A Theoretical Framework for Assessing the Impact of GIS Integrated Teaching on Underachieving Malaysian Students' Motivation to Learn Geography

Soon Singh Bikar Singh[1,2,*], Grant Kleeman[1] & Penny Van Bergen[1]

[1]School of Education, Macquarie University, Sydney, Australia

[2]School of Education, University Malaysia Sabah, Malaysia

*Corresponding author: School of Education, Macquarie University, Sydney, Australia.
E-mail: sohan4025@gmail.com

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Abstract

In 1988, Malaysia Ministry of Education introduced the integrated secondary school curriculum as a continuation of curriculum changes initially introduced in the primary school. These changes have impacted the profile of Geography in the secondary school, with Geography becoming a compulsory subject at the lower secondary school level and an elective subject at the upper secondary school level. As a result, fewer schools in Malaysia now offer Geography at the upper level. In 1999, the Ministry of Education also established the Smart School Program, which emphasizes the use of the technology tools as an important aid in learning and teaching. While there is potential to use new technological tools such as Geography Information Systems (GIS) in Geography, which has been demonstrated in other countries to increase students' motivation for learning, the integration of ICT has been prioritised in Science, Mathematics, and English only. Consequently, Malaysian students in upper secondary school are shying away from studying Geography. Furthermore in students who do continue Geography studies, the percentage who pass the exam is declining each year. Scholars have reported that Malaysian students are not motivated to study Geography and increasingly perceive it as a dry subject with little use of technology. This article presents a theoretical model based on an extensive review of literature assessing the impact of GIS on motivation.

Keywords: *geography information system; theoretical framework; underachievers; motivation*

1. Introduction

The history of Geographical Education in Malaysia is unique. Geography was first introduced in Malay vernacular schools in 1927. The geography curriculum was 'British Empire-centered' and students were taught about map drawing, principal tows, rivers, and national industries through the memorization of discrete facts. Geography education was officially introduced in primary and secondary English School in 1928. The curriculum emphasized the study of geographic terms, map reading, map drawing and identification of geographic regions across five continents (Wong 1977). The curriculum structure was reassessed again in 1936, 1956, 1979 and 1982 (Khatijah, 1989). In line with national development and the vision to produce creative, innovative and knowledgeable human resources, for example, the Malaysian Ministry of Education used the revision of the primary school curriculum in 1982 to provide greater emphasis on the acquisition of basic skills and knowledge through various learning activities (Lee, 2000). Significantly, Geography as a discrete entity was eliminated and integrated with "Alam Dan Manusia" (local study): an initiative designed to integrate Science, History, Geography, Civic and Moral studies.

The integrated secondary school curriculum was introduced in 1988 as a continuation of the curriculum changes introduced in primary schools (Abdul Hamid, Mohmadisa, Mohd Faris & Mohamad Suhaily, 2006). Geography becames a compulsory subject for lower secondary school students who were formally assessed in the government

Form 3 students (Penilaian Menengah Rendah). However, at the upper secondary school level, Forms 4 and Forms 5, Geography became an elective subject. As a result, fewer schools in Malaysia now offer Geography at the upper level (Lateh & Vasugiammai, 2009).

In 1999, the Ministry of Education also established the Smart School Program: emphasizing the use of technological tools as an important aid in learning and teaching. Significantly, the integration of ICT in teaching has given greater priority in Science, Mathematics, and English. The introduction of the Smart School project does not have any positive impact on the curriculum and methods of teaching Geography in Malaysia, and Geography has thus become what students perceive to be a 'dry' subject. Consequently, students in upper secondary school level now shy away from studying Geography. The percentage of students who pass the exam is declining each year (Habibah & Vasugiammai, 2011).

2. GIS and Achievement in Geography

Over the past three decades, Geography Information System (GIS) have become a central tool for natural resources management, disease mapping and monitoring, crime analysis and city and regional planning. Consequently, GIS education has become pervasive: emerging in secondary school Geography classes in a number of countries (Oppong & Ofori-Amoah 2012). Aladang (2010) argues that the introduction of GIS in Geography classes has a positive effect on students' attitudes towards Geography. This view is strongly supported by Kaya's (2012) research on six grade primary school students in Turkey. Kaya's research shows that GIS integrated lessons promote academic success even amongst students whose demographic characteristic and school circumstances place them at high risk of failure in Social Studies.

Numerous studies have attempted to explain the effects of GIS integrated lesson on students' achievement. For example, Shin (2007) reports that the use of GIS integrated lessons helped fourth-grade primary students to engage in the more difficult tasks, and also enhanced their understanding and achievement. Similar findings have also been reported by Sin Milson and Earle (2008), Artvinli (2010), Elisabeth, Chang, and Hang, (2010). GIS has been recognized as an effective tool in classrooms because it promotes students' Geography skill, leads to more dynamic learning, and enhances students' achievement. Milson (2008) and Liu (2010) have argued that GIS not only enhance students' skills but also provides students opportunities to work with actual data that deal with their local area. Therefore, they have concluded that GIS is an effective tool to teach Geography in primary and secondary school. However, it must be noted that the majority of studies to date have been conducted with typical and high achieving Geography students. With the exception of Kaya's research with young Turkish students, outlined above, the effectiveness of GIS in teaching and learning Geography with underachieving students is unknown (Aladang, 2010). There is no research examining the use of GIS with underachieving Malaysian students.

