

Self-Regulated Learning in Malaysian Smart Schools: The Environmental and Personal Determinants

NG LEE YEN

School of Education, University of Science Malaysia, Malaysia

KAMARIAH ABU BAKAR, SAMSILAH ROSLAN, WONG SU LUAN, & PETRI ZABARIAH MEGAT ABD RAHMAN

Faculty of Education, Universiti Putra Malaysia, Malaysia

ABSTRACT The Malaysian Smart School Project aims to systematically reinvent the teaching and learning processes in the school system, to prepare students for the information age. With the use of IT-facilities, smart schools envisage to maximize students' individual potentials and guide them to become self-regulated learners. This study attempted to determine the environmental and personal factors related to self-regulated learning in these IT-integrated schools. Environmental factors that were examined include levels of IT-integration and student-teacher interactions, while students' personal factors encompassed motivational beliefs, self-regulative knowledge, information literacy, and attitudes towards IT. The sample for this survey research consisted of 409 secondary students, taken from six randomly chosen smart schools. Findings shown that self-regulated learning was significantly and positively related to all the selected factors, except for information literacy, and attitudes towards IT. Multiple regression analysis revealed that environmental factors were more important than students' personal factors for self-regulated learning in smart schools.

Introduction

Efficient learners have the skills to design and control their own learning processes and are able to evaluate and reflect on the entire process. They are self-regulated learners, learners who metacognitively, motivationally, and behaviorally manage and promote their own academic learning (Zimmerman & Schunk, 1989). Researchers acknowledge that self-regulated learning is one of the most essential skills that students should possess, particularly in this information age (Chen, 2002; Veenman, Beems, Gerrits & Weegh, 1999; Schraw, 1998; Henderson, 1986; Wang & Peverly, 1986). Owing to the tremendous explosion of information, it is no longer adequate to continually utilize knowledge that is acquired in a limited time and with the help of others for a long time (Hoe, 2003). Students must become self-regulated learners seeing that in the future they have to proactively and assertively thrive in an information-rich and technology-driven society (Lapan, Kardash, & Turner, 2002).

The Malaysian government realizes that the mainstream teaching and learning culture in the educational system lacks the substance to produce self-regulated learners (Malaysian Strategic Research Center, 1994). No doubt, the system manages to produce students with good results but a great number of these students are actually passive learners, spoon-fed learners and rely heavily on rote learning (Zairon Mustapha, 1998; Malaysian Strategic Research Center, 1994). The Smart School Project signifies a bold step taken by Malaysian government to systematically

reinvent the teaching-learning practices in schools to produce proactive, efficient, and self-regulated learners (Ministry of Education, 2002). This project has begun in 1999 and there are currently 90 established smart schools in Malaysia. By year 2005, another 300 schools will be converted into smart schools (Ministry of Education, 2004). The Ministry of Education has classified the existing smart schools into three categories based on the levels of IT-integration; level A, B+ and B. Smart schools with level A technology are equipped with computerized classrooms, electronic resource center, computers in science labs, and self-access centers. Schools with level B+ technology, on the other hand, are equipped with at least five computers in 15 selected classrooms. These schools also have computers in the computer lab. Schools with level B technology are equipped with computers in the computer, and multimedia labs.

The learning processes in smart school focuses on all round development of the students and provide them with opportunities to enhance individual strength and abilities. With the aid of multimedia technology, smart school students are required to self-direct, self-access, and self-pace in learning. As such, students are allowed to explore topics of interest without being tied down to rigid curriculum and self-access information from various sources independent of the teacher. They can also learn at their own pace without being held back by slower students or having to deal with material beyond their capabilities (Curriculum Development Center, 2002, para. 2). In other words, smart school students are encouraged to self-regulate their own learning activities.

