Ekici, 2010). According to Brophy (1998), motivation is a theoretical construct used to explain the initiations, direction, intensity, persistence and quantity of behaviour (Ekici, 2010). In the abstract, motivation is an affecting factor that makes human organisms behave, determines the decisiveness and energy of that behaviour and keeps the behaviours going by directing them (Ekici, 2010). Whereas Young (1988) defines, "Motivation is the process of arousing an action, sustaining the activity in process and regulating the pattern of activity". Motivation is energy that encourages an individual to demonstrate certain behaviour.

Nowadays, the motivation toward lesson concepts is often used in the literature (Yilmaz and Çavas, 2007; Yuksel and Suleyman, 2008; Ekici, 2010). For applied research, students' success mostly depends on factors effective in the cognitive area; but affective area skills are also important in addition to cognitive factors (Alsop and Watts, 2000; Thompson and Mintzes, 2002). Motivation is one of these factors and hence accepted as an important component, and it is one of the main subjects studied most (Lee and Brophy, 1996; Wolters and Rosenthal, 2000; Schunk and Pajares, 2001; Ekici, 2010).

Glynn and Koballa (2006) identified six components of motivation: intrinsic motivation, extrinsic motivation, the relevance of the task to personal goals, self-determination, self-efficacy, and assessment anxiety (Torio, 2015). A wide range of literature discussed these different motivational components. Oudeyer and Kaplan (2008) described intrinsic motivation as the driver of spontaneous exploration and curiosity. They even proposed a way of defining intrinsic motivation to help spark research in more systematic studies about it.

According to Ryan and Deci (2000), "Intrinsic motivation is defined as doing an activity for its inherent satisfaction rather than some separable consequence. When intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external products, pressures or rewards. Benefits of intrinsically motivated students include the following: more learning, better behaviour, happier, a greater sense of well-being, more engagement in the classroom, treating others well, and are truly contributing to the betterment of society. On the other hand, Ryan and Deci (2000) defined extrinsic motivation as "a construct that pertains whenever an activity is done in order to attain some separable outcome. Extrinsic motivation thus contrasts with intrinsic motivation, which refers to doing an activity simply to enjoy the activity itself, rather than its instrumental value."

Self-determination and relevance to personal goals are part of the self-determination

continuum (Deci & Ryan, 2002). Ryan and Deci (2000) referred to self-determination as a student's freedom to have some choice and control of their learning. Bandura (1997) defined self-efficacy as a person's belief that he/she can perform a particular task successfully (Torio, 2015). Bandura (1982) enumerated three ways in which self-efficacy affects learning and performance: it influences the goals that employees choose for themselves; influences learning as well as the effort that people exert on the job, and influences the persistence with which

Lunenburg (2011) noted that self-efficacy influences the tasks chosen by an individual to learn and the goals that they set for themselves. In addition, four sources of self-efficacy were also cited, including past performance, vicarious experience, verbal persuasion, and emotional cues. The final component is assessment anxiety. A student may experience anxiety as a sign of significant emotional problems and maybe a precursor to depression.

Teachers are mandated to teach what the curriculum demands and to enable their learners to pass requisite examinations. Teachers often have little freedom in what they teach and, indeed, in how they teach it, for overcrowded curricula make time precious. However, Wool-folk (2004) emphasizes the need to present the material in thoughtful and exciting ways to develop and stimulate interest. Thus, teacher motivation may influence learner motivation (Mubeen and Reid, 2014).

Motivation is an effective factor that makes human behaves, determine the decisiveness and energy of that behaviour and keep the behaviours going by directing them. It encourages an individual to demonstrate certain behaviour and is an important determinant of learning outcomes, as expressed in academic performances. Individual differences in the efficiency of learning processes and their outcomes are explained by differences in abilities or capacities and motivation. They result from an interaction between cognitive and motivational variables. Whether students learn or not, what they learn, how much time they devote to it, how efficient they are at it, and the level of proficiency they reach are all partly determined by how strongly they are motivated for their school work (Hansen, 1994).

Several motivating factors are responsible for the positive responses of students. A proper study of motivational factors influencing them is a prerequisite for the effective motivation of students towards learning. So, a teacher should accept the effect of motivation in the instructional process and keep knowledge of motivational theories, factors influencing motivation during the learning process.

