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Teachers as Designers of Learning Environments

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SUMMARY. This study examined how six Singapore teachers approached the design and implementation of a unit of work (topic) to demonstrate exemplary classroom practices that engage learners and use ICT in knowledge-generative rather than presentational activities. After a reflection and feedback session on the first lesson observation involving the researcher and the teacher, the teacher re-designed the lesson to enhance ICT use and involve students more actively in their learning. Our study revealed that there is a difference between students’ physical engagement and cognitive engagement in a task and that the teacher, as a designer of the learning environment, needs to make explicit the cognitive processes involved in using the tool to ensure students’ effective use of ICT. The teachers’ understanding of what constitutes effective learning and their roles in students’ learning determine how they design the learning environment. In essence, it is the teacher’s skill in managing the “tripartite” partnership of IT tool, learning task, and teacher support that brings about higher levels of student engagement.

KEYWORDS. Student engagement, teacher support, learning task, teachers as designers of learning environments, effective use of ICT
TEACHERS AS DESIGNERS OF LEARNING ENVIRONMENTS

Teachers as Task Designers

Hawkins (1996), writing in the middle of a long-term project concerned with the use of technology to enhance teaching and learning in North American schools, commented that:

Beyond the tradition of instructing the fixed facts of disciplines and received knowledge, schools must now enable students to appreciate the complexities that bathe them – to develop sophisticated interpretation skills, tolerance for ambiguity, an appetite for difficult problems, and measured thoughtfulness in pursuit of solution. This requires creating habits of seeking out various perspectives and consulting multiple disciplines and any big question. It requires facility with tools that help us find and make sense of evidence. It requires openness to conversation as a way to challenge one’s assumptions, and a habit of remaining interested in ways of conceiving things. (p. 40)

Hawkins’ comments provide the basis for investigating how teachers function as learning activity designers. Three critical factors need to be considered and manipulated if one is to move toward more open-textured learning activity designs and use ICT tools efficiently and effectively at the same time. Simply put, in whatever is produced or implemented, scope needs to be provided for multiple solutions (end points may be validly different), multiple strategies (the route to an end point is often generated by the invention of the learner and the needs of the data being generated as part of the process), and multiple perspectives (the perspective of the problem might be instrumental in a solution or an alternative approach given a different point of view).

In the United States, when teachers were involved in the ACOT (Apple Classrooms of Tomorrow) project from 1985-1998, they were observed to pass through five phases of development as their traditional beliefs about education and classroom practices were
gradually replaced with new ones as a result of being situated in technology-rich learning environments. Summarizing Sandholtz, Ringstaff, and Dwyer (1997), teachers at the Entry level frequently found that they were unable to anticipate problems in their classrooms. At the Adoption level, teachers delivered teacher-centered lessons but also began to anticipate problems and develop strategies for solving them. At the level of Adaptation, teachers started using technology to their advantage and began to embrace student-centred orientations. At the level of Appropriation, teachers’ personal attitudes to technology changed to confident expert and willing learner; and finally with Invention, teachers were disposed to view learning as an active, creative, and social process.

Following the ACOT model provides a framework for coming to terms with learning activity design issues by positing that teachers, as task-designers, could be potentially involved in increasing the effectiveness of their use of ICT as they understand more about the technologies and how they support different learning strategies. This study sought to work with classroom teachers who were nominated as being at higher levels of technology implementation and who took up the challenge of supporting effective learning with high levels of student participation.

**Student Engagement**

Recent literature (Chapman, 2003) points to using a combination of cognitive (e.g., students expending mental efforts to learn something), behavioral (e.g., students’ participation), and affective criteria (e.g., students’ enthusiasm and interest) to assess student engagement. More specifically, Jones, Valdez, Nowakowski, and Rasmussen (1995) presented a comprehensive framework for the concept of engaged learning within the context of ICT use. It comprises 26 indicators for engaged learning that are organized into eight categories of learning and instruction (e.g., vision of learning, teacher role). Jones’ et al. eight
categories of learning and instruction were used to code the teachers’ ICT-based lessons and interview data in our study.

Effective Use of ICT

Researchers such as Jones et al. (1995), Roschelle, Pea, Hoadley, Gordin and Means (2000), Bransford, Brown and Cocking (1999), Jonassen (2000) and Maddux, Johnson and Willis (2001) indicated that students learn best when they are actively constructing new knowledge rather than passively acquiring knowledge. From Jonassen’s mindtools (e.g., semantic organization tools, semantic networking tools) to Maddux’s Type II technology applications (e.g., applications that place the control on the learners to involve them actively and intellectually), it can be seen that the role of technology is to effectively support the processes of student knowledge construction. On the basis of the literature, a checklist was derived to identify the “Value-Add” of ICT in the lessons that the teachers submitted for our study.

