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Geospatial Technology Intervention Module in Learning and Facilitation (L&F) Amongst Form Two Geography Students

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ABSTRACT

Technological evolution in the 21st Century Learning and Facilitation (L&F) have been significantly affirmed by the Ministry of Education Malaysia (MOE). Nonetheless, the present scenario still indicates the snag of technological development in the education system such as the application of geospatial technology in the subject of Geography in Malaysia which is not significant. Generally, Learning and Facilitation (L&F) of Geography subjects concern conventional activities that do not help much in improving the Spatial Thinking Skills (STS) and student interest. Ergo, Geospatial technology has been observed to have the potential to increase STS and student interest in Geography subjects. This study aims to develop a Geospatial technology intervention module based on the theory of Cognitive Learning, Theory of Constructivism and Bloom's Taxonomy Theory. The formation of this module adopts Sidek Module Construction Model (MPMS) as the main motivation to complete this module. The contents of the module are also identified through a more comprehensive and analytical and extensive review of past studies done. This study creates draft modules that have four submodules namely Geography Skill, Physical Geography, Human Geography and Area Geography. The module is anticipated to be implemented as an effective L&F material especially in enhancing STS and attracting students to Geography subjects.

Keywords: Spatial thinking skills; interests; Sidek Modules Model Construction

INTRODUCTION

Geographic Information System (GIS) is a system built to store, update, analyze, display and manipulate space data (Kerski, Demirci & Milson 2013). This system adopts computers to compile and display all types of space related data in numerous forms such as maps, charts and tables (Solari & Schee 2015). Geography subjects are an elective subject that is offered to Form Four and Five students. Most schools in Malaysia are no longer offering Geography subjects at Form Four and Five levels. Commonly, Geography subject is classified by students as tough and boring subjects as they remain in conventional teaching methods (Rathakrishnan & Talin 2017). Therefore, this subject became less desirable by the students (Lateh, & Muniandy 2011).

In addition, Spatial Thinking is defined as a cognitive skill that consists of space concepts applying symbols and representations to translate data and information (Jongwon Lee, & Bednarz 2009); Mohd, F.A (2018). Spatial thinking becomes the main cognitive skills in Geography subjects. (Solari, J & Schee 2015). However, Spatial Thinking Skills (STS) was found to be insignificant among students studying Geography subjects (Muniandy 2004). Hence, this spatial thinking should be applied to Geography students through GIS integration in Geography Learning and Pediatrics (L&F).

On contrary, this situation is very distinctive from the developed countries which highlight the development of this Geography subject at school. Since the 1990s, the United Kingdom has integrated GIS in Geography teaching and is followed by other countries such as the United States, Canada, China, Singapore, Japan, Denmark, France, Australia and the latest are Rwanda (Milson, Demirci &

Kerski, 2012). Additionally, there are many past studies that prove the effectiveness of GIS technology application in improving students' achievement and motivation to learn Geography (Alada ğ 2010) as well as improving students' thinking skills (Favier, & Van Der Schee 2012); (Duke & Kerski, 2010; Favier & Van der Schee, 2014); Huang. 2011); Keiper. 1999); Kerski. 2008); Kinniburgh. 2012) and (Chu et al. 2016). Thus, it is evident here that the integration of GIS in Geography L&F in Malaysia is substantial in line with the goal of the Ministry of Education Malaysia (MOE) towards 21st century education.

MOE roles are producing students who are technological, innovative and fulfilling the needs of the government in nature, hence, they need to ensure the students have the skills and knowledge in Geography and information technology areas. Student development is not only assessed on outstanding academic achievement, it is also include spatial thinking skill (Kerski 2017a). The skills and qualities that should be possessed by a Geography student is spatial thinking skill and problem-solving skills in spatial. Other than that, MOE intends to produce students who are interested in Geography and love environment (Curriculum Development Section 2016). Therefore, the GIS integration in Geography becomes one of the important materials in L&F. As a result, students will be able to acquire Geography with great interest in Geospatial technology. This is expected to assist in producing potential students with Geospatial technology knowledge and improve spatial thinking skill.

PROBLEM STATEMENT

Previous studies have shown there are some weaknesses in the education system in this country that concerns the interest and motivation of students on Geography (Abd Aziz 2001). Aspect of student's spatial thinking skill and interest are weak. The findings (Muniandy 2004) reflect that conventional teaching and learning methods does not help much in producing students with spatial thinking skill.