In Malaysia GIS has not been embraced in the education system. Nordin Sakke (2006) highlights the main obstacles to integrating GIS in the Malaysian education system: a lack of computers, and less ability to accessing computers among teachers and students in secondary schools. However, a recent study by Lateh and Muniady (2010) has noted that the increased number of computer labs in each school. Moreover, they note the willingness of teachers to use GIS: thus suggesting renewed opportunities to integrate GIS in Geography teaching in Malaysian schools. Singh (2012) has gone further to investigate the opportunities' to integrate GIS in Sabah Secondary Smart Schools, and found that there is significant potential to integrate GIS when teachers are well trained in GIS, willing to use GIS in teaching, and able to access sufficient ICT infrastructures.

While there is little research examining the integration of GIS in Geography classrooms in Malaysia with underachieving students, recently two studies have implemented GIS with typically performing younger students. For example, in a study by Vasugiammai (2007), Form 2 students used GIS to study the topic of Developing Area in Kepala Batas, Malaysia, The author reports that students were excited and easily understood the concept of patterns and population distribution. In a study by Umah Dewi (2008), Form 1 students who used GIS to examine mountain landscapes experienced an increase in performance following the use of GIS. Given the Malaysian Ministry of Education's goals to enhance students' achievement in the Sijil Pelajaran Malaysia (Malaysian Education Certificate), there is now a need to examine how GIS-integrated instruction could be used to also enhance the learning of underachieving students.

3. GIS and Motivation to Learn Geography

Over the last decade, a wealth empirical evidence has demonstrated that ICT enhances students' motivation to learn (Handley, 2008; Marina, 2009; Otta & Tavella, 2010; Vos, Meijden & Denessen, 2011; Moos & Honkomp, 2011; Artvinli, 2010; Aladang, 2010; Park & Kim, 2011; Vos, Van der Meijden & Denessen, 2011; Meluso, Zheng, Spires & Lester, 2012. In Geographical Education, there have been a number of studies conducted to investigate the effectiveness of using ICT to enhance students' motivation to learn Geography (Tuzun, Saylu, and Karakus, 2009; Yeung, 2010; Kaya, 2011). Interestingly, all studies suggest that ICT significantly influences their Motivation to learn Geography (e.g. Vos, Meijden, & Denessen, 2011; Santos, Perez & Hernandez, 2011; Chiu, Cheng, & Huang, 2012).

In the Malaysian context, the Ministry of Education has invested heavily in school facilities for the infusion of ICT in various subjects. However, as explained above, the integration of ICT has traditionally been prioritised in other subjects including Bahasa Malaysia (Malay language), Science, Mathematics and English (Ruslan, 2001; Abdul, 2006). Geography teachers in Malaysia have recently taken proactive steps to integrate ICT in teaching Geography, with Malaysian studies, like those in international contexts, also showing that lessons with integrated ICT have a positive impact on students' motivation (Raman, 2006 & Othman, 2007). A recent study by Ong, Ho and Teow (2011), for example, demonstrated that ICT-integrated Geography lessons not only motivated students to learn Geography but also enhanced their critical thinking.

While there is a small number of existing studies examining GIS in Geographical Education in Malaysia, these studies are not comprehensive. There is a focus on resources that can be utilized to provide an attractive learning environment in Geography class (Umah Dewi, 2008; Lateh & Muniandy, 2010), but little use of quantitative outcome measures and little focus on the motivational theory underpinning student engagement. As a consequence, while motivation has been examined in broad terms, far too little attention has been focused on the effects of ICT integrated teaching on students' goal orientation.

Goal orientation has significant implications for learning. According to Demirci (2006), underachievers' typically have very low confidence in their ability. Thus, a salient goal is to try to avoid any challenging tasks where there is a risk of failure. We suggest here that GIS may assist such students in setting appropriate goals. For example, Li (2012) posits that the integration of ICT and multimedia technology in teaching and learning raises students' learning interest, ability, confidence and engagement. Where students feel confident of success, they are less likely to set task avoidance goals.

Goal orientation is in turn related to students' intrinsic motivation. According to Woolfolk and Margetts (2010), the classroom environment, technology-based teaching and student-centered learning that supports student self-determination are each strongly associated with students' intrinsic interest in both the task and the learning process more broadly. Shroff and Rogel (2009) thus suggest that a better understanding of intrinsic motivation and the ability to measure the students' intrinsic motivation when engaged with technology supported learning would contribute to the design of more effective educational programs.

Consistent with this notion, international research reveals that technology-based teaching increases students' intrinsic motivation across a variety of disciplines. For example, Park and Kim (2011) conducted an experimental study to identify the effect of educational computer games on intrinsic motivation. This study showed that there is a meaningful increase in intrinsic motivation among learners who used such games. Another recent study by Lee and Osman (2012) also demonstrated that an increase in Form 4 chemistry students' intrinsic motivation was observed when an interactive multimedia module was used to learn electrochemistry. This is because combinations of technology-integrated learning address students' basic need for competence, autonomy, and relatedness. This view is strongly supported by Vos, Meijden and Denessen (2011), who argue that ICT integrated teaching effects students' competence by enhancing their ability to conduct specific tasks. Finally, Zhao, Lu, Wang, and Huang (2011) argue that the curiosity and enjoyment experienced when using the internet enhances students' competence and enables them to be more connected to friends which in turn induces stronger intrinsic motivation. Shin, Sutherland, Norris and Soloway (2011) assert that ICT integrated teaching enhances student autonomy because they get highly involved in teaching and learning activities.