METHODOLOGY

Case Study Approach

According to Yin (1994), the case study approach is ideal for holistic in-depth investigation of a phenomenon in its real-life context. The case study method was used to obtain rich descriptions of the pedagogical practices of teachers whose lessons support ICT use and engaged learning. Teachers, who were invited to submit lesson proposals for the study, were recommended by our colleagues who had been working closely with schools or they were identified from past winners of innovative uses of technology awards. Six proposals, covering a range of subjects, levels, and use of technology, were shortlisted from a total of 17 submitted proposals. Lessons chosen were conducted during curriculum time and appeared to be well structured in terms of learning tasks. In addition, technology played a
central role to engage the learners and was employed generatively to support knowledge building.

**Data Collection**

Data collection took place over a five-week period, with the researchers working in pairs on each case. A pre-lesson interview determined the teacher’s views and beliefs about the role of ICT in learning. This was followed by a lesson observation to see how the teacher’s intent, as indicated in the lesson plan and pre-lesson interview, was translated into classroom processes and practices. The researchers took extensive notes of teacher actions and class talk, and observed selected student groups working on a learning task. A post-lesson interview was conducted with the teachers to review the lesson and surface possible gaps between the teacher’s beliefs, practices, and outcomes. Jones’ et al. (1995) framework of engaged learning indicators was introduced to the teacher with the aim of helping the teacher identify ideas for redesigning the lesson to shift it more toward one that might be described as active, engaging, and generative for the students. The teacher was given time to redesign his or her lesson ideas and to conduct either a follow-up lesson with the same class or the redesigned lesson with another class of similar ability. The second lesson was videotaped in its entirety and a second post-lesson interview was conducted to explore the teacher’s new insights and understanding of the role of ICT in the learning experience.

**Data Coding and Analysis**

The lessons were coded using Jones’ et al. (1995) eight categories of learning and instruction. An additional category of the “Value Add of ICT” was added to each case description to focus the analysis on the role of ICT. Notes were also made on obstacles/problems encountered and the teacher’s perceptions of what constitutes effective learning. Each case study was reviewed by the whole research team to ensure that the description and analysis of each case would be comprehensive and triangulated. The
description was kept factual while the analysis was based on what was said or observed during the lessons and on the teacher’s views and opinions as expressed during the interviews.

Discussion

We propose using a tripartite model (see Figure 1) to anchor the discussion of our findings. The tripartite model describes the interplay of technology, learning task, and teacher support that determines whether learning experiences are engaging to students.

Insert Figure 1 About Here

The proposed tripartite model is adapted from Oliver’s (1999) learning design construct. According to Oliver, each ICT-mediated learning design comprises three key elements, that of tasks that the learners are required to do, resources that support learners to conduct the task, and support mechanisms provided by the teacher.

*We noted a difference between students’ physical engagement and cognitive engagement in a task and that the teacher, as a designer of the learning environment, needs to make explicit the cognitive processes involved in using the tool to ensure students’ effective use of ICT.*

In Denise’s first geography lesson, students had to use the Inspiration software (a software for mindmapping) to note down useful and relevant information when listening to the group presentations on environmental issues. For the duration of the learning task, students were physically engaged in creating text bubbles, drawing arrows, and switching colors on their screens. Although most students were technically competent in using Inspiration, they did not fully categorise their points nor link them coherently.

When designing the learning task for her first lesson, Denise had assumed that her students would know how to use the features provided by Inspiration to support their mental process of organizing information. In the follow-up lesson, Denise decided to make explicit
the cognitive processes involved in organizing and categorizing information. Table 1 shows how Denise provided additional teacher support for the learning task in her redesigned lesson.

During her redesigned lesson, Denise modelled how to categorize and link information. She asked students key questions such as “How is information chunked?” and gave them specific pointers using one student’s work:

Is there anything wrong with this schema or is there anything you think doesn’t quite fit? . . . It lacks differentiation between what is the statement of the concept, what is the explanation of the concept and what is actually an example. . . (Lesson Observation Notes)

Also, she gave an example of the kind of mindmaps that students were expected to produce:

Notice that under desertification, there may be 2 major concepts of what the effects are and then the possible solutions to the effects. . . . So this is an example of a chunked thing that I would expect from you at the end of the time. . . (Lesson Observation Notes)

In addition, Denise allocated additional time for students to do the Inspiration task. She also instructed the presenters to circulate among their classmates to “help the rest with the chunking and grouping of the information” (Lesson Observation Notes). As a result, there was more cognitive engagement on the part of the students as they focused more on linking the different categories as compared to the first lesson. The digital mindmaps they produced were more coherently organised.

