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## Opportunities To Implement GIS In Teaching And Learning Geography: A Survey Among Smart Schools In Sabah, Malaysia

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### Abstract

Geography Information System (GIS) have not yet been introduced to secondary school geography in Malaysia with reason of ability, lack of ground facilities and ICT. The purpose of this study is to determine the potential for GIS to be implemented into the teaching of geography in secondary Smart schools in Sabah, an area which is well known for having the most advanced ICT equipment in the country. This study gathers both quantitative and qualitative data from a set of survey questions and a structured interview process. The purposive sampling method applies to select Secondary Smart School. Two teachers, with varied profiles from each school, were selected randomly for an interview. The data gathered verified the analysis that an increased number of computer labs, computers, internet access and ICT tools in schools broadened the potential to establish and apply GIS within the teaching of geography in Sabah. Furthermore, 90 per cent of geography teachers in these schools attended a GIS course at the university. This significant support, in terms of the human resources available to implement the new systems, further supports the opportunity to apply GIS in teaching geography. The result from interview showed the main issue preventing teachers from using GIS to teach geography is the lack of availability of GIS software and the incompatibility of this teaching method with the existing geography curriculum.

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*Keywords:* Geography Information System; Smart School; Geography Curriculum

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### 1. Introduction

In 1996, Malaysia took the initiative and decided to develop the country as the IT hub of the region by establishing the Multimedia Super Corridor. Consequently, the demand for a computer literate workforce and IT professionals has grown dramatically (Lee, 1999). In 1999, as part of this initiative, the Malaysian Government established the Smart School System. The Smart School Programme placed emphasis on the integration of technology tools as the essential aids in teaching. Three hundred and twenty two primary and secondary schools were chosen as part of the pilot project. Teachers, as the cogwheels of change in these schools, were given courses to enhance their ICT knowledge and skills. The schools listed in the pilot project were equipped with computer laboratories and ICT equipment. To this day, computers remain the main instructors and are imperative as a teaching tool. Significantly, the integration of ICT in teaching has been given greater priority in subjects such as science, mathematics and

English compared to its use in the study of geography (Ruslan, 2001 & Abdul, 2006). As a result, geography has become what students perceive to be a 'dry' subject as it makes little use of technology (Habibah & Vasugiammai, 2011).

Unlike Malaysia, many developed countries have placed more emphasis on the importance of geography and have established the subject as a cornerstone in education both at primary and secondary school level. As a result, at the beginning of the early 1990s, GIS were widely accepted and implemented in the secondary school geography curriculum. For example, in 1990, the United Kingdom implemented the use of GIS in the teaching of geography (Bednarz, 2000). It was also adopted in the Netherlands in 2003 (Korevaar & Van Der Schee, 2004) and in Turkey in 2005 (Aladag, 2010).

Moreover, numerous scholars have reported the positive impacts of using GIS as a teaching tool for students. For example, studies by Keiper (1999), Kerski (2001), Shin (2006) and Milson & Earle (2008) have shown that GIS can improve content knowledge and also act as an additional motivation for students to learn geography. Furthermore, analysis by Thomas & Steven (2003) and West (2003) have found a significant improvement in the attitudes towards technology and geographical data due to the use of GIS's in teaching. Moreover, Kaiper (1999), Wiegand (2001) and Baker (2003) have all reported that GIS has the potential to facilitate the use of Problem Based Learning and Inquiry Based Learning methods in the classroom.

Therefore, this study needs to conduct an investigation into the facilities and human resources that are available to integrate GIS in geography teaching, with particular relevance to its use in Smart Schools. In addition, no studies have been conducted to investigate the opportunities to integrate GIS in teaching geography in Sabah Smart schools.

Specifically, this study aims to answer the following research questions:

1. What are the facilities in Smart schools and are they supportive of GIS integrations in geography teaching?
2. Do Smart schools have a trained and adequate human resource base that is capable of handling the integration of GIS in the teaching of geography?
3. Who were the teachers using GIS in teaching geography?
4. What are the obstacles for geography teachers in using GIS in teaching?

## **2. Method**

The data for the research was collected using two distinct methods. The study generated both qualitative and quantitative data from a questionnaire survey and structured interviews. It was evident that by collecting both qualitative and quantitative data, the intrinsic bias that is associated with using only single set data would be eliminated.

### *2.1 Sample*

The number of secondary Smart Schools in Sabah is relatively small. Thus, the purposive sampling method was applicable to all six of the Smart Schools. Also, the researcher used a random sampling method to select teachers for a structured interview. In total, twelve teachers from six schools were selected for interviews.

### *2.2 Questionnaire*

One questionnaire was developed for this study. This questionnaire was comprised of four sections:

Section A: Demographic of geography teacher

Section B: GIS proficiency level of geography teacher

Section C: Awareness and factors discouraging the teachers' use GIS

Section D: ICT facilities in the relevant Smart school

Sections A, B and C of the questionnaire had to be answered by the geography teacher's themselves. Section D was to be completed by the Head of Geography in the relevant school. The questionnaire was then sent to all six schools

in Sabah by November 2011. The questionnaire was then completed by the Head of Geography in each school and returned to the researcher by January 2012.