The evidence from these studies has confirmed that ICT integrated teaching and learning have a significant impact on students' intrinsic motivation. However, the impact of ICT integrated teaching in Geography subjects on students'

intrinsic motivation has not received little commensurate attention; either in Malaysia or abroad. In one of the few studies examining ICT, Geography, and intrinsic motivation, Tuzun, Yilmaz-Soylu, Karakus, Inal and Kizilkaya (2009) designed a three-dimensional educational game about Geography for elementary school children. Interestingly, they found that students demonstrated statistically significant higher levels of intrinsic motivation in the computer game-based environment to those who learned in a traditional class environment. As in other studies, however, they did not specifically evaluate the impact of ICT-integrated learning on underachieving students. In addition, in spite of an increased interest among scholars to investigate the impact of ICT integrated Geography teaching on students' motivation, no study to date has investigated the effects of GIS as a new technology teaching tools on students' intrinsic motivation.

Goal orientation and intrinsic motivation should not be considered without also considering self-efficacy Schunk and Pajares (2009) has clarified that self-efficacy play an important role in academic motivation because students who are efficacious about learning tend to be competent, engaged, set learning goal, use effective learning strategies and create a supportive environment. In line with Bandura, Schunk and Pajares' views, a large and growing body of literature has investigated the effect of ICT on students' self-efficacy (Papastergiou, Gerodimos & Antoniou, 2011 & Packer, 2012). Preliminary work focuses on GIS specifically. For example, work undertaken by Baker (2003) to investigate the effects of GIS on students self-efficacy in middle Science classrooms shows that students using the GIS-supported materials made positive and significant improvements in their Science self-efficacy and attitudes toward technology. More studies are needed in this area particularly in Malaysia in order to validate the seeming potential of GIS on enhancing students' self-efficacy.

4. Motivation and Geography Achievement

There is a large volume of published studies describing the relationship between motivation and academic achievement in primary school (Chen & Pajares, 2010; Bruckman, 2011; Hornstra, Veen, Peetsma, & Volman, 2012) in secondary school (Bruckman, 2011; Bryan, Glynn & Kittleson, 2011; Green, Liem, Martin, Colmar, Marsh, & McInerney, 2012). The relationship between motivation and achievement has been found in many subject areas, including Science (Bryan, Glynn, & Kittleson, 2011), Mathematics (Shores & Shannon, 2010; Berger & Karabenick, 2011; Areepattamannil, Freeman & Klinger, 2011), and Languages (Galloway, Leo, Rogers, & Armstrong, 2011). However, little attention has been paid to Geography, however, and no single study has revealed the effects of motivation on students' achievement in Geography and more specifically among underachievers Geography students.

Educational psychologists have affirmed that goal orientations are one of the primary influences on achievement. However, the results concerning goal orientation and achievement have been less consistent. For example, Azar, Lavasani, Malahmadi and Amani (2010) investigated the role of achievement goals and mathematics achievement among 280 third grade high school students. They demonstrated that mastery goal and performance approach goal influenced student mathematics achievement. Another study by Rostami, Hejazi, Lavasani (2011) has examined the relationship between achievement goal and achievement in English among 336 third grade students' in Iran. This study revealed that there was a meaningful relationship between mastery goals, performance approach goals, and English achievement. Poorer performance was observed when students held a performance avoidance goal orientation. Finally, Keys, Conley, Duncan, and Domina, (2012) conducted a large-scale study with 2000 seven and eight grades students of White, Hispanic and Vietnamese background in California. Students who maintain a higher level of mastery goal had higher grade in Mathematics. However, in constrast to previous findings, this study showed that neither performance-approach or performance-avoidance goal orientations predicted students' mathematics achievement. These inconsistent findings may be because of the classroom structures designed by teachers in such ways that they emphasized the development and improvement of academic mastery, rather than competition among students. This view strongly supported by Throdsen and Turmo (2012). They argue that students' personal goal orientations are influenced by the teacher's teaching practices in the classroom.

When considering motivation and goal orientation, the kind of motivation is important. A number of studies have demonstrated the enormous advantages of intrinsic motivation for the academic achievement among primary school students' (Tuzun, Yilmaz-Soylu, Karakus, Inal, & Kizilkaya, 2009; Vos, Van der Meijden & Denessen, 2011; Othman & Leng, 2011). Inspired by these findings researchers began to investigate the effect of intrinsic motivation in

relation to various aspects among secondary school students. For instance, a study by Areepattamannil, Freeman and Klingger (2011) which included 355 grade 9 to 12 Indian migrant students in Canada revealed that intrinsic motivation had a positive predictive effect on academic achievement, whereas extrinsic motivation did not. In Malaysia too, a considerable number of studies have been conducted to explore the relationship between intrinsic motivation and academic achievement. For example, Othman and Leng (2011) tested the relationship between intrinsic motivations and achievement among 200 Primary Chinese School students in Johor, Malaysia. A positive relationship was found. Recently, Thang, Ting and Jaafar (2011) also tested the effect of intrinsic motivation on attitude and achievement in English for 143 students in Sarawak. The findings of this study revealed there is positive relationship between attitudes to learn English, achievement scores, and intrinsic motivation.

