

A Conceptual Framework for Assessing the Impacts of GIS on the Motivation and Achievement in Geography Among Underachieving Students of Smart School in Sabah, Malaysia

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In 1988, the integrated secondary school curriculum was introduced as a continuation of the curriculum changes introduced in the primary school. These changes have impacted geography subject in the secondary school. Geography becomes a compulsory subject for lower secondary and elective subject at the upper secondary school level. As a result, fewer schools in Malaysia offer geography at this level. Consequently, students in upper secondary school level are shying away from studying geography and the percentage of students who pass the exam is declining each year. Unlike Malaysia, geography is getting more attention in developed countries and has become a key subject at both the primary and secondary levels. As a result, GIS (geography information system) was widely accepted and implemented in the secondary school geography curriculum. Numerous scholars have reported that the use of GIS as a teaching tool has had a positive impact on students' engagement and motivation to learn geography. However, GIS has not yet been introduced to secondary school geography in Malaysia with reason of ability, lack of substantive research into the capacity of GIS to support and motivate students to learn geography. Therefore, the aim of this study is to determine the effectiveness of GIS promoting students' motivation, engagement, and achievement in geography. This article presents a conceptual model based on an extensive review of literature in a related area for assessing the impact of GIS on the motivation and achievement.

Keywords: GIS (geography information system), motivation, achievement, framework

Introduction

Government of Malaysia has established a Multimedia Super Corridor project in 1996 to make the country as ICT (information technology and communication) hub of the region. In line with this, one of nine key strategies outlined in the Eighth Malaysia Plan (2001–2005) is to develop the national ICT field and expand the use in all sectors of the economy (Malaysia Economic Planning Unit, 2001). This initiative is based on the belief that there will be growing demand for computer literate workforce as well as professionals in ICT (Lee, 2000). As part of this initiative, the Malaysian Government established a Smart School Project in 1999 and School Computerization Program in 2002. The main objective of this project is to emphasize the use of

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technology tools as an important aid in learning and teaching. Computers are the main instruction. However, the integration of ICT in teaching is given greater priority in Bahasa Malaysia (Malay language), science, mathematics, and English subjects. In contrast, geography remains as “dry” subject with little use of technology and is taught with conventional teaching method (Abdul Hamid, Mohmadisa, Mohd Faris, & Mohamad Suhaily, 2006).

Unlike Malaysia, geography is getting more attention in developed countries and has become a key subject at both the primary and secondary levels. As a result, beginning in the early 1990s, GIS (geography information system) was widely accepted and implemented in the secondary school geography curriculum. For example, in 1990, United Kingdom introduced GIS in geography teaching (Bednarz, 2004). It was also adopted in the Netherlands 2003 (Korevaar & Van Der Schee, 2004) and in Turkey 2005 (Aladag, 2010). However, the Malaysia Ministry of Education was not interested in integrating GIS in geography education on the reason of lack of ability, human resources, and ICT facilities. Therefore, this study was to identify the strengths and weaknesses in an effort to integrate GIS in geography teaching in smart schools which is well-known for the most complete schools with sophisticated ICT equipment in the country.

School Geography Curriculum Reforms in Malaysia

The history of geography education in Malaysia is unique. Geography subject was first introduced in Malay vernacular school in 1927. The geography curriculum was “British Empire-centered” and students were taught of map drawing, chief towns, rivers, and industries in each country by the method of memorizing the facts. Geography education was officially introduced in primary and secondary English school in 1928. The curriculum emphasized more on geographic term, map reading, map drawing and geographic region on five continents (Wong, 1977).

According to Khatijah (1989), in 1936, Malay vernacular and English schools received their second curriculum to synchronize and structure the standard of pupils’ cognitive development and their experience. However, geography education in Malaysia halted in the period of the Second World War, during the Japanese occupation and Malayan emergency (1948–1960).