In the context of Nepal, many of the students of school level received Science as a difficult subject and also the achievement level of Science is low in relation to other subjects though Science has been given a significant place at the secondary level of school education. The cause might be a deficiency of knowledge of students' motivational factors and the poor condition of motivational techniques promoted by Science teachers in teaching Science at the secondary level. So this research has aimed to explore students' motivational factors for learning Science.

It is beneficial to consider students' motivation toward learning biology because one of the

main causes for students not being successful and to get disappointed may be about the lack of motivation (Arwood, 2004). Low motivation level often brings up low success (Cavallo et al., 2003; Glynn et al., 2007). But when students are motivated enough and guided in learning, they will be successful (Dalgety et al., 2003; Zusho et al., 2003). Though there is some research on student motivation toward Science and finding the level of students' motivation in different countries (Lewthwaite and Fisher, 2004), similar studies are still lacking in the context of Nepal. On the other hand, it is determined that there is not much research on identifying factors that affect the biology lesson motivation of students. Ekici (2010) conducted his research on the factors affecting biology lesson motivation of high school students of Turkey (Ankara), but a similar study is still lacking. Hence, this research aims to evaluate the factors affecting biology lesson motivation of high school students and establish the relationship between factors affecting students' motivation towards biology lessons at the secondary level.

## Hypothesis

**Null Hypothesis (H0)**

I. There is no relationship between the factors affecting students' motivation toward biology lessons at the secondary level.

**Alternate Hypothesis (H1)**

I. There is a relationship between the factors affecting students' motivation toward biology lessons at the secondary level.

**Conceptual Framework of the Study**

In social cognitive theory (Bandura, 2006), students' learning is viewed as most effective when it is self-regulated. Students understand, monitor, and control their motivation and behaviour, leading to desirable learning outcomes. Motivation is defined in this theory as an internal state that arouses, directs, and sustains goal-oriented behaviour. By extension, the motivation to learn Science can be defined as an internal state that arouses, directs, and sustains science-learning behaviour. Motivated students achieve academically by engaging in question-asking, advice seeking, studying, and participating in classes, labs, and study groups (Schunk, Pintrich & Meece, 2008). Combining the constructivist learning and motivation theories, Tuan et al. (2005) argue that students' self-efficacy, science learning value (or task value), students learning strategies, the individuals learning goals, and the learning environment are important motivational factors. The following conceptual framework is used to study motivational factors of Biology learning.

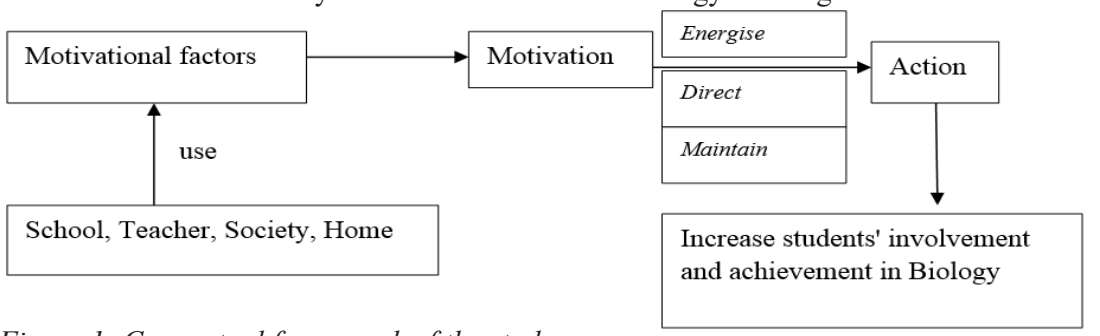


*Figure 1: Conceptual framework of the study.*

## Methodology

This study was carried out under a quantitative research design. In this study, five secondary schools in Gorkha district of Province four of Nepal were randomly selected. Randomly selected 200 students from five secondary schools: forty students from grades nine and ten (including 20 from nine and 20 from ten) from each school were the study sample. Girls were 51.5%, and Boys were 48.5% (the academic year 2075 B.S.). The ratio of girls and boys is almost equal. The research data was collected using the 30-items Likert- type instrument: "Students Motivation towards Biology Lesson Questionnaire (SMTBL)". The data were gathered by the measurement device developed by Glynn and Koballa (2006) as a science lesson motivation questionnaire and adapted by Ekici (2009) as a biology lesson motivation questionnaire. The questionnaire includes six dimensions. These dimensions are internal motivation, external motivation, interest in learning biology, responsibility for learning biology, trust in learning biology and anxiety in biology exams. There are 30 items in the questionnaire. Positive items are evaluated; strongly disagree: 1 point, disagree: 2 points, neutral: 3 points, agree: 4 points, highly agree: 5 points and negative items are evaluated vice versa. The highest point can be 150, and the lowest point is 30 for the questionnaire. The data obtained using the Biology Lesson Motivation Questionnaire and Personal Information Form was tabulated first and then analyzed by applying quantitative procedures by the use of Statistical Program for the Social Sciences (SPSS), version 18.0 (SPSS Inc., 2006).