Self-regulated learning has garnered a great deal of interest among academicians and psychologists as research indicated that it has positive effects on students' academic achievement (Dckeyrel, Dernovish, Epperly, & Mckay, 2000; Dolianac, 1994). Researchers attempt to understand and explain this psychological construct from various theoretical perspectives. The most significant theory that has guided extensive research in self-regulation is Albert Bandura's social cognitive theory (Zimmerman & Schunk, 1989). According to this theory, self-regulated learning processes such as self-observation, self-judgment, and self-reaction can be influenced by environmental and personal factors (Bandura, 1997, 1986, 1977).

Environmental Factors and Self-Regulated Learning

Environmental factor is divided into two categories, the physical context of a learning setting, and the social experiences that students have during the learning processes (Zimmerman, 1997). From the physical perspective, IT integration into learning settings may promote self-regulated learning given that it provides students with tools such as personal computers, educational software, and Internet that support and enhance self-learning. Lewis and Mendelsohn (1994) assert that students in schools with high level of IT integration may have more opportunities to self-regulate than those in schools with low or minimum levels of IT integration. This implies that levels of IT integration in learning settings may predict students' self-regulated learning.

Social cognitive theorists also propose that students' social experiences in learning environment, particularly interactions with teachers, can affect self-regulated learning (Zimmerman, 1989). Based on past research, students are more likely to self-regulate if teachers promote student-centered learning, provide them with appropriate feedbacks during the learning processes, and teach them self-regulated learning

strategies. Ames (1992) claims that teachers who practice student-centered learning provide more opportunities for students to learn independently or becoming self-regulated learners. On the other hand, feedbacks provided by teachers on academic performance, and learning tasks can affect self-regulated learning by helping students to self-evaluate and refined their learning strategies (Butler & Winne, 1995). The teaching of learning strategies or strategy-instruction can also affect self-regulated learning (Schunk, 1989). Students who received training in self-regulated learning are most likely able to manage their studies more efficiently as compared to those who did not receive any guidance.

Personal Factors and Self-Regulated Learning

Apart from environmental factors, social cognitive psychologists have devoted particular attention to the personal or self factors in relation to self-regulated learning. Self-efficacy is deemed as the key personal factor affecting self-regulated learning. This is because humans think about the connection between their behaviors and its consequences and act accordingly (Bandura, 1986). In support of this assumption, students' self-efficacy has been found to be related to students' use of learning strategies, and self-monitoring. Students with high self-efficacy believe that they are capable of improving their performance by employing various strategies, thus these students use more and better quality learning strategies, particularly self-monitoring strategy to monitor their learning outcomes (Kurtz & Borkowski, 1984; Pearl, Bryan & Herzog, 1983).

Other personal factors that affect self-regulated learning are students' self-regulative knowledge, goals, and affective states. Students' self-regulative knowledge can be defined as students' knowledge on self-regulated learning strategies and also their beliefs about the values of these strategies. Self-regulative knowledge is recognized as an important factor that can affect self-regulated learning (Zimmerman, 1989). This is because effective self-regulated learners always know how, when and why they employ certain regulating strategies.

Goals setting can influence self-regulated learning given that when students adopt a goal, they may experience a sense of self-efficacy for attaining it and be motivated to perform the appropriate self-regulatory activities (Schunk & Peggy, 1999). Conversely, if students do not set any specific short term or long term goals in learning, they will probably care little about how they perform. In fact, they may not even assess their performances or expand their efforts to achieve better grades. Besides goal setting, Bandura (1986) asserts that affective states such as anxiety can influence self-regulated learning. This is because anxiety is a debilitating factor; it can cause distraction and disorientation. Students with high level of anxiety are always worried, and unconfident about their own academic performances. Such affective state may impede them to carry out the intended actions like concentrate in class, follow study plans, complete exercises on time, and revise for examinations.

Personal factors such as self-efficacy, goal and anxiety are classified as students' motivational beliefs (Pintrich & Roeser, 1994). The relationships between these motivational beliefs, and self-regulated learning have been extensively studied. However, not enough attention was given to other motivational beliefs such as task values (task interest, task importance and task autonomy) and control beliefs. Recent studies found that self-regulated learning is indeed positively related to students' perception of task values (Zimmerman, 2002; Kwon, 2001) and their control beliefs

(Elliot & Church, 1997). Task values can influence self-regulated learning as students' perception of task mediate goals they select and strategies they adopt to learn. If a given task is perceived as interesting and important, students are more willing to employ strategies to complete it. From another perspective, if students believe that they are able to control the learning outcomes and their efforts can produce the desired results, they will use more self-regulated learning strategies. This is because students are confident that their efforts in using strategies will be fruitful and the desired results can be successfully attained.