Geographical education curriculum in Malaysia has been reviewed again in 1956 by the committee, which was comprised of teacher training college lecturers, educational administrators, and teachers. The primary school curriculum remained from the pre-war syllabus. On the other hand, secondary school received greater attention through local geography, topographical map work, weather observations, and physical geography. A review of the effectiveness of the 1956 curriculum led to the 1964 geography syllabus. It also emphasized logical progression and introduction to both local and regional geography and map work. In 1979, primary school geography was revised and drafted based on the concept of spatial organization of geographical phenomena and societal pressure in a national context. At the same time, conceptual thinking of spatial orientation in geography was introduced in lower secondary school.

In line with national development and the vision to produce the creative, innovative, and knowledgeable human resources, Malaysia Ministry of Education has revamped primary school curriculum in 1982. The new curriculum was introduced in schools in 1983 and provided greater emphasis on the acquisition of basic skill and knowledge through various learning activities (Lee, 2000). Significantly, geography as a discrete entity was eliminated and integrated with “Alam Dan Manusia” (local study) was designed to integrate science, history, geography, civic, and moral. This subject was introduced in primary school with four standard students.

The integrated secondary school curriculum was introduced in 1988 as a continuation of the curriculum changes introduced in the primary school. This new curriculum gave greater emphasis to the integration of teaching process across the curriculum. These changes also influenced geography in the secondary school context (Abdul Hamid et al., 2006). Geography becomes a compulsory subject for lower secondary school students who were formally assessed in the government examination for the Form 3 students (Penilaian Menengah Rendah). However, at the upper secondary school level (Forms 4 and 5) geography becomes an elective subject. As a result, fewer schools in Malaysia offer geography at this level (Habibah & Vasugiammai, 2010). The same situation occurs at the pre-university level. Consequently, students in upper secondary school and pre-university level are shying away from studying geography (Nordin Sakke, 2006).

Secondary school geography curriculum has been revised again in 2002. The new curriculum implemented in 2004 places greater emphasis on creativity and critical thinking skills. The curriculum content has changed and has been divided into three parts. Namely, Part A (geographical skills), Part B (physical and human geography), and Part C (local study). Part C is a new element introduced to the students. Students need to conduct research on a local area based on the concepts and knowledge taught in class. Nevertheless, these curricular changes have not been able to attract students to learn geography (Katiman Rostam, 2005).

Smart School Project in Malaysia and Geography Education

For the past two decades, ICT components and multimedia-based learning are widely applied in the classroom (Beuschel, Graiser, & Draheim, 2003). This has provided inspiration for the Malaysian government to establish Smart School Project (locally known as Sekolah Bestari). The main goal of this project is to provide more interactive teaching facilities and teaching materials to improve the teaching quality and students learning outcome in schools (Malaysia Ministry of Education, 2006). A total of 89 schools were involved in a pilot program (Malaysia Ministry of Education, 2004a; 2004b; 2006). There are three categories of smart school under this project. Namely, the new smart school, a state smart school, and remote smart school.

The new smart schools are supplied with high-tech ICT equipment while a state smart school with a medium level and remote smart school with a minimum level of technology and equipment. Each student in the new smart schools is provided a personal laptop. While the smart schools in remote areas are supplied with PC (personal computer) in the computer lab. Malaysia Ministry of Education also provides laptops to all teachers involved in the pilot project to facilitate and implement computer technology in the classroom (Rohana, 2006; Malaysia Ministry of Education, 2008). Various types of interactive learning material have been introduced into primary and secondary school in Malaysia. This includes CD-ROM, browser-based teaching, and learning materials, such as online tutorials available through the web portal (Azizah & Hanita, 2005). In line with this, the Malaysia Ministry of Education has collaborated with several private companies to develop interactive software.