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).

## Validation of Tools

Both, the Biology Lesson Motivation Questionnaire and Personal Information Form as developed by Glynn and Koballa (2006) as a science lesson motivation questionnaire and adapted by Ekici (2009) as a biology lesson motivation questionnaire were previously constructed and revised by the help of the experts. The validity of the used schedules was established by its approval from the subject experts.

## Result and Discussion

## Descriptive Statistics

The descriptive statistics in terms of mean and standard deviation are executed for each individual SMTBL question. The result, in general, indicates that the first statement, "I find learning Biology interesting has the highest mean value i.e. 4.43 with a standard deviation (SD.) 0.572. It is followed by the second statement "the biology I learn has practical value for me" with mean score 4.40 and SD. 0.666. The third statement "the biology I learn is relevant to my life has mean value 4.33 and SD 0.715. It means students feel biology is an interesting subject having a practical value relevant to their lives. But in, contrary to this, the statement "I believe I can earn a grade of "A" in the biology course" receives the least mean score 2.14 (SD. 1.003). Similarly, the statement "I worry about failing the biology tests (r)" received a mean score 2.31 (SD. 1.278) and the statement "I am confident I will do well on the biology tests" received 2.42 (SD. 1.196). This result means students

showed disagreement with the statement, "I believe I can earn a grade of "A" in the biology course". Similarly, the third statement, "I am confident I will do well on the biology tests" receiving a mean score 2.42 (SD. 1.196), showed that the students were not confident in their Biology tests (For detail, see table 1).

**Table 1**

**Descriptive statistics of each statement of the BLM questions**

| Statements | N | Sum | Mean | SD |
|---|---|---|---|---|
| I find learning biology interesting | 200 | 886 | 4.43 | .572 |
| The biology I learn has practical value for me | 200 | 881 | 4.40 | .666 |
| The biology I learn is relevant to my life | 200 | 865 | 4.33 | .715 |
| The biology I learn is more important to me than the grade I receive | 200 | 831 | 4.16 | .790 |
| The biology I earn relates to my personal goals | 200 | 851 | 4.25 | .796 |
| I like biology; that challenges me | 200 | 784 | 3.92 | .963 |
| Understanding biology gives me a sense of accomplishment | 200 | 749 | 3.75 | .885 |
| I think about how I will use the Biology I learn | 200 | 814 | 4.07 | .712 |
| I think about how the biology I learn will be helpful to me | 200 | 833 | 4.16 | .843 |
| I am nervous about how I will do on the biology tests (r) | 200 | 834 | 4.17 | .851 |
| I worry about failing the biology tests (r) | 200 | 462 | 2.31 | 1.278 |
| I become anxious when it is time to take a biology test (r) | 200 | 512 | 2.56 | 1.366 |
| I am confident I will do well on the biology tests | 200 | 484 | 2.42 | 1.196 |
| I am concerned that the other students are better in biology (r) | 200 | 795 | 3.98 | .823 |
| I believe I can earn a grade of "A" in the biology course | 200 | 428 | 2.14 | 1.003 |
| I hate taking the biology tests (r) | 200 | 694 | 3.47 | 1.075 |
| I believe I can master the knowledge and skills in the biology course | 200 | 721 | 3.60 | 1.337 |
| I am confident I will do well in the biology labs and projects | 200 | 778 | 3.89 | .884 |
| I put enough effort into learning the biology | 200 | 768 | 3.84 | .905 |
| I prepare will for the biology tests and labs | 200 | 739 | 3.69 | 1.018 |
| I use strategies that ensure I learn biology well | 200 | 760 | 3.80 | .919 |
| If I am having trouble learning biology, I try to figure out why | 200 | 688 | 3.44 | 1.146 |
| I think about how earning biology can help my career | 200 | 672 | 3.36 | 1.216 |
| I think about how learning biology can help me get a good job | 200 | 765 | 3.83 | .953 |
| I like to do better than the other students on the biology tests | 200 | 799 | 3.99 | 1.044 |
| Earning a good biology grade is essential to me | 200 | 818 | 4.09 | .765 |
| I expect to do as well as or better than other students in the biology course | 200 | 864 | 4.32 | .867 |
| I think about how my biology grade will affect my overall grade point average | 200 | 795 | 3.97 | .817 |
| I think about how my biology grade will affect my overall grade point average | 200 | 744 | 3.72 | .978 |
| It is my fault if I do not understand the biology | 200 | 838 | 4.19 | 1.063 |
| Valid N (listwise) | 200 | | | |