### 2.3 Structure Interview

The structured interviews were conducted in February and April 2012. Two geography teachers from each school were chosen for interview. Each interview session lasted for a period of between 30 and 45 minutes. All of the interviews were recorded and categorized for further analysis.

## 3. Result

### 3.1 Availability of ICT facilities in Smart School.

**Table1. Availability of ICT facilities in Smart Schools**

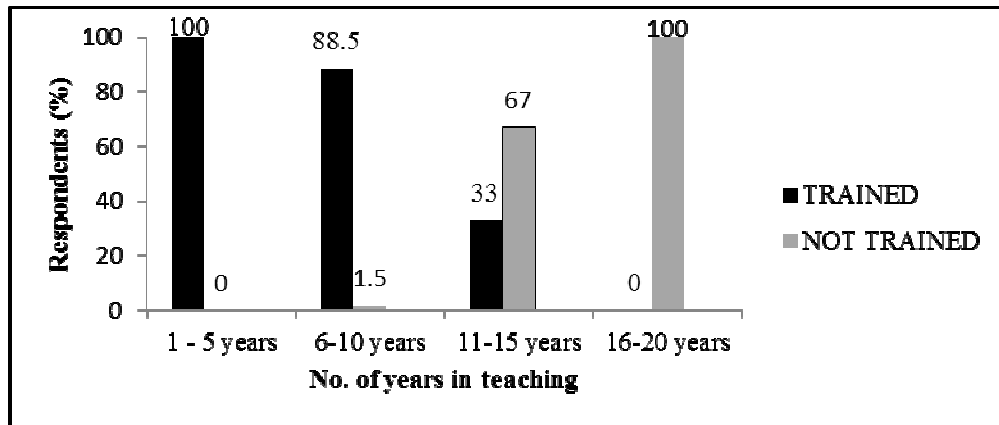
School	A		B		C		D		E		F	
	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010
Computer lab	4	6	2	4	3	5	2	4	2	6	2	4
Computer (Classroom)	30	42	28	30	24	28	20	24	22	36	18	28
Lap top	28	40	20	32	18	24	25	38	26	38	26	35
Computer projector	32	36	30	34	26	32	24	28	24	38	20	32
Wireless access point	6	10	6	10	6	12	4	18	6	12	5	12
Server	2	3	2	3	2	3	1	3	2	3	2	3
Technician	2	6	2	5	2	4	2	3	2	3	2	3

In order to evaluate the ICT infrastructures and facilities in the Smart Schools in Sabah, the responses taken from the Heads of Geography at the six schools formed the basis for further data analysis. As seen above, Table 1 provides a summary of the availability of the ICT facilities in the schools. Based on the data above, it is clear that the use and reliance on ICT equipment in the schools has grown over a period of five years. Furthermore, “School E” recorded the highest increase in the use of ICT equipment: computer labs increased by four units and the number of computers in operation increased by fourteen units. However, these results need to be placed into perspective, particularly if we consider that the geography teachers from “School E” admitted that twenty per cent of the ICT equipment in the school was still under installation. In addition, the interviews that were conducted with the geography teachers suggested that the number of ICT facilities available in their schools were sufficient in relation to the ratio of students at each establishment.

Based on these results, there does not appear to be any problems with schools becoming more intensive in their implementation of ICT equipment. Thus, it can be concluded that the ICT infrastructures and facilities in Smart Schools are adequate. Therefore, geography teachers in Smart School should be encouraged to implement the use of GIS in their teaching activities.

### 3.2 GIS Proficiency Level of Geography Teachers

Figure1. Comparison of teaching experience and GIS training level of teachers



Out of a total number of 35 geography teachers from the six Smart Schools who responded to the questionnaire, 28, or 80 per cent of them had attended GIS course at university. As seen in Figure 1 above, three quarters of geography teachers who have been trained to use GIS at university have taught for ten years or less in their respective schools. In addition, result from interview shows they attended a GIS class in second and third semesters of their Bachelor Education Course. These findings also show that teachers who have taught geography for more than sixteen years have not attended a GIS course.