In addition, personal factors such as attitudes towards IT (Czaja & Sharit, 1998) and information literacy (Hancock, 1993) may also affect self-regulated learning. Students with positive attitudes towards IT and information literacy may be better self-regulated learners in IT-integrated learning environments. These students are more competent in utilizing IT tools such as personal computers, Internet and multimedia software to facilitate self-learning.

In short, literature reviews suggest that self-regulated learning in smart schools may be related to its IT-integrated learning setting, student and teacher interactions, students' motivational beliefs, self-regulative knowledge, information literacy, and their attitudes towards IT. This study has formulated two research objectives to confirm the postulation. The findings may contribute significantly to the existing knowledge in self-regulated learning, given that not many studies have looked into self-regulated learning in Malaysian smart schools.

Objectives of the Study

1. Determine the relationships between selected environmental and personal factors with smart schools students' self-regulated learning.
2. Determine the contribution of environmental and personal factors in explaining smart school students' self-regulated learning.

Methodology

Samples

The targeted population for this study was smart school students. According to the Curriculum Development Centre (2002) and the Ministry of Education (2004, 2002), there are at least 1000 students in each of the 90 smart schools. In other words, the population for this study consisted of approximately 90,000 smart schools students. Smart schools are scattered in the Peninsular Malaysia and East Malaysia, however, due to cost and time constraints, only schools in the Peninsular Malaysia were involved. The population was sampled by cluster sampling method.

Using the table of random numbers, six smart schools were randomly selected for this study, with two schools representing each level of IT-integration; level A, level B+ and level B. For example, in order to randomly select two schools from level A category, the researcher first listed all level A schools and numbered them consecutively. Next, an arbitrary number in the table of random numbers was selected. The researcher only used the last two digits of the number as the population

of level A schools is less than 100. If the number corresponded to the number assigned to any of the schools in the population, then that school was in the sample. These steps were continued until the sixth school was selected. Two Form Four classes were then randomly chosen from each school and sampled by the researchers.

The sample size for this survey research was 409 students (average 16 years old). This sample size was more than the minimum sample size, 383 students, proposed by Krejcie and Morgan (1970). The appropriateness of this sample size was also determined with Cochran's Formula (1977), which suggested a size of 400 students. The researchers are confident that 409 students were adequate for this research since it was more than the size proposed by both Cochran (1977) and Krejcie & Morgan (1970).

Instruments

Self-Regulated Learning. Students' self-regulated learning was measured by the adapted Learning Strategies Scale, taken from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Gracia, & McKeachie, 1991). This 7-point Likert instrument measures students' usage of self-regulated learning strategies. Items in the scale have to be modified and translated into Malay Language, to be applied in the local context. Under the smart schools' learning concept, individual assignment is an integral aspect of learning as it promotes students abilities to self-direct. Six extra items were constructed by the researchers to gauge students' usage of self-regulated learning strategies in assignments completion. The revised instrument has 56 items. After running Cronbach's alpha analysis, the scale is confirmed to be a highly reliable instrument (alpha coefficient = .92).

Two categories of environmental factors were examined in this study. Level of IT-integration is the physical environment factor, while student-teacher interaction is the social environmental factor. The measurements of the variables are as follows:

Levels of IT-Integration. Based on the information provided by the Ministry of Education, level of technology for each smart school involved was written in the questionnaire by the researcher, this was to facilitate data analysis.