## Motivational Factors

All thirty statements of BLM questions are grouped under five motivational factors by calculating the mean scores of each statement included under each factor. The result generally indicates that the mean score for Factor 3: Self-determination is the highest

4.170, followed by factor 4: career motivation (3.890), and Factor 1: Intrinsic motivation and personal relevance (mean score: 3.779). Factor 1 is followed by Factor 2: Self-efficacy and assessment anxiety (mean score 3.744). Emergent Motivation Theory (EMT) suggests that individuals choose to engage most fully in everyday tasks and even make lifelong commitments due to feeling consistent, momentary positive effects while engaging in activities (Shumow, Jennifer, & Diana, 2013). Central to EMT is the idea that students will continue to freely engage in an activity only if it is experienced as appropriately challenging, aligned with individual skill level (so that success is perceived as possible), personally relevant, and enjoyable. Individuals' simultaneous subjective experience of challenge, skill, and enjoyment while engaged in particular activities predicts both short-term and longer-term commitment to these same activities (Shumow, Jennifer, & Diana, 2013).

The least mean score is received by Factor 5: Grade motivation with a mean score 3.289. All these motivational factors possess value greater than three. So, all factors are motivational factors for the students in learning Biology. But self-determination is the major motivational factor for learning biology, and grade motion is the least motivational factor (see Table 6). Self Determination Theory (SDT) posits that people have a basic need to feel competent, successful, autonomous, and affiliated with others when doing a task (Shumow, Jennifer, & Diana, 2013). A few studies suggest that over time this translates into longer-term commitments to specific tasks or subjects (Grolnick, Gurland, Jacob, & Decourcey, 2002 as cited in Shumow, Jennifer, & Diana, 2013). A related issue is an idea that individuals pursuing an activity out of genuine interest and commitment will be both more persistent and more successful than those who do not (Ames, 1992, as cited in Shumow, Jennifer, & Diana, 2013). Several studies have found that high school students report less enjoyment, interest and overall motivation in Science than younger students do (Shumow, Jennifer, & Diana, 2013).

Social cognitive theory, developed by Bandura (1986, 2001, 2006) and extended by others (e.g., Schunk & Pajares, 200; Pintrich, 2003), construes human functioning as a series of reciprocal interactions among personal characteristics, environmental contexts, and behaviors. In social cognitive theory (developed by Bandura (1986, 2001, 2006), students' learning is viewed as most effective when self-regulated, which occurs when students understand, monitor, and control their motivation and behaviour, leading to desirable learning outcomes.

**Table 2**

**Descriptive statistics for motivation factors.**

| Factors | N | Range | Minimum | Maximum | Sum | Mean | | Std. Deviation | Variance |
|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Statistic |
| Factor 1: Intrinsic motivation and personal relevance | 200 | 2.4 | 2.4 | 4.8 | 755.7 | 3.779 | .0332 | .4688 | .220 |
| Factor 2: Self efficacy and assessment anxiety | 200 | 2.1 | 2.6 | 4.7 | 748.7 | 3.744 | .0276 | .3899 | .152 |
| Factor 3: Self determination | 200 | 2.5 | 2.5 | 5.0 | 834.0 | 4.170 | .0364 | .5147 | .265 |
| Factor 4: Career motivation | 200 | 3.5 | 1.5 | 5.0 | 778.0 | 3.890 | .0583 | .8239 | .679 |
| Factor 5: Grade motivation | 200 | 2.4 | 1.8 | 4.2 | 657.8 | 3.289 | .0315 | .4454 | .198 |
| Valid N (list wise) | 200 | | | | | | | | |

One sample t-test was applied for the test of all five motivational factors at 95% confidence level, 0.05 % level of significance. The result is significant for all five motivational factors (p= 0.000 for all). For detail see table 3.