MOE policy only requires students to study Geography subject in form one until Form Three. Lower Secondary Assessment (PMR) is carried out until 2013 only. Since 2014 until now this assessment is known as Form 3 Assessment (PT3). Geography subject which is taught in high school in Malaysia are not classified as core subject (compulsory), it is regarded as an elective or optional subject only, instead. In fact, it becomes an elective subject only in form four level. Following the MOE action, Geography was marginalized compared to other subjects taught in high school. The policy changes caused Geography to become unpopular among the students and it is also affected students as the number of taking the subject for SPM is declining. Table 1 shows the number of PMR and PT3 candidates from 2008 until 2017. The number of candidates who sit for the Geography in SPM level is also shown.

TABLE 1. Comparison of PMR/PT3 candidates with SPM candidates who took Geography subject from 2008 until 2017

Years	Number of candidates	Number of SPM candidates	Number of SPM candidates who do not take Geography subject in SPM	Percentage (%) of students who do not take Geography subject in SPM
2008	434794	42621	392173	90.19%
2009	435279	42588	392691	90.21%
2010	438483	42076	396407	90.4%
2011	440226	41751	398475	90.51%
2012	439839	40350	399489	90.92%
2013	421736	39102	382634	90.72%
2014	461781	38344	423437	91.7%
2015	452671	36865	415806	91.8%
2016	460670	36851	423819	92.0%
2017	467721	36896	430825	92.11%

Source: Modified data from 2008 LPM until 2017

Referring to Table 1, it shows comparison between PMR/PT3 and SPM candidates. On average, 91% of candidates sitting for PMR or PT3 did not take Geography in SPM level. This shows that for each year within 9% of the candidates only take Geography in SPM level throughout Malaysia. The question is, where do another 91% candidates go? Obviously, most schools do not offer Geography in SPM level.

According to (Abdul Aziz 2012), students are less interested in Geography and one of the reasons is the traditional L&F method bored the students. Additionally, he suggested that the use of technology in L&F such as

GIS technology should be implemented so that the students are more interested in studying Geography. L&F should be implemented using Geospatial technology on the school level as a measure to engage more student to the subject.

Until today, L&F's frequently-used method of presentation in Geography is the 'chalk and talk' method and 100% presentation of facts. The fundamental skills of mapping such as painting, identifying location of state and the country are not mastered by students. Mapping skill topic which is the root knowledge within Geography realm is no longer prominent. Map photocopy trend has reduced emphasis on individual mapping skill (Muniandy 2005). As a result, spatial thinking is not so significant among Geography students.

The facts mentioned are supported through a need assessment conducted by researcher prior to the synthesizing of the module. 61% of Geography teachers from 20 populations of high school agreed that the current L&F activities do not cover STS entirely. 87% of Geography teachers agreed that their L&F does not use Geospatial technology. While 78% of teachers mentioned that students are less interested in traditional L&F method. Consequently, 82.5% of them support the Geospatial technology integration in L&F is very necessary. Table 2 shows the analysis of need assessment conducted among Geography teachers.

TABLE 2. Need Assessment

No.	Items	Percentage of Agreement
1	The importance of GIS in school	82.5%
2	Students interest in Geography	78.3%
3	Technology application	87.0%
4	Students' involvement in L&F	51.7%
5	Student achievement level	55.7%
6	STS activity in L&F	61.0%
7	Module Need	69.5%

Source: Fieldwork in 2022

LITERATURE REVIEW

GEOGRAPHIC INFORMATION SYSTEM (GIS)

GIS (Geographic Information System) is a computer-based information system that combines map elements (geographic) and the map information (attribute data) designed to restore, update, analyze, display and manipulate data space (Kerski et al. 2013). Whereas Geography Education in schools have undergone profound changes over the last few decades in the world. Technological advancement should be adopted in the global Geography education. Therefore, Geospatial technology education is crucial in today's world (Kerski 2017a).

In the context of synthesizing a learning module, many modules are built and implemented in schools. Most L&F modules are in major subjects such as Mathematics, Science, History, Physics, Biology and etc. (Jasmi & Tamuri 2011). In the local context of the module synthesis, most are in counselling field such as Career Module (Amla, Mizan & Salleh Amat 1998), Career Awareness Module (Mohd Ali Jammat 2010), (Mahmud, Noah & Ahmad 2017) and etc. While in the Geography field, the building of a module using technology is lacking.

Amongst them are Animation Map Modules (Habibah & Arumugam, R. 2005), Love Nature Geography Module (Adrinata, Sumarmi & Astina 2016), Technology Module (Yusri et al. 2018). It is evident that the construction of modules based on local Geospatial technology is scarce. However, there are a lot of researches are conducted abroad to study GIS effectiveness in L&F. Among them are (Sorokine & Ackermann 2000), (Bearman et al. 2016), (Keiper 1999a), (Keiper 1999b), (Zhang & You 2012), (Chan & Williamson 1999), (Michaela Merryday 2000) (Kerski 2000) and etc. The studies show that there is a positive impact on the effectiveness of Geospatial technology and the development of Spatial Thinking Skill (STS) and to attract students to Geography.

