Using Teaching Courseware to Enhance Classroom Interaction as a Method of Knowledge Sharing

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Abstract
Information technology (IT) is a generic term referring to technologies which are being used for collecting, storing, editing and passing on information in various forms. Information and communication technology is being used extensively not just part of national curriculum requirements but also as a management, assessment diagnostic and statistic tool. Interactive computer applications and simulation exercise can be used to supplement the traditional study preparation (Leidener and Jarvenpaa 1995). Various researches have been done to investigate the effectiveness of information technologies as an educational tool. IT has the potential to play an important role in making science in schools more relevant, interesting and motivating for students (Mork 2005). It is believed that the power and accessibility of IT are now narrowing the gap between school science and industrial science, thus enabling science teaching to provide opportunities for students to emulate uses of IT made by professional scientists. Therefore consideration needs to given to developed IT-based science activities in classrooms, which enables students to learn science as well as to experience it. The goal of teaching is to facilitate the transfer of knowledge from the expert (teachers) to the learners (students) (Leidener and Jarvenpaa 1995). Errors in understanding are the result of imperfect or incomplete knowledge transfer. Individuals must share the same understanding of words in order to communicate efficiently. In a classroom setting, the teacher is the source of knowledge and should be in control of the teaching material and learning pace. Knowledge sharing is related to knowledge management. Knowledge management is viewed as an increasingly important discipline that promotes the creation, sharing and leveraging of knowledge. This study investigate how teaching activities, such as using teaching courseware, allow sufficient interaction for knowledge sharing process to take place within the classroom environments.

Keywords: Teaching Courseware, Classroom Interaction, Knowledge Sharing

1.0 Introduction
Since 2003, the Malaysian Education System had started the teaching and learning of science and mathematics in English. The beginning of this drastic notion stated when the Malaysian Minister of Education officially announces in July 2002 that teaching and learning of all science and mathematics in public schools were to be conducted in English (MOE 2002). Prior to this, these subjects have been taught using the Malay language, the national language for Malaysia. The move from Malay language to English language of teaching medium is to take advantage of the vast resources available in English world wide.

The lack of English proficiency of teachers did not stop the Malaysian government to continue with the new policy. English courses called ETeMS (English in Teaching Mathematics and Science) were introduced to train the teachers teaching science and mathematics in English. In addition to ETeMS, educational coursewares were developed by the Curriculum Development Centre (CDC) of the Malaysian Ministry of Education. These coursewares include computer-based teaching material and aids.

Courseware can be defined as educational material intended as teaching aids and kits for teachers, usually packaged for use with a computer with the objective to enhance teaching and learning process among students. Courseware in this study comprises fully developed, interactive instructional materials using complex authoring tools such as multimedia and Authorware. Multimedia courseware combines text, audio, still images,
animation, video and interactivity content forms. The multimedia courseware is normally recorded and played, displayed or accessed by information content processing devices such as computerized or electronic devices.

In Malaysia, multimedia courseware has been one of the most important tools in assisting teachers in classrooms since 2003 when teachers need to teach science and mathematics in English (7). The teachers believed that the multimedia courseware helps students to understand science and mathematics better and at the same time helped the teachers to deliver their lessons in English better. These multimedia coursewares is useful to overcome learning problems among students and teaching problems among teachers.

2.0 Literature
The literature is focused on concept of good teaching principles, ITC and teaching, and knowledge sharing process in class room environment.

2.1 Good Teaching Principles
Bain (2004) presents seven principles common to the practices and approaches used by the best teachers. They include:

a) Creating a natural critical environment for learning, including an intriguing questions, guidance in helping students understand the significance of the intriguing questions, engaging students in higher order thinking, helping students answer the question, and leaving students with follow-up questions
b) Get students attention and keep it
c) Start with the students rather than the discipline
d) Seek commitments from the students to the course and the learning
e) Help students learn outside the class
f) Engage the students in disciplinary thinking
g) Create diverse learning experience because the brain thrives on diversity.

2.2 IT and Teaching
The advent of IT has important part in re-shaping the curriculum and pedagogy of science according to Osborne and Hennessy in 2003 (Mork 2005). IT can enhance both the practical and theoretical aspects of science teaching and learning. A range of various IT-tools was proposed by Osborne and Hennessey in 2003, for use in school science activities which include multimedia software for simulation of processes and carrying out virtual experiments, publishing and presentation tools, digital recording equipment, computer projection technology, computer-controlled microscope and tools for data capture, data logging systems, graphing tools and modeling environments. They argued that these forms of IT activities can enhance both the practical and theoretical aspects of science teaching and learning.