Student-Teacher Interactions. Student-teacher interaction was measured by the 12-item Student-Teacher Interactions Scale, developed by the researchers. It is a 7-point Likert instrument, written in Malay Language. The scale is divided into three dimensions; student-centered learning, feedbacks provided by teachers, and strategy instruction, or the teaching of learning strategies. Its content validity was verified by a panel of experts in Educational Psychology, while the construct validity was supported by factor analysis, conducted prior to the study. Cronbach's alpha analysis, on the other hand, shows that the scale also has high level of internal consistency (alpha coefficient = .88).

Four personal factors were examined in relation to self-regulated learning in smart schools. These factors include motivational beliefs, self-regulative knowledge, information literacy, and attitudes towards IT. Instruments to gauge these variables are as follows:

Motivational Beliefs. Motivational beliefs were measured by the 33-item Motivation Scale, taken from MSLQ. This 7-point Likert instrument was developed by Pintrich et al. in 1991. There are six subscales in this instrument (Intrinsic goal orientation, extrinsic goal orientation, self-efficacy, control beliefs, tasks values, and anxiety subscales), which measure different motivational beliefs. Minor modification and adaptation was done on the instrument for the use of local context. The scale was highly reliable (alpha coefficient = .87).

Self-Regulative Knowledge. Students' knowledge about self-regulated learning strategies and their beliefs about the values of these strategies were measured by the Self-Regulative Knowledge. This 12-item instrument was written in Malay Language by the researchers. It is a 7-point Likert scale. A panel of experts in Educational Psychology has verified the content validity of the scale and each item has been checked by language experts. Factor analysis was also carried out by the researchers to establish its construct validity. Besides, Cronbach's alpha analysis indicates that the scale is highly reliably (alpha coefficient = .87).

Information Literacy. The Information Literacy Scale is a self-report instrument, developed by the researchers to measure students' abilities to access, process, and apply information from the Internet. This 10-item, 7-point Likert scale was written in Malay Language. A panel of experts in Educational Technology has verified the content of Information Literacy Scale. Each item has also been checked by language experts. Even so, given that this is a newly constructed instrument, factor analysis and Cronbach's alpha analysis were carried out to ensure the validity and reliability of the instrument. Results show that the scale has construct validity and it is reliable (alpha coefficient = .83).

Attitudes towards IT. The Attitudes towards IT Scale was employed to measure students' affective, cognitive and behavioral attitudes towards the application of computers and Internet in learning. This 7-point Likert scale consists of 10 items, and was written in Malay Language by the researchers. A panel of experts in Educational Technology has verified the content validity of the scale and every item was checked by language experts. Its construct validity was established by factor analysis. In addition, Cronbach's alpha analysis confirms that it is highly reliable (alpha coefficient = .83).

Results

The relationships between self-regulated learning with the environmental and personal factors were investigated using Pearson product-moment correlation coefficient. Interpretation on the strength of correlation was based on guidelines proposed by Cohen (1988) (Table 1).

Table 1: Guidelines to Interpret the Strength of Correlation (r)

Correlation Coefficient (r)	Strength
r = .10 to .29	Small Strength
r = .30 to .49	Medium Strength
r = .50 to 1.0	Large Strength

(Source: Cohen, 1988, p. 120)

According to Cohen (1988), the strength of correlation is considered small when the coefficient value range from .10 to .29. The strength of association, however, will be interpreted as medium, if the value range from .30 to .49. When the value fell within the range of .50 to 1.0, it is considered as large strength relationship. Table 2 shows the results of correlational analyses on self-regulated learning with the various environmental and personal factors. As a whole, self-regulated learning was related to these two factors.

Table 2: Relationships between Self-Regulated Learning with Environmental and Personal Factors

Variables	Self-Regulated Learning
Environmental Factors	
i. Levels of IT-Integration	.49**
ii. Student-Teacher Interactions	.36**
Student-Centered learning	.35**
Feedbacks	.17**
Strategy Instructions	.33**
Personal Factors	
i. Motivational Beliefs	.47**
Intrinsic Goal Orientation	.29**
Extrinsic Goal Orientation	.36**
Task Values	.31**
Control Beliefs	.11*
Self-Efficacy	.45**
Anxiety	-.07
ii. Self-Regulative Knowledge	.37**
iii. Information Literacy	.02
iv. Attitudes towards IT	-.01

** $p < .01$.

* $p < .05$.