Based on previous studies pertaining to the synthesizing and implementation of the module is one of the most appropriate interventions implemented to address the issue of spatial thinking skill and skills using Geospatial technology. For instance, (Kerski 2017a) states that Geospatial technology interventions in L&F can boost spatial thinking skill especially among Geography students. Learning and Facilitation Geography in schools, students' achievement, GIS education, pedagogy, fieldwork, student-centered learning, community and teachers, these elements should be emphasized in the 21st century L&F Geography (Wilmot & Dube 2015). The world is aware of the importance of Geography and it is expanded with training program for teachers, new Geography curriculum, conferences, courses and learning models. Geography is no longer a subject requires to memorize facts about the location and the features of the place even the Geography field viewed as social and physical science that assesses human relationship with the environment (Kerski 2000). Hence, Geospatial technology education in Geography is very important (Lastória, & Papadimitriou 2012).

Additionally, the use of 3D technology greatly assists students to comprehend a phenomenon faster than traditional methods. (Carbonell Carrera & Bermejo Asensio 2016) and (Carbonell Carrera & Bermejo Asensio 2017).

According to (Newcombe & Frick 2010), they state that spatial intelligence has evolution and adaptation. Next, the space orientation and environmental knowledge are known as the use of main room (Robson 2012). Various previous studies have also proven that the use of GIS in Geography Learning and Facilitation enhances students' learning thinking skills (Favier & Van Der Schee 2012)more and more geography teachers have become interested in the possibilities of using GIS in secondary education. However, teaching with GIS is complex, and little is known about how to do so in an optimal way. Therefore, an Educational Design Research study (EDR; (Duke & Kerski 2010; Favier & Van der Schee 2014); (Huang 2011); (Keiper 1999); (Kerski 2008); (Kinniburgh 2012) and (Chu et al. 2016).

Ergo, the development of Geospatial technology among students is vital in everyday life. The development of GIS skill among Geography students refers to a transition process between L&F Geography and Spatial Thinking Skill (STS). Hence, the transition process requires some actions in the development of L&F such as Preparation of Daily Teaching Plans by teachers, teaching of GIS skill, appropriate software selection and testing its effectiveness. Therefore, students get GIS skill technology, STS and problem-solving skills involving spatial aspects. The use of GIS in L&F Geography has been shown to increase STS among Geography students and to explore student's interest in Geography (Kerski 2001).

SPATIAL THINKING SKILLS (STS)

Spatial thinking is an important cognitive component, supporting academic achievement and becomes a daily activity (Borriello & Liben 2017) and (Kerski 2008). While the use of GIS in education support spatial thinking and becomes important in everyday life (Cheung et al. 2011) and (J Lee & Bednarz 2012). While the National Research Council Report (NRC) and (Vu & Mitsunobu 2004) point out "Learning to Think Spatially". According to report, spatial thinking is divided into three parts: knowledge, tool and skill and mind habit. Whereas (Lee & Bednarz 2008), describes the spatial thinking as a combination of three components related to each other namely space nature, representing space information method and spatial thinking process. Spatial thinking is a catalyst to enhance the understanding of the subject across the curriculum and as a way of thinking across borders (Bednarz & Bednarz 2008).

Meanwhile (Goodchild M. 2006) argues that spatial thinking is one of the basic forms of intelligence required in order to function in modern society, it is the basic and important skill that development should be part of everyone's education such as language, science and mathematics. Students need to know the development of spatial thinking. It includes models, graphics, charts, images, 3D modeling, video and other multimedia tools. In addition, (Haklay 2012) says that spatial thinking helps us in the realistic world to understand location-based services (LBS). Besides that, (Tsou & Yanow 2010) argue that spatial thinking is based not only on the education of the Geographical information system but it also indirectly links humanity's Geography to solve a problem in space.

GIS plays a vital role in the development of spatial thinking amongst its students, focusing on spatial thinking so students understand the spatial pattern, relationship and relationship between nature and human (Kerski 2008). GIS technology has the power and potential to uncover spatial thinking skill and analysis skill (Murphy & Hare 2016); Yeapa, K. H., Haib, H. H. & Waic, S. H. (2023).. In addition, (Kerski 2000) reported students using GIS in schools have higher scores in spatial thinking analysis test compared with students using traditional method. Students using GIS demonstrate higher ability to identify, synthesize and describe. This demonstrate that the use of this GIS encourages the Higher Order Thinking Skills (KBAT) (Millsaps, & Harrington Jr. 2017). According to (Kerski et al. 2013) stated:

"The use of GIS in geography education developed student spatial thinking skills and supported the overall geography teaching at the upper secondary school level"

Based on the above description, it can be concluded that L&F using Geospatial technology is an important factor in generating STS and interest among Geography students. The development of GIS and STS skills are influenced by other factors such as teachers, software, finance and the role of an organization (school). Hence, this study focuses on variables that affect GIS skills, namely STS and interest factors. According to (Solari J & Schee 2015), the effectiveness of GIS in L&F is influenced by several factors, namely student characteristics, finance, software, school administrators and teacher experience with GIS intervention.