There is a growing importance for IT within the schools curriculum. Teachers should apply computers and related technologies to support instruction in their grade level and subject areas. The major objective is that developing skills, knowledge and understanding in the use of IT prepares pupils to use such technologies in their everyday lives. IT tools enable pupils to access, share, analyze, and present information gained from a variety of sources and in many different ways. The use of IT provides opportunities for pupils to work both collaboratively and independently. Teachers have indicated that they preferred educational software that allows choices, invites transference of skills and stimulate thinking (Chisholm 1995). As such, the role of IT
within the curriculum is not only to enhance the learning experiences of students but also to help them develop the skills essential to participate effectively in classroom. It generates avenues for students working in groups to develop team spirit, cohesion and social values.

Various researches have been done in finding out the effectiveness of technology as an educational tool. Generally, the following functions of the use of IT in education are:

a) IT as objects. It refers to learning about IT. Mostly organized in a specific course. What is being learned depends on the type of education and the level of the students. Education prepares students for the use of IT in education, future occupation and social life

b) IT as an ‘assisting tool’, IT is used as a tool, for example while making assignments, collecting data and documentation, communicating and conducting research. Typically, IT is used independently from the subject matter

c) IT as a medium for teaching and learning. This refers to IT as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. It appears in many different forms, such as drill and practice exercise, in simulation and educational networks

d) IT as a tool for organization and management in schools.

2.3 Multimedia and Teaching

Many researches have been done to study effectiveness of using multimedia and how knowledge can be shared. The multimedia technology enhance learning by its ability to combine pictures, diagrams, sound, texts, image and graphics with appropriate animation and simulation that can stimulate learners mind and encourage learning through all senses and motivation. In learning science subjects like physics, simulation and visualization tools help students recognize patterns, reason qualitatively about physical processes and envision dynamic models. These curricular approaches improve success for all types of learners and may differentially enhance the performance of the students.

The quality and range of materials has proved to be the strongest feature of the courseware. Teachers most often use the courseware to support teaching, while students may use it in a computer lab sessions or independently to prepare for classroom discussion and tutorial. The courseware is normally developed with flexible set of "core resources" that could be incorporated into existing teaching programs. The table of contents, provides links to each section of the core resources, information on the author and additional sources, and access to the index, bibliographies, and glossaries. The enriched-lecture multimedia format, using HTML and Web browsers, makes the tutorials flexible learning tools.

Students respond to information differently. Thus, it is often the teachers’ advantage to be able to use many different formats and modes to teach the subject matter of a lesson. This is why teachers normally use some combination of lecture, text and hands-on laboratory for conveying information. With the advent of the Internet and the multiple formats that can be communicated over the World Wide Web, teachers now have several new and exciting ways to present information. The Web allows the incorporation of animation, moving pictures, and sound into lessons, which extends their abilities to present materials that encourage student interaction with the subject matter. Pictures and animations help bring to life scientific principles, and multimedia allows students to take a more active role in learning: they can watch experiments in action, see
microorganisms up close, and use a mouse or keyboard to navigate images, simulations and interactive material. One of the advantages of using multimedia is to convey information quickly and effectively to all students and keep them interested in learning.

2.4 Knowledge Sharing
Knowledge sharing system supports the process through which explicit or implicit knowledge is communicated to other individuals. They do so by supporting exchange, (that is sharing of explicit knowledge) and socialization (which promotes sharing of tacit knowledge). Knowledge sharing is the process through which explicit or tacit knowledge is communicated to other individuals. The knowledge is shared and may take place across individuals, groups, departments or organizations. Knowledge sharing is an effective transfer of knowledge. Nonaka and Takeuchi (1995) argued that a successful knowledge management program needs, on one hand, to convert internalized tacit knowledge into explicit codified knowledge in order to share the knowledge, but on the other hand, it also must permit individuals and groups to internalized and make personally meaningful codified knowledge they have retrieved from the knowledge management process.

King in Klein (2008) defines knowledge sharing as ‘the exchange of knowledge between and among individuals, and within and among teams, organizational units, and organizations’ He distinguishes between knowledge sharing and knowledge transfer: ‘transfer implies focus, a clear objective, and unidirectionality. Knowledge management frequently invokes the distinction between tacit and explicit knowledge. Explicit knowledge, being encodable and expressible, refers to knowledge that has been expressed into words and numbers is in principle and is straightforward to share, while tacit knowledge includes insights, intuitions, and hunches (Becerra-Fernandez 2004).