The findings of Malaysian and international studies strongly show that students tend to learn and perform better in academically when they are intrinsically motivated. One of the main reasons for better performance among intrinsically motivated students could be that their teachers are more likely to facilitate teaching and learning activities which are associated with intrinsic goals and autonomy-supportive classroom contexts. This view is strongly supported by Reeve (2012, p. 157) who posits that students learn better and feel better when they pursue intrinsic rather than extrinsic goals when their teachers facilitate learning associated with intrinsic goals. However, there are very limited studies investigating the effect of intrinsic motivation for achievement among under achieving Malaysian students, who are less likely to be intrinsically motivated than their peers

Finally, the relationship between self-efficacy and academic achievement has captured the attention of many scholars. Recently, for example, Caprara, Vecchione, Alessandri, Gerbino and Barbaranelli (2011) conducted a longitudinal study to investigate the interrelationship between 13-19 year old Italian students' self-efficacy and academic achievement. Their study revealed that self-efficacy was correlated significantly to predictors of academic achievement. Hsieh and Kang's (2010) study of 192 ninth-grade English learners in Korea likewise found that there was a positive correlation between self-efficacy and achievement in English, and, in one of the most comprehensive studies to date, Yeung and Nie (2010) aimed to examine the relationship of academic achievement to six motivation constructs: namely Self-efficacy, Interest, Mastery goal orientation, Engagement, Avoidance Coping and Effort withdrawal in learning English in 78 schools in Singapore. In this large scale study, involving 4214 primary and secondary school students, they again found that self-efficacy significantly influences students' English achievement.

Although ample studies have demonstrated that self-efficacy is significantly associated with students' academic achievement, there is also a considerable amount of published literature showing the negative correlation between self-efficacy and academic achievement. For example, in a study of 497 middle school students in the United States, Ritzhaupt, Higgins and Allred (2011) found that high mathematics self-efficacy positively influenced students' attitudes toward Mathematics, but did not change their achievement. Given these equivocal findings, further research is required.

Within the Malaysian context, numerous empirical studies in educational settings have also attempted to explain the relationship between self- efficacy, motivation, and achievement. For instance, in studies of 688 form four Malaysian students, Elias, Mahyuddin, Noordin, Abdullah and Roslan (2009) found significant correlation between Self-efficacy and student achievement in Mathematics and English. Nevertheless, most of the studies that have been conducted in Malaysia lack consideration of the self-efficacy of underachievers' and its bidirectional influence on student achievement. Schunk and Mullen (2012) postulate that self-efficacy has diverse effects on various motivation outcomes associated with students' engagement and achievement. Hence, more research is necessary to examine the effects of self-efficacy on underachievers' students' motivation to enhance their academic achievement and preventing from school dropout.

5. A Theoretical Framework for Assessing the Impact of GIS on Achievement and Motivation

The aim of this research is to assess the effectiveness of GIS based learning in enhancing students' motivation and achievement in Geography. Achievement Motivation Theories are the theoretical lenses through which the data are analyzed. Theories of achievement motivation are based on the broad theory to explain, predict, and influence learning and performance. This theory assumes there is an interrelationship between an individual's cognitive process, social environment, and achievement-oriented behavior (Alderman, 2008, p. 8). In this study, Goal Theory, Self Determination Theory, and Self-efficacy Theory are used as a point of reference. Significantly, Areepattamannil,

Freeman & Klinger (2010) and Diseth (2012) have used these theoretical frameworks to determine motivation effect on students' achievement. There were three theoretical frameworks utilized to support this study. A visual representation of how these theories are interrelated on students achievement show in Figure 1.

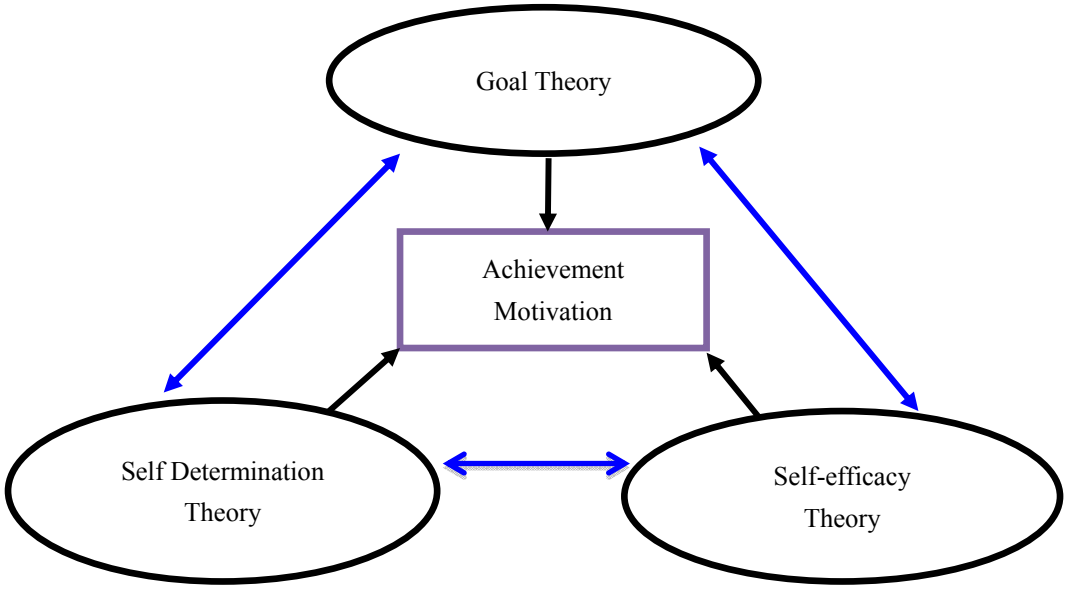

Figure 1: Theoretical Framework

The blue arrows in Figure 1 show the relationship between Self Determination Theory, Self-efficacy Theory, Goal Theory and student achievement motivation. Goal Theory focuses on the reason students have for engaging in a specific activity or undertake a task (Stepek, 1998; Martin & Dowson, 2009). Most goal theorists distinguished between learning goals (mastery goal) and performance goals (demonstrate superiority). More-recent developments in goal theory have added social goals, which focus on social reason for achievement (Elliot, 1997; Martin & Dowson, 2009). There are a number of studies demonstrated a significant association between students learning goal with their academic achievement (Meece, Eric & Lynley, 2006; Eow, Ali, Mahmud & Baki 2009).