From the environmental factors perspective, levels of IT-integration ($r = .49$, $p < .01$) and student-teacher interactions ($r = .36$, $p < .01$) were significantly and positively related to self-regulated learning in smart schools. In fact, level of IT-integration has the highest correlation coefficient amongst all the independent variables examined in this study.

Correlational analyses also reveal that the three dimensions of student-teacher interactions, student-centered learning ($r = .35$, $p < .01$), feedbacks provided by teachers ($r = .17$, $p < .01$), and strategy instruction ($r = .33$, $p < .01$) were also significantly and positively related to smart school students' self-regulated learning. Based on Cohen's (1988) guidelines, these social environmental factors have moderate strength associations with self-regulated learning, except for feedbacks, which has only recorded a small strength relationship.

From the aspect of personal factors, motivational beliefs ($r = .47$, $p < .01$), and self-regulative knowledge ($r = .37$, $p < .01$) were significantly and positively related

to self-regulated learning, with moderate strength relationships (Cohen, 1988). However, the other two personal factors, information literacy ($r = .02$, $p > .05$) and attitudes towards IT ($r = -.01$, $p > .05$) were not significantly related to it. The analysis also shows that one of the dimension of motivational beliefs, anxiety, was not significantly related to self-regulated learning in smart school ($r = -.07$, $p > .05$).

As for the other five dimensions of motivational beliefs; intrinsic goal orientation ($r = .29$, $p < .01$), extrinsic goal orientation ($r = .36$, $p < .01$), task values ($.31$, $p < .01$), control beliefs ($r = .11$, $p < .05$), and self-efficacy ($r = .45$, $p < .01$) were all significantly and positively related to self-regulated learning. Amongst these factors, only intrinsic goal orientation and control beliefs have small strength relationships with self-regulated learning, while the rest have moderate strength associations. Self-efficacy, which has the highest correlation coefficient, was consistent with literature reviews.

The relationships between self-regulated learning with the various environmental and personal factors have been determined by correlational analysis. Even so, no conclusion could be made on which category of the factors contributes more in explaining smart school students' self-regulated learning. To answer this question, multiple regression analysis was carried out.

There are different types of multiple regression analyses, such as standard, hierarchical, or stepwise methods. The standard multiple regression analysis was employed in this study, whereby all the independent variables were entered into the equation simultaneously. The alpha level was set at .01. Prior to this analysis, the assumptions underpin it such as multicollinearity, normality, linearity, outliers were tested. No assumption was violated.

To produce a regression model with higher explanatory power, the researchers decided that only factors, which were at least moderately ($r \geq .30$) related to self-regulated learning, were subjected to multiple regression analysis. As shown in Table 2, feedback provided by teachers has small strength relationship with self-regulated learning (Cohen, 1988), it was, thus, eliminated from the analysis. So were control beliefs and anxiety, two of the dimensions in motivational beliefs. The researcher has also decided to analyze intrinsic goal orientation and extrinsic goal orientation as a combined variable, goal orientation. In addition, attitudes towards IT, and information literacy, were also excluded from the analysis as they were not significantly related to self-regulated learning in smart schools.

It is also important to note that levels of IT-integration (physical environment), and student-teacher interactions (social environment) were grouped as environmental factors. Motivational beliefs and self-regulative knowledge, on the other hand, were categorized as students' personal factors. Table 3 shows the standardized beta coefficient for the environmental and personal factors.

The beta weight for the environmental factors was .33, after the personal factors were statistically controlled. Interestingly, .28, was obtained for the personal factors when the environmental factors were controlled. Such findings indicate that environmental factors have higher contribution in explaining the variance in self-regulated learning scores. The results were unexpected as literature reviews on self-regulated learning seem to suggest that the personal factors could have higher contribution in explaining self-regulated learning, compared to the environmental factors. This finding highlighted the importance of environmental factors in promoting self-regulated learning in smart schools.