However, the attitude of students towards the use of computers can contribute to either success or failure of the success of any computer-based activities. Positive and negative attitudes towards such computer-based activities among teachers and students have implications on the learning outcome and knowledge shared.

2.5 Research Objective
The study is designed to understand the use of physics teaching courseware as a teaching aid. The study also investigates the types of interaction occurs during the teaching and learning process in the classrooms using the teaching courseware, and how this interaction can promote knowledge sharing in the classrooms.
3.0 Research Methodology
This study involves a total of 54 research participants. Two classes, identified as Class A and Class B, having 26 students each and two teachers teaching Physics using the courseware, identified as Teacher A and Teacher B were involved in this study.

The objective of this study is to explain the classroom phenomena when the science courseware, in this study the physics courseware, is being used as a teaching aid. The study uses qualitative research approaches in collecting data. Qualitative research strategy is used because it provides rich information pertaining to how the courseware is used to share knowledge. The qualitative research instruments used are observation, questionnaire and interviews. Observation were made on the students during the physics lessons to see the interaction between the teacher and the students, students and students, the teachers and the courseware, and the student and the courseware. Observation is the most direct form of finding out about something. It contains the most truth because it is grounded in direct experience. Observation enables the researchers to experience interaction in real time. Observation research findings enabled the researcher to witness and document the behavior of the research participants. Open-ended questionnaires were conducted based on three questions relating to the use of the physics courseware and knowledge sharing process. Interviews were also conducted with the teachers and the students to discover what actually happen during the physics class when using the physics courseware.

4.0 Case study
During the last two decades, the Malaysian schools education system experience a gradual shift in emphasis from teacher-centered approach to a student-centered one. There are four types of rationale or purpose for the use of IT in education are identified as:

a) Type A: Encouraging the acquisition of IT skills as an end in themselves
b) Type B: Using ITs to enhance students’ abilities within the existing curriculum
c) Type C: Using ITs to enhance students’ abilities as an integral component of broader curriculum reforms that are changing not only how learning occurs but what is learned
d) Type D: Using ITs as an integral component of the reforms that alter the organizational structure of schooling itself.

The role of teachers in the new decades have indeed changed and reinvented where teachers act as learning facilitators to students on an individual basis and not necessarily in a traditional classroom setting.

A classroom observation, group interviews and questionnaires are used to investigate teachers’ and students’ opinions. The focus of the observation is based on:

a) How has the physics teaching courseware assisted the teachers in the teaching-learning process in the physics lesson?
b) How does the physics teaching courseware match the cognitive level of the students?
c) How can the physics teaching courseware be improved

In order to administer the questionnaire and conduct observations and interviews, approval from the Education Planning and Research Department (ERPD) of the Malaysian Ministry of Education (MOE) is obtained. In addition, permission from the respective principal of each selected schools also need to be obtained.
The physics courseware is based on the curriculum specifications of physics for upper secondary class (form 4 and form 5) as lined out in the Malaysian Integrated Curriculum for Secondary Schools, 2005. The courseware is designed to supplement and complement regular classroom teaching. Teachers can use the courseware to assist in the teaching and learning process.

The physics courseware consists of 60 lessons within 5 learning areas. The 60 lessons for the physics courseware are developed with the educational emphasis of scientific skills, which include the science process skills and the manipulative skills. It also emphasize on the thinking skills, namely critical thinking skills, creative thinking skills and thinking strategies. This is followed with reasoning skills, IT skills, values and citizenship, multiple intelligences and knowledge acquisition.

Key features in the physics courseware being assessed include simulated activities, virtual experiments animations and videos. Each lesson in the courseware comes together with a set of teacher’s teaching resources. The courseware adheres to the constructivist view of teaching and learning strategies. Teaching and learning strategies in the science curriculum emphasizes thoughtful learning. Thoughtful learning is the process that helps students acquires knowledge and master skills that help students to develop their mind to the optimum level. Thoughtful learning can occur through various learning approaches such as: inquiry-discovery; constructivism; science, technology and society; contextual learning; and mastery learning.

Teaching and learning methods used in the physics courseware include experiment, discussion, simulation, project, visit and use of external resources. The science process skills are shown in Figure 1. Learning activities using the physics courseware is therefore be geared towards activating students’ critical and creative thinking skills and not to be confined through routine or role learning (see Figure 2). The teaching and learning process would enable students to acquire knowledge, master skills and develop scientific attitudes and noble values in an integrated manner.