Self Determination Theory holds that human beings have three innate psychology needs, namely relatedness, competence, and autonomy. These are required to function at optimal levels (Martin & Dowson, 2009). According to Deci and Ryan (2004) relatedness refers to the need to feel a sense of belonging to a social group and autonomy refers to the need to express one's authentic. They also note that competence refers to needs to feel that one is effective in performing the requisite action. Self Determination Theory evolved from the distinction between intrinsic and extrinsic motivation. A number of empirical studies have demonstrated the innumerable advantage of intrinsic and extrinsic motivation in student achievement (Shrof & Vogel, 2009; Areepattamannil, Freeman & Klinger, 2010).

Self-efficacy Theory, developed by Bandura (1997, 1986), focuses on an individual's belief in their capabilities to successfully achieve desired performance. Self-efficacy Theory originated from the social learning theories, which signify one's ability to learn from others. A wealth of research indicates that a higher sense of self-efficacy can positively affect learning, achievement, and motivational outcome such as individuals' choices of activities, effort and interest (Bandura, 1997; Schunk & Usher, 2012). Many studies have also shown that self-efficacious students are motivated and engaged in learning, which promotes their competence as learners. On the other hand, a lower sense of self-efficacy for study and performing well in school can negatively affect students' motivation and increasing the risk of underachieving and drop out (Schunk & Mullen, 2012).

Goal Theory, Self Determination and Self-efficacy theory are interrelated and have been extensively providing an empirical useful conceptual framework to understand the achievement motivation of students. According to Svanum

and Aigner (2010), intrinsic and extrinsic motivations are strongly related to the Goal Theory. They stated that students who are intrinsically motivated develop mastery goal, whereas students who are extrinsically motivated to develop performance goal. On the basis of a large and consistent body of research, Tabernero and Wood (2009) concluded that Self Determination Theory and Self-efficacy Theory are interrelated. They emphasize that high self-efficacy leads individuals to view difficult tasks as challenges to be tackled rather than threats to be avoided. This understanding foster intrinsic motivation and deep concern with the activities carried out. Therefore, Self-efficacy is directly related to task involvement and intrinsic motivation.

Previous research also has revealed that self-efficacy relates to achievement goals. More specifically achievement goals are considered an outcome of academic self-efficacy (Diset, 2012).In addition, Fan, Meng, Billings, Litchfield, and Kaplan (2008) assume goals as predictors of self-efficacy and Diseth (2012) regard self-efficacy as predictors of Goal these entire variables are strongly related to students' academic achievement.

The above discussion shows these three motivation achievement theories are interrelated and particularly relevant for study students' motivation achievement and provide a useful lense. Therefore, three achievement motivational theories are the theoretical lens through which data are analyzed.

6. Conclusion

The aim of this paper has been provide a comprehensive theoretical framework to assess the impact of GIS on the achievement and motivation to learn geography among Malaysian underachieving students. Theories of achievement motivation are based on a need to explain, predict, and influence students' behavior toward learning and performance. Each assumes there is an interrelation between an individual's cognitive process, social environment, and behavior that is striving for achievement. Research has shown that GIS has positively influenced on students' goal, intrinsic motivation, and self efficacy to study Geography. In addition, a wealth of research highlights the positive impact of GIS on students' achievement. However, an extensive literature review found little research investigating the effectiveness of GIS integrated lessons on underachieving students' achievements, not on their motivation to learn Geography. While there are a number of studies demonstrating a significant association between students' learning goals and their academic achievement, and a number of empirical studies have demonstrated the innumerable advantage of intrinsic motivation, these tend to be based on normative samples only. Likewise, a wealth of research suggests that a higher sense of self-efficacy can positively affect learning, achievement choices of activities, effort, and interest, however, underachieving students are less likely than other students to experience positive self efficacy. Given that Goal theory, Self determination theory and Self efficacy theory are interrelated, and that learning goals, intrinsic motivation and self efficacy strongly affect students' achievement, there is a need to examine these theories in light of new efforts to integrate GIS into Geography classrooms in Malaysia.

References

Abdul Hamid Abdullah, Mohmadisa, Mohd Faris Dzianuddin, & Muhamad Suhaily. (2006). Using GIS as teaching tool in geography education. In A. H. Abdullah (Eds.), *Geographic education issues in Malaysia*. Tanjung Malim (110-134). Perak, Malaysia: UPSI Publisher.

Aladag, E. (2010). The effects of GIS on students' academic achievement and motivation in seventh grade social studies lessons In Turkey. *International Research in Geographical and Environmental Education, 19*(1), 11-23.

Ali, A. (2008). Evaluating the implementation and effectiveness of GIS-based application in secondary school geography lessons. *American Journal of Applied Sciences, 5*(3), 169.

Anderman, E. M., & Patrick, H. (2012). Achievement goal theory, conceptualization of ability/intelligence, and classroom climate. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 173-191). US: Springer.