The discussion explains that Geospatial technology can enhance STS and student interest in Geography, too. It is evident that GIS technology is a versatile technology that is very useful for teachers, students and researchers. Therefore, the country policy makers need to play an important role in bringing the Geospatial technology into the curriculum through their respective education policies. This is because the world is heading towards Geospatial technology. Labor needs in Geospatial technology are needed in the 21st (Bearman, Munday & McAvoy 2015) and (Şeremet & Chalkley 2016). Therefore, Malaysia must follow the current trend of technological advancement starting from the school level.

PURPOSE OF THE STUDY

Based on the above discussion, the study aims to produce Geographic Information System – Spatial Thinking Skills (GIS-STS) Module based on Geography Standard Curriculum and Assessment Document (DSKP) amongst Form Two Geography students.

METHODOLOGY

This study aims to develop a Geospatial technology intervention module based on the theory of Cognitive Learning, Theory of Constructivism and Bloom's Taxonomy Theory. The formation of this module adopts Sidek Module Construction Model *(MPMS)* as the main motivation to complete this module. The contents of the module are also identified through a more comprehensive and analytical and extensive review of past studies done. Based on literature reviews done such as references to various books, journal articles locally and internationally, thesis and official government reports have helped researchers in determining the contents of the module that have been produced. Based on this approach, researchers have made appropriate justification and consistent with the scope of the study, namely the preparation of the GIS-STS module draft. Additionally, researchers have used several theories as a platform in building the GIS-STS module. Among the theories are Cognitive Theory, the Theory Of Constructivism and Bloom's Taxonomy Theory.

COGNITIVE THEORY

As Jean Piaget cites on the theory of cognitive teaching, he has studied the area of cognitive development by looking at how mental skills are formed and changed according to one's physiological maturity. According to his description, cognitive theories are the learning of an individual depending on how one thinks and observes something and then how the information is processed in mind.

The Cognitive Theory Approach emphasizes mental processes and thoughts. Information received, processed through election, comparison and unification with other information contained in memory. The unification of this information will then be modified and reorganized. The brain will actively process the information received and exchange it to new forms or categories. This theory is closely related to GIS. This cognitive theory is also supported by (Lobben & Lawrence 2014), they said Geospatial thinking is a cognitive process occurs in the human mind. GIS technology can enhance thinking skills among students (Mark 1999). Figure 1 shows the cognitive development and process of student knowledge that will occur in Geography teaching and learning (Bearman et al. 2016).

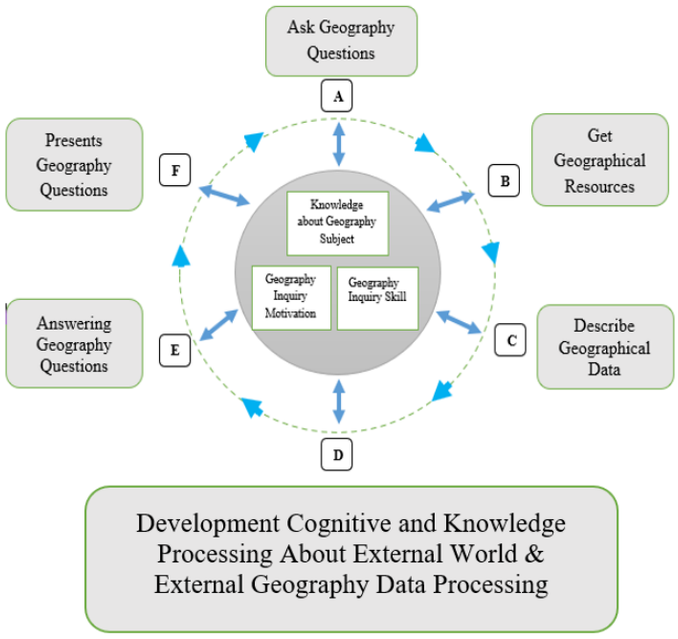


FIGURE 1. The process used when answering Geography questions.
Source: Customized from (Solari, J & Schee 2015)

Referring to Figure 1 it can be concluded that a student who follow L&F able to memorize and understand something when the lesson is based on a particular pattern and logic better. Geography learning based on the third process answers the question according to cognitive theory will generate student's thinking. Preparation of teaching procedures should be from easy to complex. Therefore, the integration of GIS should be done from simple skills to more complex skills. This theory is also better suited to help students to do practical inside and outside of classroom to memorize Geography terms more easily than traditional methods that need to memorize facts. It is obvious GIS-STS Module is important to be set up to help Geography pedagogy based on cognitive theory.