Table 3: Standardized beta coefficient of Environmental and Personal Factors of Self-Regulated Learning

Variables	<u>B</u>	<u>SE B</u>	β	t	<u>Sig.</u>
Constant	2.60	.21		12.16	.00
Environmental Factors (Levels of IT-Integration and, Student-Teacher Interactions)	.04	.01	.33	7.20**	.00
Personal Factors (Motivational Beliefs and, Self-Regulative Knowledge)	.02	.00	.28	6.19**	.00

** $p < .01$.

Results and Interpretation

The Relationships between Self-Regulated Learning with Environmental Factors

Pearson correlation coefficient analysis demonstrates that levels of IT-integration and self-regulated learning in smart schools were positively and significantly related to each other ($r = .49$, $p < .01$). The positive association suggests that by enhancing the levels of IT-integration in smart schools, students' self-regulated learning may be improved. This finding is consistent with many past studies (Eom & Reiser, 2000; Lee, 2000; Bonk & Dennen, 1999; Bopry, 1999; Rosenberg, 1987; Dede, 1986; Anderson, Boyle, & Reiser, 1985). In fact, it supports the view that environmental factor, such as the physical context of a learning setting, is related to self-regulated learning (Zimmerman, 1997). IT permits the educational processes to be redefined around the individual and allows smart school students to be more proactive in learning. For instance, students can use the personal computers to organize and complete their learning tasks. They also have great opportunities to access useful, up-to-date, and limitless information and learning materials from the Internet independently. Learning became more student-centered, independent, and exploratory in nature. As emphasis by Liu (1992) students have more control of their own learning activities in IT-integrated environments. To put it in a nutshell, modern learning technologies, such as personal computers, educational software, and Internet, may support and promote smart schools students' self-regulated learning.

Student-teacher interactions was found to have a positive and significant correlation with self-regulated learning ($r = .36$, $p < .01$). The positive relationship between these two variables implies that teachers can play an important role in cultivating self-regulated learning among students. This is because they are able to shape the learning settings to accommodate, encourage, and facilitate students' self-regulated learning.

The three dimensions of student-teacher interactions, student-centered learning ($r = .35$, $p < .01$), feedbacks provided by teachers ($r = .17$, $p < .01$), and strategy-instruction ($r = .33$, $p < .01$) were positively and significantly related to self-regulated learning. These results imply that teachers may enhance students' self-regulated

learning by promoting student-centered learning, as oppose to teacher-centered learning. Student-centered learning is a teaching approach, which enables students to determine the content, pacing, instructional sequence and approaches based on their learning needs, abilities and attitudes. In addition, the teaching of learning strategies or strategy instruction may improve students' self-regulated learning as well. Students who received training in self-regulated learning manage their studies more efficiently as compared to those who did not receive any guidance (Zimmerman & Schunk, 1989). Lessons on learning strategies should, therefore, be provided in schools. From another aspect, feedbacks provided by teachers only yielded a low correlation with self-regulated learning. Yet, the result does not diminish the importance of feedbacks. Literature reviews show that feedback provided by teachers is a prime determiner of self-regulated learning (Butler & Winne, 1995; Phye & Sanders, 1994; Phye & Bender, 1989). Appropriate feedbacks may guide students to self-evaluate their own learning and also to refine their learning strategies (Butler & Winne, 1995). Thus, teachers should not neglect it during the teaching and learning processes.

The Relationships between Self-Regulated Learning with Personal Factors

Pearson correlation coefficient analysis show that motivational beliefs were positively and significantly related to self-regulated learning ($r = .47$, $p < .01$). The strength of associations was close to a large strength relationship. This result was within expectation given that motivation always plays an important role in students' learning processes, including self-regulated learning. Past studies have consistently found that motivational beliefs were positively related to self-regulated learning (Kwon, 2001; Eom & Reiser, 2000; David, 1999; Riverto, Cabanach & Arias, 2001; Pintrich & Roeser, 1994). These beliefs enable students to exercise control over their thoughts, feelings, motivation, and actions, consequently affecting their learning behaviors. The relationship between motivational beliefs and self-regulated learning was further examined by looking into its various dimensions; which include intrinsic goal orientation, extrinsic goal orientation, self-efficacy, control beliefs, task values and anxiety