Areepattamannil, S., Freeman, J. G., & Klinger, D. A. (2011). Intrinsic motivation, extrinsic motivation, and academic achievement among Indian adolescents in Canada and India. *Social Psychology of Education*, *14*(3), 427-439. http://dx.doi.org/10.1007/s11218-011-9155-1

Artvinli, E. (2010). The contribution of geographic information systems (GIS) to geography education and secondary

school students' attitudes related to GIS. *Educational Sciences: Theory & Practice, 10*(3), 1277-1292.

Azar, H. K., Lavasani, M. G., Malahmadi, E., & Amani, J. (2010). The role of self-efficacy, task value, and achievement goals in predicting learning approaches and mathematics achievement. *Procedia-Social and Behavioral Sciences, 5*, 942-947. http://dx.doi.org/10.1016/ji.sbspro.2010.07.214

Baker, T. R. (2003). *The Effects of Geographical Information Systems (GIS) Technologies onStudents' Attitudes, Self-efficacy, and Achievement in Middle School Science Classrooms.*(Unpublished doctoral dissertation). University of Kansas, United State.

Bandura, A. (1997). *Self efficacy: The exercise of control*. New York: Freeman.

Berger, J.-L., & Karabenick, S. A. (2011). Motivation and students' use of learning strategies: Evidence of unidirectional effects in mathematics classrooms. *Learning and Instruction, 21*(3), 416-428. http://dx.doi.org/10.1016/j.learninstruc.2010.06.002

Bruckman, I. R. (2011). The relationship between achievement motivation and sex, age, social class, school stream and intelligence. *British Journal of Social and Clinical Psychology, 5*(3), 211-220. http://dx.doi.org/10.1111/j.2044-8260.1966.tb00977

Bryan, R. R., Glynn, S. M., & Kittleson, J. M. (2011). Motivation, achievement, and advanced placement intent of high school students learning science. *Science Education, 95*(6), 1049-1065. http://dx.doi.org/10.1002/sce.20462

Caprara, G. V., Vecchione, M., Alessandri, G., Gerbino, M., & Barbaranelli, C. (2011). The contribution of personality traits and self-efficacy beliefs to academic achievement: A longitudinal study. *British Journal of Educational Psychology, 81*(1), 78-96. http://dx.doi.org/10.1348/2044-8279.002004

Chen, J. A., & Pajares, F. (2010). Implicit theories of ability of Grade 6 science students: Relation to epistemological beliefs and academic motivation and achievement in science. *Contemporary Educational Psychology, 35*(1), 75-87.

Chiu, J. H., Cheng, C. C., & Huang, K. H. (2012). *More than Learning Mathematics: The Impact of Mathematics Games on Learning in Geography and Community Education.* Paper presented at the IEEE International Conference On Digital Game And Intelligent Toy Enhanced Learning, Soule, Korea.

Deci, E. L., & Ryan, R. M. (2004). *Handbook of self-determination research*. Rochester, New York: Univ of Rochester Press.

Diseth, Å., Danielsen, A. G., & Samdal, O. (2012). A path analysis of basic need support, self-efficacy, achievement goals, life satisfaction and academic achievement level among secondary school students. *Educational Psychology, 32*(3), 335-354. http://dx.doi.org/10.1080/01443410.2012.657159

Elias, H., Mahyuddin, R., Noordin, N., Abdullah, M. C., & Roslan, S. (2009). Self-efficacy beliefs of at-risk students in Malaysian Secondary Schools. *The International Journal of Learning, 16*(4), 201-210.

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of personality and social psychology, 72*(1), 218.

Eow, Y. L., Ali, W. Z. b. W., Mahmud, R. b., & Baki, R. (2009). Form one students' engagement with computer games and its effect on their academic achievement in a Malaysian secondary school. *Computers & Education, 53*(4), 1082-1091. http://dx.doi.org/10.1016/j.compedu.2009.05.013

Fan, J., Meng, H., Billings, R. S., Litchfield, R. C., & Kaplan, I. (2008). On the role of goal orientation traits and self-efficacy in the goal-setting process: Distinctions that make a difference. *Human Performance, 21*(4), 354-382. http://dx.doi.org/10.1080/08959280802347122

Galloway, D., Leo, E. L., Rogers, C., & Armstrong, D. (2011). Motivational styles in English and mathematics among children identified as having special educational needs. *British Journal of Educational Psychology, 65*(4), 477-487.

Green, J., Liem, G. A. D., Martin, A. J., Colmar, S., Marsh, H. W., & McInerney, D. (2012). Academic motivation, self-concept, engagement, and performance in high school: Key processes from a longitudinal perspective.

Journal of adolescence, 35(5), 1111-1122. http://dx.doi.org/10.1016/j.adolescence.2012.02.016

Handley, R. (2008, 18-21 June 2008). *Using technology to motivate student learning*. Paper presented at the The Emerging Technologies Conference, University of Wollongong, Australia.

Hornstra, L., van der Veen, I., Peetsma, T., & Volman, M. (2012). Developments in motivation and achievement during primary school: A longitudinal study on group-specific differences. *Learning and Individual Differences*, *23*, 195–204. http://dx.doi.org/10.1016/j.lindif.2012.09.004

Hsieh, P. P.-H., & Kang, H.-S. (2010). Attribution and self-efficacy and their interrelationship in the Korean EFL Context. *Language Learning, 60*(3), 606-627. http://dx.doi.org/10.1111/j.1467-9922.2010.00570.x

Kaya, H. (2011). Primary 6th grade students' attitudes towards the social studies lesson aided with geographic information systems (GIS): Karabük Case. *Middle-East Journal of Scientific Research, 7*(3), 401-406.