![Science Process Skills](image)

Figure 1: Science Process Skills
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4.1 Data Collection
The researcher used direct observation approach. Narrative notes were taken of what took place during the physics class. Observation made:

a) Interaction between students and students.
   The students were observed in terms of their interactions, their facial expression and the knowledge sharing process that occurs.

b) Interaction between teachers and students.
   The teachers and the students were observed in terms of frequency of interaction and purpose of interaction. Interactions include asking questions, answering questions, seeking for explanation. Facial expression, such as amazed look, or spontaneous reaction such as laughter are also considered as interaction.

c) Interaction between the teachers and the physics courseware.
   Teachers are the main actors during the physics class. The observation is done to discover how the teachers interact with the physics courseware and the need equipment such as computers, LCD projector, the mouse and the screen. Observation is also made on how the teachers incorporate their subject matter knowledge (Physics), teaching skill and knowledge, computer skill and knowledge and the courseware knowledge.

d) Interaction between the students and the physics courseware.
   The observation helps to discover how the students interact with the physics courseware, the students’ skills in using the courseware and the computers.

Interviews were conducted in groups of four. Interviews were conducted because face-to-face interview is an effective reason for research participants to voice their different opinions and characteristics. Interviews are useful ways to gain a rich understanding of users’ reaction to the situation.

Figure 2: Flow Chart of the Skills Incorporated in the Courseware

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4.2 Data Analysis

Various activities were seen during the teaching of physics using a multimedia courseware. There interactions were categories as low level of interaction, moderate level of interaction and high level of interaction. Each of these interactions is dependent on the attitude of the students. These attitudes refer to how the students think and behave, which include their interest, anxiety and preference. The interactions are being summarized in Table 1 and Table 2.

Table 1: Level of Classroom Interactions in Using Physics Courseware

<table>
<thead>
<tr>
<th>Resource</th>
<th>Low Level of Interaction</th>
<th>Moderate Level of Interaction</th>
<th>High Level of Interaction</th>
</tr>
</thead>
</table>
| Observation field notes 1 | 5 students had their heads on the table, watching the courseware lazily | • 2 students were seen writing down some notes  
• Teacher asked one basic question and only one student answered the question | One student tried to charge a ruler by rubbing the ruler using the hands. This action is followed by his friends (imitation) |
| Observation field notes 2 | • All students paid attention to the courseware. Students tried to answer the courseware’s questions displayed on the screen.  
• Teacher let the courseware on with the voice over, without connecting it to the speaker.  
• Students were very quiet in order to listen to the voice from the system | • Teacher asked ‘What is electricity?’ and students answered ‘current, ampere’.  
• Some students tried to finish the teachers’ sentence by shouting out what they though the correct answer.  
• One student shouted ‘ah’ because he was startled by the spark made by the Van de Graff generator.  
• Students move about to ask questions from friends | Students start to explore with the Van de Graff generator. |
| Observation field notes 3 | • When the teachers do not understand the questions poised by the students, a student took the initiative to go to the teacher’s laptop and showed her what their question meant.  
• One student exclaimed ‘waah’ when watching the pattern of electric field |                                                                                                          |                                            |
Table 2: Table of Observation of a 70 Minute Lesson using Physics Courseware