CONSTRUCTIVISM THEORY

According to Constructivism Theory, knowledge is actively formed by the thinker rather than the student passively obtain knowledge from teacher. Students will customize any new information with their existing knowledge to form new knowledge in their minds with the help of social interaction with friends and teachers (Syah et al. 2013).

The pioneer of Constructivism Theory consists of educators and psychologist such as Jerome Bruner, Jean Piaget, John Dewey, Seymour Papert and Lev Vygotsky. According to them, this Constructivism is a new learning process when students are facing with something unknown but have a high curiosity. For instance, for those students who do not know about GIS technology. They will learn something new through this module. According to Constructivism Theory, knowledge is a mind product built with new experience and inputs received through senses as a result of perception (Hopf 2014). Hence, Constructivism learning is an active and dynamic learning process resulting from the transformation of existing ideas with the latest technological advances (Chen, Chen & Chiu 2018).

BLOOM'S TAXONOMY THEORY

Bloom's Taxonomy Theory was introduced by Benjamin S. Bloom in 1956. This taxonomy is a model for analysing a field in education. This theory encompasses education objectives that lead to knowledge, attitude and psychomotor. This theory is divided into three main divisions namely cognitive domain, affective domain and psychomotor domain. Cognitive domain involves the thinking of students that emphasize the intellectual aspects of a student involves knowledge, understanding and thinking skills. Affective domain is also the development of students in terms of attitude, feeling, emotions and values. While the psychomotor domain involves the physical development of a student. (Yee et al. 2015). Cognitive skills are one of the major taxonomic domains used to measure students' intellectual skills based on cognitive hierarchies. This domain is composed from low to high oder (Figure 2). He divides these thinking skills into two, namely low-oder and high-oder thinking. Low-oder thinking involves knowledge, understanding and application. This low-oder thinking is best suited to students of Geography who uses GIS technology in L&F at an early stage. In these situations, students can use the existing knowledge in their mind to understand and apply these Geospatial technology skills in Geography L&F.