3.3 GIS awareness and use among geography teacher

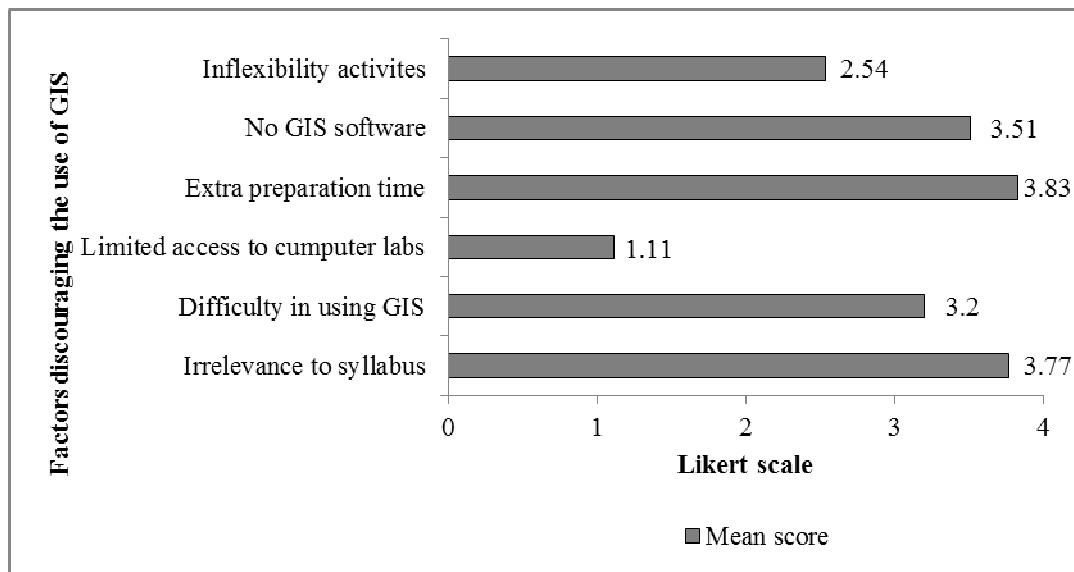
Table 2: GIS awareness and usage among geography teachers

Category	N (35)	Percentage (%)
Aware about GIS	31	88.6
Not Aware about GIS	4	11.4
<b>Total</b>	<b>35</b>	<b>100</b>
Using GIS in teaching	5	14.3
Not Using GIS in teaching	30	85.7
<b>Total</b>	<b>35</b>	<b>100</b>

As is shown in Table 2 above, thirty one geography teachers, or 88.6% of teachers from the Smart Schools in Sabah had prior knowledge of the use of GIS in teaching geography. Therefore, the results from the structured interviews show that a majority of teachers are knowledgeable about the use of GIS in teaching. This is due to the dissemination of GIS information on websites, in journals and in newspapers. However, only five, or 14.3% of teachers had conducted geography lessons with the use of a GIS. In the interviewing session, these teachers indicated that although they had received training on how to use GIS as part of their university studies, in practice they would not be competent enough to use these systems as they had no prior experience of using GIS in teaching geography. Nevertheless, the teachers did admit that they had sometimes found GIS teaching material, such as maps, online. This finding shows that geography teachers are highly motivated to use GIS in teaching geography and also that they are best placed to implement GIS in geography education.

3.4 Factors discouraging the use of GIS's

Figure 2: Factors discouraging use of GIS's among geography teachers



This data was obtained from the responses given by geography teachers in the questionnaire. They were asked to indicate on a Likert scale of 1 to 4 how each factor had discouraged them from using GIS in teaching geography (1 = not at all, 2 = somewhat, 3 = very much, 4 = definitely). Figure 2 above shows that “extra preparation time” and “irrelevance to syllabus” were the most significant factors discouraging teachers from using GIS in teaching. Geography teachers were also concerned about the use of GIS software and the difficulties associated with its use. In general terms, the teachers appeared unwilling to use GIS in teaching because it was not in the subject’s curriculum. Furthermore, it is also clear that the teachers had not been using GIS since graduating from university and therefore they lacked the requisite knowledge and confidence to use the systems in teaching geography lessons.

#### 4. Discussion

Based on the study conducted, all six Smart Schools in Sabah have an ICT infrastructure which is capable of implementing the use of GIS in the schools’ teaching of Geography. However, there is an inherent inefficiency in the Ministry of Education’s failure to increase the number of computer technicians that are available to repair damaged ICT equipment in Malaysia. The study also shows that nearly three-quarters of the teachers who teach geography at school have undertaken university courses relating to the use of GIS in education. Thus, it can be concluded that a well-trained base of human resources is sufficient to implement GIS software in teaching geography. Building on this idea, the Ministry of Education in Malaysia provides an extensive GIS course for teachers who are looking to improve or refine the skills that they learnt at university. Moreover, the survey data also shows that nearly 90% of geography teachers realize the importance of the use of GIS in geography teaching methods. Consequently, some of these teachers have already begun using GIS in their teaching. As a result, the teachers in the survey and interview were highly motivated by the prospect of using GIS in teaching. Therefore, the Ministry of Education may wish to use skilled teachers to train inexperienced teachers as to the methods of using GIS to teach geography. The study also showed that among the main factors that prevent geography teachers from using GIS is the incompatibility of its use with the conventional teaching curriculum. Also, it is clear that all of the schools do not have the necessary materials and GIS software to implement such a change. Thus, the Curriculum Department and Ministry Education in Malaysia can help the situation by providing a list of geographical topics which could be taught using a GIS. In addition, the Division of Educational Technology can help by listing free online GIS resources and teaching materials which would be available for teachers to use.

#### 5. Conclusion

GIS have the potential to be implemented in the teaching of geography, primarily because of the ICT facilities and human resources available in the country. Therefore, the lack of facilities available and the low computer literacy rate in the country should not be an excuse to implement GIS in the teaching and learning of geography in the future.

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