Through this collaboration, Malaysia Ministry of Education managed to develop 1949 interactive courseware (Malaysia Ministry of Education, 2008). However, the coursework developed was only involving key learning subjects in the school such as Bahasa Melayu (Malay language), English, science, and mathematics. Thus, it can be concluded that the introduction of the smart school project in Malaysia does not have any positive impact on the curriculum and methods of teaching geography in Malaysia. Nevertheless, geography has become what students perceive to be a “dry” subject with little use of technology (Habibah & Vasugiammai, 2011).

Integrate GIS in Geography Education

GIS is one of the information system used to store, display, analyse, and manipulate data related to space. Recognising the importance of GIS in geography education, several developed countries around the world have taken innovative steps to incorporate GIS in primary and secondary geography curriculum. According to Bednarz (2004), United State was one of the first countries to use GIS in education. In 1990, United Kingdom introduced GIS in geography curriculum (Wiegand, 2007) and fully utilized to support teaching primary and secondary school students (Fargher & Rayner, 2012). In 1998, Singapore has also taken initiative steps to introduce GIS as an important teaching tool for teaching geography at the secondary school and junior college level. This was followed by Netherland 2003 and Turkey 2005 (Aladang, 2010).

In Malaysia, GIS is successfully used in various fields. These included areas, such as engineering, environment, crime mapping, real estate land use, and politics. Most of the universities in Malaysia, namely, UTM (University Technology Malaysia), USM (University Science Malaysia), UKM (University Kebangsaan Malaysia), UMS (University Malaysia Sabah), and UITM (University Technology Mara), are widely using GIS in their research and offering as major subject to students. However, GIS has not been embraced by Malaysia's education system and absence from the geography curriculum in primary and secondary school context (Habibah & Vasugiammai, 2010). Nevertheless, researchers continued to explore its potential (Abdul Hamid et al., 2006). Most of the research focused on the educational potential of GIS and the obstacles to its implementation (Mohd Faris, 2006). Thus, it has inspired researchers to undertake research on integrating GIS in teaching geography in the classroom. For instance, Vasugiammai (2005) has conducted studies of using GIS in local study and followed by Umah Devi (2008). Unfortunately, the findings of this research were not able to convince the Ministry of Education and Curriculum Department of Malaysia to embrace GIS within in geography curriculum.

GIS and Motivation

The impact of students' motivation in school on learning outcomes is a major field of study in education (McInerney & Ali, 2006). In geographical education, there have been a number of studies conducted to investigate the impact of motivation on students' achievement (Chionh & Fraser, 2009; Aydın & Coşkun, 2011; Kaya, 2011). As an extension to this study, various studies were conducted to investigate the effectiveness of using ICT to enhance students' motivation to learn geography recently (Tuzun, Yilmaz Soylu, Karakus, Inal, & Kizilkaya, 2009; Yazici & Dermirkaya, 2010; Vos, Meijden, & Denessen, 2011; Santos, Perez Sanagstin, Hernandez Leo, & Blat, 2011). Interestingly, all the findings from the studies suggested that ICT significantly influences their motivation to learn geography.

Continuous development of technology has introduced GIS as a novelty and exciting tool in geography education. However, few quantitative studies have been conducted to study the effectiveness of GIS on students' motivation (Keiper, 1996; Kerski, 2000; West, 2003; Milson & Earle, 2008). These studies proved that GIS has positively influenced on students' motivation to study geography. The most-recent research was from Aladang (2010), using quasi experiment with primary school students in Turkey, reported that GIS supported lesson has a positive effect on students' motivation towards the geography lessons. However, none of these studies utilized mix-method design to reveal the effectiveness of GIS supported lesson on students' motivation to study geography. Thereby, this research will introduce a new method in research of the effectiveness GIS tool on students' motivation to learn geography. In addition, Theobald (2006) argued that motivation changes are an

internal circumstance which affects the nature of an individual's behavior. Therefore, using a single method will ignore other aspects underlying motivated behavior. Thus, the use of mix method and triangulate design in this study can result in well validated and substantiated finding on students' motivation. Furthermore, it also reduces the intrinsic a bias that might occur with single research method.