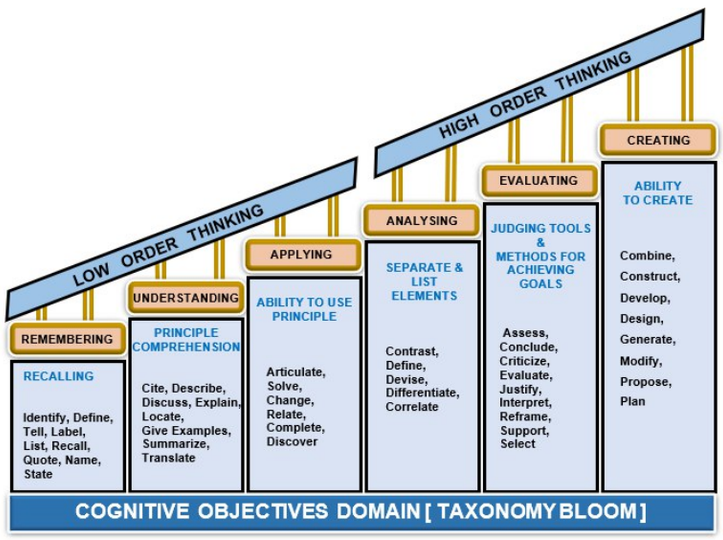
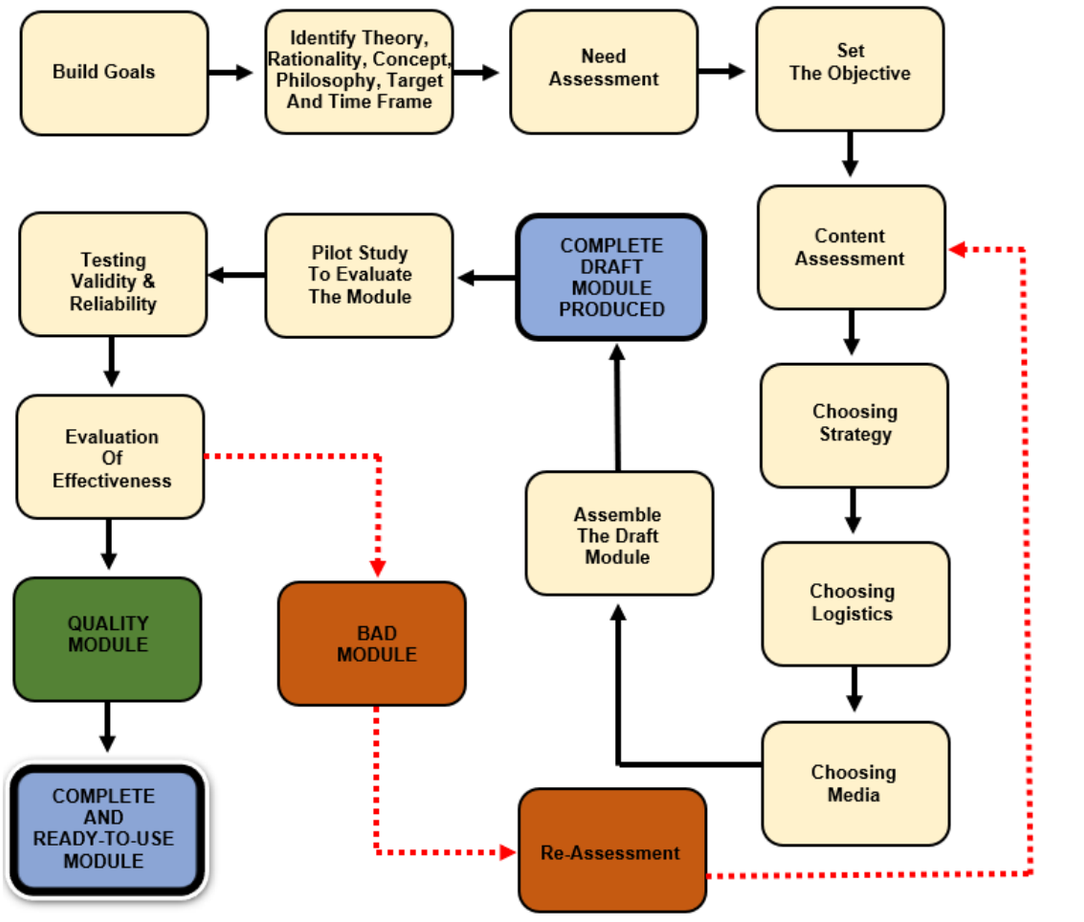


FIGURE 2. Level of thinking according to Taxonomy Bloom Theory
Source: Modified from KPM (Department of Curriculum Transformation 2014)

These three theories can be used in GIS integration in Geography pedagogy (Curriculum Development Section 2016). As the result, these three theories are used as support for the study that intended to shape and view the effectiveness of the GIS-STS Module in L&F Geography on STS and the interest of form two Geography students on the subject.



Note:Construction module of stage I, provides draft for modules
Construction module of stage II, testing and evaluating modules.

FIGURE 3. Construction Model Sidek Module 2005
Source: Synthesizing module of Sidek Mohd Jamaluddin Ahmad (2005)

MODULE SYNTHESIZING MODEL

Researchers who wanted to synthesize a better module have to consider all sorts of rules and procedures in order to form the best version (Noah & Jamaludin Ahamd 2005). The procedures and rules in preparation of certain module have to be based on reliable sources. There is actually some closure in preparing the module, one of it is introduced by past researchers which are Russel 1974, Design and Development Research- DDR (Richey, Klein & Nelson 2004), Alwiah Alsagoff 1981, and Module Construction Model Sidek (MPMS) (Sidek Mohd Noah & Jamaluddin Ahmad 2005). Even when there is still lots of other exposure, this research used Sidek 2005 module as a developing procedure module whether it is for education or practical (Sidek Mohd Noaj & Jamaluddin Ahmad 2005). Figure 3 explained about the whole development module process based on Sidek 2005 model. This model will be providing suggestions on how the development module can be achieved with two phases which are draft preparation phase and also test and evaluate module phase. Figure 3 shows the construction module process based on the construction model of Sidek 2005 module. In this process, every step taken in producing this module will be explained in details.