Intrinsic goal orientation was significantly and positively related to self-regulated learning in smart schools ($r = .29$, $p < .01$). This is because students who perceived learning as an end in it self would engage more in self-regulated learning (Ablard & Lipschultz, 1998; Meece, 1994; Ames & Archer, 1988). Students with intrinsic goals prefer learning materials that enable them to learn new things as they constantly feel the thirst for knowledge. If given the opportunities, they will also choose individual assignments that they can learn from even if it does not guarantee good grade. This result indicate that the learning activities in schools should place more emphasis to fulfill students' interests and needs to learn, and not just aiming for better examination scores.

Extrinsic goal orientation was also significantly and positively related to self-regulated learning in smart schools ($r = .36$, $p < .01$). Most literature reviews show that intrinsic goal orientation was more related to self-regulated learning than extrinsic goal orientation (Samsilah Roslan, 2000; Ablard & Lipschultz, 1998; Ames & Archer, 1988). In fact, a study by Wolters and Yu (1996) found that extrinsic goal orientation was negatively related to students' self-regulated learning. Surprisingly, this was not the case in smart schools; extrinsic goal orientation was more related to students' self-regulated learning than intrinsic goal orientation. The contrary result could possibly due to the learning culture in Malaysian schools, which is very

examination-oriented (Ho, 2004; Lee, 2002). When academic performance is perceived as the ultimate goal in learning, students may be more motivated and strategic in learning. The usage of self-regulated learning strategies is mainly aimed at enhancing test performance or examination scores, rather than learning per se.

Amongst the six dimensions of motivational beliefs, self-efficacy has the strongest association with self-regulated learning ($r = .45, p < .01$). It appears that smart school students who perceived themselves as being more capable, used a greater number of self-regulated learning strategies. This finding was within expectation given that self-efficacy is the key motivational beliefs affecting self-regulated learning (Zimmerman, 1989). The result was also in accord with previous studies, which found that students who reported higher perception of self-efficacy, also reported greater use of learning strategies (Pintrich & Schrauben, 1992; Zimmerman & Martinez-Pons, 1992; Pintrich & DeGroot, 1990). High self-efficacy beliefs provide students with confidence that that they can use strategies to improve their own performance. These students use more and better quality learning strategies, particularly self-monitoring strategy to monitor their learning outcomes (Kurtz & Borkowski, 1984; Pearl, Bryan & Herzog, 1983).

Pearson correlation coefficient analysis reveals that control beliefs only have a small strength positive relationship with self-regulated learning. This association, nevertheless, was significant ($r = .11, p < .05$). The role of control beliefs should not be diminished. If teachers wish to improve students' control beliefs, attribution retraining perhaps is one of the possible means. This program may enhance students' control beliefs by changing how they attribute their successes and failures (Perry, Hechter, Menec, & Weinberg, 1993). Students will be convinced that their performances in learning activities are mainly control by themselves therefore efforts can make a difference. The retraining activities can be carried out individually or using group interventions. Teachers have to do more readings and research about the program before implementing it.

Tasks values, another dimension of motivational beliefs, was also significantly and positively related to self-regulated learning ($r = .31, p < .01$). Based on the result of this study, smart school students may be more prone to self-regulate when their learning tasks or assignments are off high values, for instance are interesting, important and has more choices. These students should be provided with learning tasks that are interesting, challenging, motivating, exploratory, and constructive in nature ("Learning in an Electronic Age", 2002). These tasks can be designed using conventional and electronic learning materials, such as multimedia courseware and materials obtained from the Internet.

Anxiety was the only dimension of motivational beliefs, which has a negative and insignificant association with self-regulated learning ($r = -.07, p > .05$). This was an unexpected finding since literature reviews suggest that self-regulated learning is related to anxiety (Malpass, O'Neil, & Hocesvar, 1999; Pintrich & Roeser, 1994; Bandura, 1986). The possible reason underlie this result is that the influence of anxiety may not be as directly as thought by the researchers. Bandura (1997) proposes that students' physiological state, such as anxiety, is a source of self-efficacy beliefs. Anxiety may play a mediating role between self-efficacy and self-regulated learning. Therefore, it did not exhibit a strong association with self-regulated learning.