Keiper, T. A. (1999). GIS for elementary students: An inquiry into a new approach to learning geography. *Journal of geography, 98*(2), 47-59.

Kerski, J. J. (2001). A national assessment of GIS in American high schools. *International Research in Geographical and Environmental Education, 10*(1), 72-84.

Keys, T. D., Conley, A. M. M., Duncan, G. J., & Domina, T. (2012). The tole of goal orientations for adolescent mathematics achievement. *Contemporary Educational Psychology, 37*(1), 8. http://dx.doi.org/10.1016/j.cedpsych.2011.09.002

Khatijah Khalid (1989). *Curriculum change and innovation: A study in the teaching of secondary school geography in Malaysia*.(Unpublished doctoral dissertatio). Columbia University. New York.

Lateh, H., & Muniandy, V. (2010). ICT implementation among Malaysian schools: GIS, obstacles and opportunities. *Procedia-Social and Behavioral Sciences, 2*(2), 2846-2850. http://dx.doi.org/10.1016/j.sbspro.2010.03.426

Lee, M. N. (2000). Education in Malaysia: towards vision 2020. *School Effectiveness and School Improvement, 10*(1), 86-98.

Lee, T. T., & Osman, K. (2012). Interactive multimedia module in the learning of electrochemistry: Effects on students' understanding and motivation. *Procedia-Social and Behavioral Sciences, 46*, 1323-1327.

Li, Z. (2012). Superiority of multimedia Technology in geography teaching. In T. Zhang (Ed.), *Future Computer, Communication, Control and Automation* (Vol. 199, pp. 581-585). Berlin: Spinger.

Liu, Y., Elisabeth, N. B., Chang, C. H., & Hang, G. (2010). PBL-GIS in secondary geography education: Does it result in higher-order learning outcomes? *Journal of Geography, 109*(4), 150-158. http://dx.doi.org/10.1080/00221341.2010.497541

Marina, P. (2009). Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. *Computer and Education, 52*(1), 1-12. http://dx.doi.org/10.1016/j.compedu.2008.06.004

Martin, A. J., & Dowson, M. (2009). Interpersonal relationships, motivation, engagement, and achievement: Yields for theory, current issues, and educational practice. *Review of Educational Research, 79*(1), 327. http://dx.doi.org/10.3102/0034654308325583

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annu. Rev. Psychol., 57*, 487-503. http://dx.doi.org/10.1146/annurev.psych.56.091103.070258

Meluso, A., Zheng, M., Spires, H. A., & Lester, J. (2012). Enhancing 5th graders' science content knowledge and self-efficacy through game-based learning. *Computers and Education, 59*(2), 497.

Milson, A. J., & Earle, B. D. (2008). Internet-based GIS in an inductive learning environment: A case study of ninth-grade geography students. *Journal of geography, 106*(6), 227-237. http://dx.doi.org/10.1080/00221340701851274

Moen, F., Skaalvik, E., & Hacker, C. M. (2009). Performance psychology among business executives in an

achievement oriented environment. *Mission of the Journal of Excellence, 13*(2), 342.

Moos, D. C., & Honkomp, B. (2011). Adventure Learning: Motivating students in a Minnesota middle school. *Journal of Research on Technology in Education, 43*(3), 22.

Nordin Sakke. (2006). Implimentation GIS in geography education in sabah state. *Environmental Geography and Geography Education*. Perak, Malaysia: UPSI Publisher.

Ong, L. L., Ho, G. Y. F., & Teow, M. L. (2011, 16-18 September 2011). *Influence of google earth on students' interest and learning attitude toward geography Subject.* Paper presented at the Electrical and Control Enginerring International Conference, Yinchang, China.

Oppong, J. R., & Ofori-Amoah, B. (2012). Ghana: Prospects for secondary school GIS education in a developing country. In A. D. Andrew J. Milson (Ed.), *International Perspectives on Teaching and Learning with GIS in Secondary Schools* (pp. 115-123). New York: Springer.

Othman, M. A. (2007). *Effectiveness of computer aided teaching on academic achievement among form four low achiever geography students* (Doctoral dissertation). University Science Malaysia, Penang, Malaysia.

Othman, N., & Leng, K. B. (2011). The Relationship between self-concept, intrinsic motivation, self-determination and academic achievement among chinese primary school students. *International Journal of Psychological Studies, 3*(1), 90-98.

Otta, M., & Tavella, M. (2010). Motivation and engagement in computer-based learning tasks: investigating key contributing factors. *World Journal on Educational Technology, 2*(1), 1-15.

Packer, D. L. (2012). *Experimental Effects of Online Collaborative Tools on High School Student Motivation to Learn.* (Ed.D. 3528227), Northcentral University, United States -- Arizona. Retrievedfromhttp://simsrad.net.ocs.mq.edu.au/login?url=http://search.proquest.com/docview/1040720956?accountid=12219 ProQuest Dissertations & Theses (PQDT)database

Papastergiou, M., Gerodimos, V., & Antoniou, P. (2011). Multimedia blogging in physical education: Effects on student knowledge and ICT self-efficacy. *Computers and Education, 57*(3), 1998-2010. http://dx.doi.org/10.1016/j.compedu.2011.05.006

Park, H., Park, J., & Kim, Y. T. (2011). The effect of educational game on the intrinsic motivation by learner's Traits: Focus on Personality Types. *Grid and Distributed Computing*, *261*, 286-292. http://dx.doi.org/10.1007/978-3-642-27180-9_35

Raman, A. (2006). *Effects of animation maps on teaching and learning geography* (Unpublish doctoral dissertation). University Science Malaysia, Penang, Malaysia).

Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 149-172). New York: Springer.

Ritzhaupt, A., Higgins, H., & Allred, B. (2011). Effects of modern educational game play on attitudes towards mathematics, mathematics self-efficacy, and mathematics achievement. *Journal of Interactive Learning Research, 22*(2), 277-297.

Rostam, K. (2005). Teacher perception on geography education in Malaysian secondary schools. *Geografia: Malaysian Journal of Society and Space, 1*(1), 66-75.

Rostami, M., Hejazi, E., & Lavasani, M. G. (2011). The relationship between gender, perception of classroom structure, achievement goals, perceived instrumentality and academic achievement in English course third grad middle school students (English as second language). *Procedia - Social and Behavioral Sciences, 29*(0), 703-712. http://dx.doi.org/10.1016/j.sbspro.2011.11.295

Ruslan, R., & Osman, S. (2001). *The potential of GIS to enhance geography education in Malaysia*. Paper presented at the The second International Literacy Conference, Penang, Malaysia.

Schunk, D. H., & Mullen, C. A. (2012). Self-efficacy as an engaged learner. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 219-235). New York: Springer.

Schunk, D. H., & Usher, E. L. (2012). Social cognitive theory and motivation. In R. M. Ryan (Ed.), *The oxford handbook of human motivation*. New York: Oxford University Press.

Shin, E. K. (2006). Using geographic information system (GIS) to improve fourth graders' geographic content knowledge and map skills. *Journal of geography, 105*(3), 109-120.

Shin, N., Sutherland, L. A. M., Norris, C. A., & Soloway, E. (2012). Effects of game technology on elementary student learning in mathematics. *British Journal of Educational Technology*, *43*(4), 540–560. http://dx.doi.org/10.1111/j.1467-8535.2011.01197.x

Shores, M. L., & Shannon, D. M. (2010). The effects of self-regulation, motivation, anxiety, and attributions on mathematics achievement for fifth and sixth grade students. *School Science and Mathematics, 107*(6), 225-236. http://dx.doi.org/10.1111/j.1949-8594.2007.tb18284.x

Shroff, R. H., & Vogel, D. R. (2009). Assessing the factors deemed to support individual student intrinsic motivation in technology supported online and face-to-face discussions. *Journal of Information Technology Education, 8*, 59-85.

Singh, S. S. B., Kleeman, G., & Van Bergen, P. (2012). Opportunities to implement GIS in teaching and learning geography: A survey among smart schools in Sabah, Malaysia. *Procedia-Social and Behavioral Sciences, 69*, 884-889.

Svanum, S., & Aigner, C. (2011). The influences of course effort, mastery and performance goals, grade expectancies, and earned course grades on student ratings of course satisfaction. *British Journal of Educational Psychology, 81*(4), 667-679. http://dx.doi.org/10.1111/j.2044-8279.2010.02011.x

Tabernero, C., & Wood, R. E. (2009). Interaction between self-efficacy and initial performance in predicting the complexity of task chosen. *Psychological Reports, 105*(3), 1167-1180.

Thang, S. M., Ting, S. L., & Jaafar, N. M. (2011). Attitudes and motivation of Malaysian secondary students towards learning English as a second language: a case study. *3L; Language, Linguistics and Literature, The Southeast Asian Journal of English Language Studies, 17*(1), 40-54.

Throndsen, I., & Turmo, A. (2012). Primary mathematics teachers' goal orientations and student achievement. *Instructional Science*, 1-16. http://dx.doi.org/10.1007/s11251-012-9229-2

Tuzun, H., Yilmaz-Soylu, M., Karakus, T., Inal, Y., & Kizilkaya, G. (2009). The effects of computer games on primary school students' achievement and motivation in geography learning. *Computers & Education, 52*(1), 68-77.

Umah Devi, R. (2008). *Open source GIS in teaching and learning geography in schools.* (Unpublish master' thesis), University Science Malaysia. Penang. Malaysia.

Vasugiammai, M. (2005). *GIS in Malaysian school: GIS application in local studies.* (Unpublish master's thesis), University Science Malaysia. Penang. Malaysia.

Vos, N., Van der Meijden, H., & Denessen, E. (2011). Effects of constructing versus playing an educational game on student motivation and deep learning strategy use. *Computers & Education, 56*(1), 127-137. http://dx.doi.org/10.1016/j.compedu.2010.08.013

West, B. A. (2003). Student attitudes and the impact of GIS on thinking skills and motivation. *Journal of geography, 102*(6), 267-274. http://dx.doi.org/10.1080/00221340308978558

Williams, T., & Williams, K. (2010). Self-efficacy and performance in mathematics: Reciprocal determinism in 33 nations. *Journal of Educational Psychology, 102*(2), 453.

Woolfolk, A., & Margetss, K. (2010). *Educational psychology*. Australia: Pearson Education.

Yeung, S. P. (2010). IT and geography teaching in Hong Kong secondary schools: a critical review of possibilities, trends and implications. *International Research in Geographical and Environmental Education, 19*(3), 173-189. http://dx.doi.org/10.1080/10382046.2010.496966

Zhao, L., Lu, Y., Wang, B., & Huang, W. (2011). What makes them happy and curious online? An empirical study

on high school students' Internet use from a self-determination theory perspective. *Computers & Education, 56*(2), 346-356.