TABLE 3. Formation of the Geographic Information System -Spatial Thinking Skills (GIS-STS) based on Phase Preparation Module

Level	Steps
Construction of Objectives	Based on the general objectives, the main reason of this synthesizing of module GIS-STS is because of the technology intervention Geospatial towards the Geography students in high school that facing with low Spatial Thinking Skills and low interests in this Geography subject. In this building of objectives level, the results of the analysis of needs (need assessment) have been used in certain module and activities. Based on the findings of the requirement analysis, the modules need to integrate Geospatial technology in L&F Geography. Based on that, the objectives that have been constructed will be put into the theme of how Geospatial technology helps L&F Geography as well as explaining on the content of the activities.
Identify theory, rationality, philosophy, concept, target and time frame	Theory that have been used as the foundation of this module are Cognitive Theory, the theory of Constructivism and the theory of Bloom's Taxonomy. These theories explained about the variables that have been measured according to the problems in this research, which are STS and the students' interest. The target of students that are using this module are Form Two. Whereas, the recommended time frame of the module is 16 hours.
Need Assessment	To identify the needs to build a module, Need assessment needs to be done. In this research, the Need assessment was conducted through two methods which are questionnaire and interview the respondents (Fuzzy Delphi Method Analysis). The findings of the requirements analysis were discussed in the study.
Setting the Objectives	The objectives of this module are divided into two, which are general objectives and specific objectives. The general objective is to describe the overall purpose that will be achieved after the implementation of this module. Whereas, specific objective is the purpose of each sub module and activity to be implemented.
Selection of content	The content of this module is based on the Document of the Curriculum and Assessment (DSKP) of Geography on Form 2 Geography students. The content is also based on four main themes of the DSKP namely Geography Skills, Geography Physical, Human Geography, and Geographic Geography. Selection of content also affects the objectives of each activity.
Strategy selection	The perfect and appropriate strategy should be adopted into this implementation of the module. Researchers take into considerations on the level of understanding of Geography teachers, the relevance of the students, the place and also the suitability of time for the meetings. All these aspects will be taken into account to ensure that the implementation of this module goes well and has an impact on the effectiveness of the module.
Logistics selection	Researchers choose appropriate logistics including materials or facilities to be used in carrying out activities in modules in terms of suitability of places, training to teachers and students' safety. Researchers also provide a checklist to ensure complete logistics requirements so that these modules are implemented properly. For instance, in this study the use of computers, internet and instructors is more important.

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Media selection	Researchers will take these modules delivery methods based on activities in modules such as training, assignments (Homework),and student presentations. In addition, teaching aids such as GIS software, internet connection, and other infrastructure in computer labs are used to attract students to actively participating in managing each activity successfully.
Assemble the draft module	The completed drafts will be coordinated according to the activities in the module chronologically. After that, the complete phase of the module construction module will go through the second phase of testing and evaluating the module.

Source: Modified from Construction of Sidek Mohd Module, Jamaludin Ahmad (2005)

GEOGRAPHIC INFORMATION SYSTEM - SPATIAL THINKING SKILLS (GIS-STS) MODULE

Draft of the Geographic Information System Module – Spatial Thinking Skills (GIS-STS) is designed and prepared based on three main key areas of integration, GIS, STS and interest. The use of Geospatial technology in L&F Geography is expected to increase STS and students' interest. Based on that, four sub modules have been identified from DSKP Form Two Geography, Geography Skill, Physical Geography, Human Geography and Area Geography. Based on the sub module, six units have been taken in the construction of this module. These are (i) Scale and Distance, (ii) Topography Map, Earth's Movement impact on weather and climate, (iii) Weather and Climate in Malaysia, (iv) Transport in Malaysia and (v) Importance of Climate and its Influence on human activities in Asia. Additionally, out of these six units will result in 13 activities holistically.

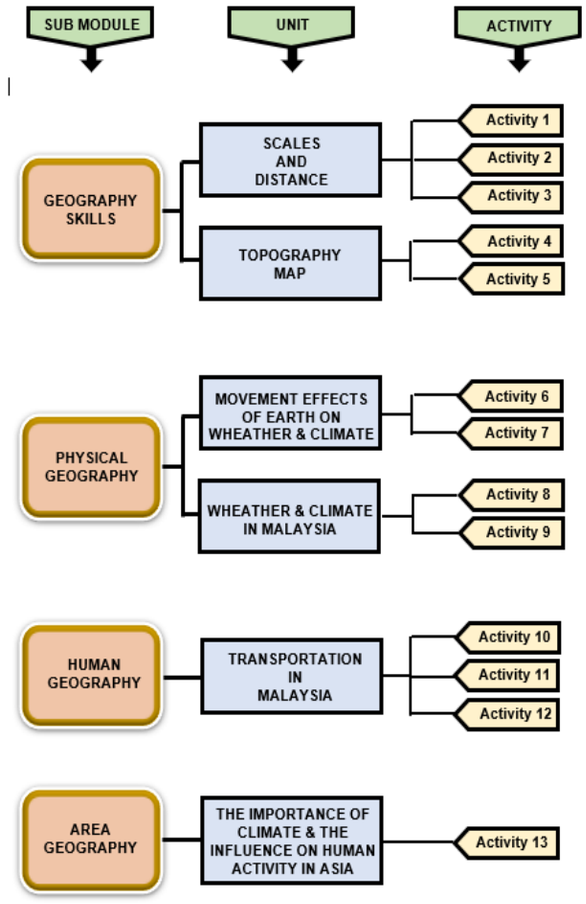

FIGURE 4 Preparation of the Geographic Information System Module – Spatial Thinking Skills (GIS-STS)