<table>
<thead>
<tr>
<th>Teacher-Courseware</th>
<th>Student-Teacher</th>
<th>Student-Courseware</th>
<th>Student-student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared the courseware and LCD prior to the lesson and the screen was already displaying the first interface of the lesson when the students entered the physics lab.</td>
<td>• Asked students to look at the screen and observed the pattern of the electric field when a positively charged sphere conductor is attracted to a negatively charged sphere conductor.</td>
<td></td>
<td>One student exclaimed ‘Waah’ being amazed when watching the pattern of the electric field.</td>
</tr>
<tr>
<td></td>
<td>• Gave explanation of the pattern of the electric field and asked students to draw the diagram in their note books.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulated the variable, by changing the negatively spherical conductor to become a positively charged spherical conductor, to show the pattern of the electric field.</td>
<td>Some of the students were excited and wanted to change more variables, and asked the teacher to change experiment variables again.</td>
<td></td>
<td>Other students were satisfied when the student changed the variable at the laptop. They instructed the students to continue other variables to see further changes in the physics experiment.</td>
</tr>
<tr>
<td>Teacher continued varying the variations and changing the variables.</td>
<td>• Some students ignored the teacher’s reaction and did not look at the screen, especially the students sitting at the back row of the class.</td>
<td></td>
<td>Some students who were sitting at the back of the classroom have moved to the front of the class to see the activities, that is changing variables in the experiments.</td>
</tr>
<tr>
<td></td>
<td>• Teacher started to walk around the lab to see the students’ experiments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Corrected students mistake in their drawing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher changed teaching method by doing simulation.</td>
<td>• Most students listened enthusiastically.</td>
<td></td>
<td>• Most students paid attention and exchange information</td>
</tr>
<tr>
<td></td>
<td>• Some students ignored the teacher’s reaction and did not watch the screen especially those students sitting at the back of the class.</td>
<td></td>
<td>• One student sitting at the back dozed off to sleep.</td>
</tr>
<tr>
<td></td>
<td>One student volunteers to do the simulation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3 Data Findings
The findings of the study shows that interactions between teacher-students and students-students do happened in the classroom when the teacher uses the teaching courseware. However, there can be different level of interaction happening concurrently within a classroom. These interactions can be classified as three level of interaction as follows:

a) Low Level of Interaction
   This kind of interaction is categorized as low level because it is a one-sided interaction where the courseware has no ability to interact with the students. Most of the time, when the teacher uses the physics courseware for teaching, the students merely watches the computer screen as if watching a movie on tv. This happened especially when the teachers depended on the courseware voice over rather than the teachers’ own voice. The students watched the computer screen giving the ‘feeling bored and sleepy’ face expression.

b) Moderate Level of Interaction
   This kind of interaction is categorized as moderate level when there is a response or immediate feedback upon new things learned during the lesson using the physics courseware. Responses such as facial expression, writing down notes, asking questions are the kinds of reactions categorized as moderate interaction. These kinds of interactions show that students are giving their attention in the classroom. It indicated that what is taught is being digested by the students’ minds and knowledge is being shared between the students using the courseware.

c) High Level of Interaction
   High level of interaction can only happen between the teachers and the courseware. If the teachers utilize the courseware prior to teaching the lesson, and then prepared her own notes by using only some of the courseware presentation slides and at the same time created a student-centered atmosphere in the classrooms, High level of interaction can be seen when students uses what they have learned from the physics courseware and apply the knowledge when the students are carrying out their own experiments and activities. This means that students are applying the knowledge in real-time situations.

Students’ interaction is highly dependent on the students response towards the teachers and the courseware in used. Teachers must arrange activities that facilitate student interaction, for example by encouraging students to try the experiments such as changing the data variables or to try to do the simulation themselves.

5.0 Discussion
The findings of the study indicated that interactions do happened in the classrooms when the teachers use the physics teaching courseware as a teaching material. The study helps to understand how teaching courseware is used as a teaching aid during the teaching and learning process in the classrooms. This study also provides insight of the different types of interaction occurs in the classroom, and whether these interactions promote knowledge sharing in the classrooms.

These coursewares have made learning of physics fun and interesting with the use of multimedia interactive teaching material like the physics courseware. However, interaction in the classrooms can be further improved if the teachers are innovative and creative to combine their experience and knowledge with the new teaching materials.
such as teaching courseware to create a more student-centered classroom. According to Leidener and Jarvenpaa (1995) students tend to generate higher-level reasoning strategies, a greater diversity of ideas and procedures, more critical thinking and more creative responses when they are actively learning in cooperative groups than when they are learning individually or competitively. Hence, there need to be cooperation between teacher-students and students-students to enhance knowledge sharing in the classroom.

6.0 Conclusion

The study investigates the use of science courseware in the teaching and learning process in a classroom and how the courseware can increase interaction in the classroom and how these interaction can enhance knowledge sharing process between teachers-students and students-students. However, based on the research, it was evidenced that the success in knowledge sharing depended on the attitude of the students and teachers. Positive attitude such as willingness to ask questions, sharing opinions and giving explanation helps to the knowledge sharing process. However, negative attitude like boredom, unwilling to learn and unwilling to participate hinders knowledge sharing to take place. The physics courseware with inter-active multimedia elements is just a medium to encourage interaction between teachers-students and students-students. Classroom interactions can still be improved if the teacher is innovative and creative as to combine their experience, their teaching creativity with the teaching courseware to create a more student-centered classroom.

References


BIOGRAPHY

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