In addition, this study found that self-regulative knowledge has a positive and significant relationship with self-regulated learning ($r = .37, p < .01$). One implication for educational practices arising out of this finding suggests that teachers can play a prominent role in promoting self-regulated learning. They can provide students with

knowledge on self-regulated learning strategies and convey the values of these strategies. Students must be taught how to select and use appropriate strategies to regulate their own learning activities independently, and proactively. Strategies training can be provided directly as separate lessons or indirectly by incorporating it into school lessons. The latter may be more effective as students can apply strategies during normal learning context and utilize the existing curriculum materials.

Information literacy was not significantly related to self-regulated learning ($r = .02, p > .05$). The strength of correlation was extremely small (Cohen, 1988). This was an unexpected finding. An important factor that may have been overlooked by the researchers was the learning experiences that students had with the Internet. Experiences here refer to the frequency and types of Internet usage during the teaching and learning processes. This factor may be a mediator between students' information literacy and self-regulated learning activities in smart schools. Further research is needed to investigate this supposition.

Finally, correlation analysis reveals that attitude towards IT has a weak and negative relationship with self-regulated learning. This association was not significant ($r = -.01, p > .05$). The complete absence of evidence to support the relationships between attitudes towards IT and self-regulated learning was intriguing. This is because literature reviews seem to suggest that the two variables are related. Despite that, the result of this study has proved otherwise. Smart schools students reported usage of learning strategies has no relation with their attitudes towards IT. The reason behind this contradictory finding may due to the scope of literatures. The reviews of literature on the relationship between the two variables have focused only on foreign studies, since no local study could be found. There are possibilities that the results of these studies could not be generalized to the Malaysian smart schools context.

The Environmental and Personal Determinants of Self-Regulated Learning

This study contributes significantly to the existing knowledge in self-regulation. It looked into self-regulated learning in Malaysian smart schools' setting, an area of research that has yet to be explored. The findings of multiple regression analysis are congruent with social cognitive theory. Both environmental and personal factors were related to self-regulated learning. In addition, this study discovers that the environmental factors play a much more important role than expected by the researchers. Literature reviews show that social cognitive psychologists devote particular attention to the personal or self factors, particularly self-efficacy, in relation to self-regulated learning. This is because this theory proposes that humans think about the connection between their behavior and its consequences, and often are more affected by what they believe will happen than by the consequences they actually encounter (Bandura, 1986). Thus, when discussing about self-regulated learning, more emphasis are placed on the personal-beliefs factors than the environmental factors.

Learning activities in smart schools are closely related to the IT-integrated learning environment. Students have to utilize various IT-tools, such as personal computers, educational software, and Internet to support and manage their own learning activities. In addition, they are provided with opportunities and encouragements to self-regulate during the learning processes. In such learning setting, the physical and social environmental factors may enhance students' self-regulated learning. For this reason, researchers should not be confined to the idea that self-factors are always the main determinants of self-regulated learning, as subscribed

by many social cognitive theorists. Factors that influence self-regulated learning may differ according to the learning environment. In IT-integrated learning settings, such as the smart schools, the influence of external or environmental factor may be more dominant.

Conclusions

In conclusion, the Malaysian Smart School Project signifies a dramatic change in the local educational system; whereby information technology is utilized in every aspect of education and students are required to take much greater responsibilities of their own learning. The learning settings in smart schools are conducive for self-regulated learning. Information from this study may help smart schools' authorities and teachers to further promote and enhance self-regulated learning in these schools. Both environmental and students' personal factors must be taken into account. Factors that need to be paid extra attentions are levels of IT-integration in the school, student and teacher interaction during the teaching and learning processes, as well as students' motivational beliefs and their knowledge about learning strategies.

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