In Malaysia, there was research examining a pivotal GIS in geography education. However, these studies were not comprehensive. Among the aspects investigated, they included potential and resources that can be utilized to provide an attractive learning environment in geography class (Umah Devi, 2008; Habibah & Vasugiammai, 2010). Consequently, this study will add new value and input to the study on the implementation of GIS in geography education in Malaysia.

GIS and Achievement

The rapid development of ICT has provided new ideas for teachers to utilize various ICT tools to enhance students' achievement in geography. Several studies have also been carried out to examine the effectiveness of ICT tools on students' achievement (Shin, 2006; Marina, 2009; Miler & Roberston, 2010; Park & Kim, 2011). The findings of these studies demonstrated that the utilization of ICT enhances students' achievement in geography. The introduction of GIS in geography also provides alternative ICT tools to be used in teaching geography to enhance students' achievement. And researchers began to evaluate the effectiveness of GIS in geography education. Jenner (2006) has reported that GIS teaching tools help students to engage in the more difficult task and enhance their achievement. Similar findings were also reported by Wiegard (2007). However, little has been written about the effect of GIS with underachieving students in primary and secondary school. Consequently, Aladang (2010) proposed that further research could be focused on underachieving students.

In Malaysia, there are a number of studies which highlighted the positive impact of ICT on students' achievement in Geography (Habibah & Arumugam, 2005; Sidin & Mohammad, 2007; Othman, 2007). There is also growing interest of researches on the implementation of GIS in Malaysians geography classrooms. For example, study by Vasugiammai (2005) among Form 2 students on the topic of developing area in Kepala Batas, Malaysia demonstrated that students were excited and easily understood the concept of patterns and population distribution. Another study by Umah Dewi (2008) with Form 1 students demonstrated an improvement in the post-test scores in a topic dealing with mountain landscapes. Unfortunately, none of these studies focus on underachieving geography students, which are more being concerned by the Malaysian Ministry of Education to enhance their achievement in Sijil Pelajaran Malaysia (Malaysian Education Certificate). The review of the Malaysia research literature revealed that there is a lack of research on the impact of GIS-based learning of underachieving students in geography, especially in smart schools, none of which fully utilize ICT in teaching and learning activities. Therefore, this study needs to be carried out to fill this gap and strengthen the evidence regarding the importance of GIS in the study of geography in Malaysian secondary school.

A Conceptual Framework for Assessing the Impacts of GIS on Motivation and Achievement

Review of literature has shown that the use of ICT and GIS in teaching enhances students' engagement and motivation to learn geography (Keiper, 1996; Kerski, 2000; West, 2003; Milson & Earle, 2008). In addition, studies by Tuzun, Yilmaz Soylu, Karakus, Inal, and Kizilkaya (2009), Yazici and Dermirkaya (2010), Vos, Meijden, and Denessen (2011), and Santos, Perez Sanagstin, Hernandez Leo, and Blat (2011) revealed that motivation enhance students' achievement in geography. However, none of these studies focus on

underachieving geography students and are applied mix-method research in their studies. Thus, this study will be conducted to fill the studies gap on the impacts of GIS on students' motivation and achievement based on the conceptual framework which is illustrated in Figure 1.