GEOGRAPHY SKILL SUB MODULE

The Geography Skill module consists of two units, Scale & Distance and Topographic Map. Geography Skill is a fundamental thing in learning Geography subjects. Geography Skills include the ability to observe, measure, record, and convey information. This Geography Skill Unit refers to the skills learned through the direction of title, position, scale and distance and topography map. The titles in Geography Skill enable students to study and connect them in spatial organizations. Geography Skills focus on acquiring skills using GIS software. There are five activities which are: (i) Measuring straight distance, (ii) Curved distance, (iii) Measuring area, (iv) Recognizing the east and north line (v) Physical landscape and human-made landscape. Overall, the Geography Skill 5 sub-module is structured and can be measured using Geospatial technology intervention.

PHYSICAL GEOGRAPHY SUB MODULE

Physical Geography sub-module discuss the physical condition of the earth based on the theme of the Earth Surface's Nature and Drainage, Weather and Climate and Natural Plants and Wildlife Nazri, F. A., Zamani, N. S. M., & Singh, M. J. (2018). Physical Geography enables students to learn about the basic features and processes of surface and earth formation, the occurrence of a phenomenon, and the extent to which the physical environment of the earth is affected by human activity and vice versa. There are four activities involving the use of GIS namely (i) Recognizing the effects of earth rotation (ii) four seasons occurrence, (iii) Area with High Concentration of Rain (iv) Area with Low Concentration of Rain, Mahmud, A. R., Sakawi, Z., & Maulud, K. N. A. (2019).

HUMAN GEOGRAPHY SUB MODULE

The Human Geography Sub module studies the patterns and dynamics of human activities as well as their relation to the physical environment. Human Geography consists of Residents and Placements, Transport and Telecommunication theme and Resources and Economic Activities. Researchers only choose the title of transport for Geospatial technology intervention. There are three activities which are: (i) recognizing and marking land transport, (ii) air transportation and (iii) water transportation.

AREA GEOGRAPHY SUB MODULES

Geographic Geography is a geographical branch of learning about the areas of the world that are unique in terms of physical and human environment. Regional Geography focuses on specific countries in Southeast Asia, Asia and the world as case references. The researchers chose an activity that recognizes four climate zones in Asia.

CONCLUSION

The study of the synthesizing of the GIS-STS module based on the DSKP discussed in this article has resulted in the draft of four sub modules and 13 activities as a whole. Where the Sidek 2005 modelling module is suitable as the basis for the construction of this GIS-STS module. Additionally, Sidek Model 2005 helps researchers to plan, devise and organize systematic modules. The GIS-KBR module is considered complete as it explains how to build step-by-step modules until the draft of this module is tested for reliability. All the steps have been carefully organized in phases to ensure the quality of the module as suggested by (Sidek Mohd Noah & Jamaluddin Ahmad, 2005). Researchers also organize training in modules to elicit STS, interest and skills using Geospatial technology.

According to past studies using geospatial technology and L&F Geography, it can stimulate STS and interest among students. (Aladağ 2010), (Isioye, Moses & Nzelibe 2013), (Metoyer, & Bednarz 2017), and (Solari, J & van der Schee 2015). According to (Kerski 2017b) it can be explained in relation to how GIS creates spatial-minded people since school. He also pointed out that with GIS interventions will also attract students to Geography subjects. Furthermore, previous studies on the creation of the modules in Geography are lacking, however guidance and past research in the construction of modules in other fields can be used as a guide in building a module in Geography. Among the previous research module guides are (Mahmud et al. 2017), (Mahmud et al. 2017), (Aladağ 2010), (Eremet, & Chalkley 2015), (Isioye et al. 2013), Mayalagu, G., Jaafar, M., & Kuok Choy, L. (2018). and etc.

Hence, the invention of the GIS-STS module with Geospatial technology is crucial for students to equip themselves with STS, Geospatial technology skills and to attract students to Geography subjects in line with L&F 21st century. Along with that, it is thus an effort to guide students and observe them who use Geospatial technology

in L&F to prove that it is very important in improving STS and interest. Implementation of Geospatial technology intervention with aided GIS-STS module is expected to assist L&F. At the same time, the next study should focus on the validity and reliability of the GIS-STS module that has been prepared and discussed in this article.

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DECLARATION OF COMPETING INTEREST

None

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