**Table 3**

**One- Sample test for motivational factors**

| | Test Value = 0 | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Factor 1: Intrinsic motivation and personal relevance | 113.981 | 199 | .000 | 3.7785 | 3.713 | 3.844 |
| Factor 2: Self efficacy and assessment anxiety | 135.783 | 199 | .000 | 3.7435 | 3.689 | 3.798 |
| Factor 3: Self determination | 114.575 | 199 | .000 | 4.1700 | 4.098 | 4.242 |
| Factor 4: Career motivation | 66.772 | 199 | .000 | 3.8900 | 3.775 | 4.005 |
| Factor 5: Grade motivation | 104.450 | 199 | .000 | 3.2893 | 3.227 | 3.351 |

Pearson correlation coefficient is calculated between the motivational factors. The result, in general, indicates that there is a moderate correlation (r= 0.592) between factors one (intrinsic motivation and personal relevance) and two (self-efficacy and assessment anxiety), which is significant at 5% level of significance as p=0.00 is less than the level of significance. There is a low correlation between factor 2: Self-efficacy and assessment anxiety and factor 3: Self-determination (r= 0.345), which is significant at 5% level of significance as p=0.00 is less than the level of significance. Similarly, Factor 1: Intrinsic motivation and personal relevance and Factor 3: Self-determination has a low correlation (r= 0.234), which is significant at 5% level of significance as p=0.00 is less than the level of significance. But, the correlations between other factors have very low correlation. Factor 1: Intrinsic motivation and personal relevance and Factor 4: Career motivation, Factor 2: Self-efficacy and assessment anxiety and Factor 4: Career motivation, Factor 2: Self-efficacy and assessment anxiety and Factor 5: Grade motivation, Factor 3: Self-determination and Factor 5: Grade motivation have very low correlation ($r \leq 0.20$) but is significant at 5% level of significance as p is less than the level of significance. But the correlation between Factor 1: Intrinsic motivation and personal relevance and Factor 5: Grade motivation, Factor 4: Career motivation and Factor 5: Grade motivation is insignificant at 5% significance level as p is greater than the level of significance. The correlation between motivational factors is given below in table 4.

**Table 4**

**Correlation between motivational factors**

| Factors | | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|---|
| Factor 1: Intrinsic motivation and personal relevance | Pearson Correlation | 1 | .592** | .234** | .155* | .129 |
| | Sig. (2-tailed) | | .000 | .001 | .029 | .069 |
| | N | 200 | 200 | 200 | 200 | 200 |
| Factor 2: Self efficacy and assessment anxiety | Pearson Correlation | | 1 | .345** | .140* | .179* |
| | Sig. (2-tailed) | | | .000 | .048 | .011 |
| | N | | 200 | 200 | 200 | 200 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Factor 3: Self determination | Pearson Correlation | | | 1 | .243** | .146* |
| | Sig. (2-tailed) | | | | .001 | .039 |
| | N | | | 200 | 200 | 200 |
| Factor 4: Career motivation | Pearson Correlation | | | | 1 | .103 |
| | Sig. (2-tailed) | | | | | .147 |
| | N | | | | 200 | 200 |
| Factor 5: Grade motivation | Pearson Correlation | | | | | 1 |
| | Sig. (2-tailed) | | | | | |
| | N | | | | | 200 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | | |

## Conclusion

Students feel biology is an interesting subject having practical value relevant to their daily lives. Though the students are not confident in their Biology tests, they are not greatly worried about the biology tests and are not receiving grade motivation. Self-determination is the major motivating factor with the highest mean score of 4.170, followed by career motivation (3.890), followed by Intrinsic motivation and personal relevance. Grade motivation has the least role in Biology lesson motivation. All these five motivational factors possess a value greater than three. So, all factors are motivational factors for the students in learning Biology. But self, a determination is the major motivational factor for learning Biology and grade motion is the least motivational factor. The result, in general, indicates that there is a moderate correlation (r= 0.592) between factors one (intrinsic motivation and personal relevance) and two (self-efficacy and assessment anxiety), which is significant. Conclusion: there is a low correlation between self-efficacy, assessment anxiety, and Self-determination, but it is significant.

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