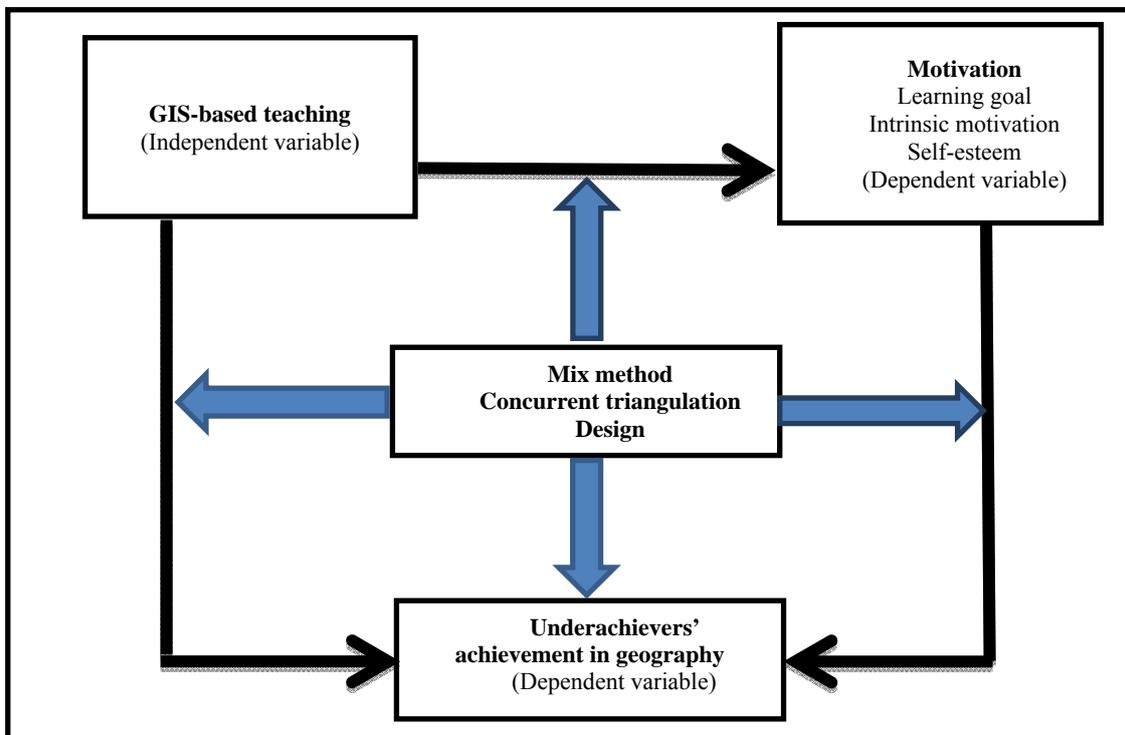


Figure 1. Conceptual framework.

Figure 1 shows that this study focuses on the impacts of GIS-based teaching on motivation and achievement among underachievers' geography students. GIS-based teaching is the independent variable and the motivation and achievement are dependent variable. Figure 1 also shows that this study centered on concurrent triangulation mix-method design to study the effects of GIS on students' motivation (learning goal, intrinsic motivation, and self-esteem), motivational effects on students' achievement and impact of GIS on students' achievement. Based on this design, the quantitative and qualitative data collection is concurrently happening in one phase of the research. The quantitative data will be collected through non-equivalent quasi-experimental design and 20 multiple-choice pre- and post- test questions while, qualitative data will be collected through observation and interview. The collected data will be analyzed separately and the findings will be compared and triangulated in an interpretation section.

Conclusion

The aim of this paper is to provide a comprehensive conceptual framework to assess the impact of GIS on motivation and achievement in geography among Malaysian underachieving students. The paper also acknowledged the reform of school geography curriculum and brief history of smart school system in Malaysia. Research has shown that GIS has positively influenced on students' motivation to study geography. In addition, there are a number of studies, which highlighted the positive impact of GIS on students' achievement. However, an extensive literature review found little research utilized the mix-method design to reveal the effectiveness of

GIS supported lesson on students' motivation and achievement. Furthermore, the review of the Malaysia research literature revealed that there is a lack of research on the impact of GIS-based learning of underachieving students in geography. Therefore, a conceptual framework based on the literature related to this study has been proposed. This study is currently in progress where quasi-experimental design, observation, and interviews will be used to support the validation of the framework. Further research should be conducted using this framework in different educational course to examine the result for proper validation.

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