*We observed that the lessons in our study revealed a continuum of ICT use. How ICT is used depends on the teachers’ understanding of what constitutes effective learning and their roles in students’ learning.*
Andrew is one example of a teacher whose use of ICT reflected his understanding of what constitutes effective learning and his role in his students’ learning. According to Andrew, an effective learning environment is one that is sufficiently open to encourage multiple perspectives and collaboration and it places the onus on the students to make sense of their own learning. He felt that his role as a teacher is to facilitate students’ learning: “I don't know if you noticed my style, I tend to like to ask questions more than to give answers and I like to ask as many questions as time permits” (Post Lesson Interview).

His understanding of what effective learning entails and his role in the learning process influenced the way he designed his English lessons. Andrew wanted his students to incorporate the main components of a story (e.g. character, climax) in their writing of a short narrative. He deliberately chose open-ended IT resources (digital movie trailer, still images, and Microsoft Word), designed a learning task that afforded multiple perspectives and solutions (students could choose to replicate a movie plot or create a new one), and used open-ended questions to guide student discussions (see Table 2).

Andrew used the movie trailer because it was sufficiently ambiguous to support different interpretations. He also provided a large range of digital pictures that gave different perspectives of the same scenes to generate discussions, develop multiple perspectives and spark creativity:

I would try to take pictures that were quite similar. . . and since there were quite a few scenes where the spikes flew out and different angles of the ball rolling, I had to put in more so that it would [allow] for flexibility of interpretation. Had I given fewer pictures and tell-tale pictures, then it would have been too predictive and everybody would naturally be locked into thinking what had happened, what did not happen. (Post Lesson Interview)
In Andrew’s English lessons, pairs of students within each group viewed separately a movie trailer and a set of digital images. To get the full picture, the two pairs within each group came together to co-construct the story by pooling their knowledge and experiences.

Andrew left it open to students to negotiate whether to replicate the original plot or create a new plot:

This class is a mixed ability class so there is virtually no way to allow the creativity and yet insist that they recreate. . . .if I insisted that they recreate, that would also hamper their creativity and then they would be forced to think of alternative forms (Post Lesson Interview).

Collaboratively shaping their story using Microsoft Word supported students’ continual improvisation of their story (i.e., editing features like undelete and spellcheck) and provided a platform for students to make their thinking visible. Students used different colors (e.g. green for setting and character, dark blue for rising action, red for climax, plum for resolution, orange for coda) to indicate the story components within their story. This provided feedback to both the students and the teacher on how well they had understood the different story components:

There was one child who selected all red (indicating climax), so I asked and said, “Are you sure that everything is red; is that it?” and I pointed out certain phrases, and he was then able to realize that it shouldn’t have been all red, and then he himself uncoloured that particular portion.” (Post Lesson Interview)

In presenting their stories for class review or critique, the groups had to explain how they crafted their stories. Learning was made public so that each group could get input from other groups (i.e., diverse perspectives) and build on their knowledge (i.e., improve their story). Andrew facilitated students’ learning by asking mainly open-ended questions, and giving them the opportunity to explain their multiple solutions (different stories).
Student 3: We started with dialogue which makes it sound better.
Andrew: Why do you say it sounds better?
Student 1: Because normally stories start without dialogue, they just start off. We wanted it to sound more interesting, more unique so we had a dialogue.
Andrew: How does that contribute to character development?
Student 4: It shows what the character is feeling.
Student 3: His emotions.
Student 1: It gives the reader a headstart on what the character is like. (Lesson 2 Observation Notes)

We observed that it is the teacher’s skill in managing the “tripartite” partnership of IT tool (to be chosen with careful thought and with appropriateness), learning task (to design with the students’ ability in mind) and teacher support (provision of adequate support in terms of modelling/scaffolding of key processes and allocation of sufficient time) that brings about higher levels of student engagement.

One of Denise’s learning tasks was to get students to ask questions online to consolidate their understanding of environmental issues. For this task, she managed very successfully the tripartite partnership of IT tool (discussion forum), learning task (students asking higher order questions) and teacher support (modelling the process of asking questions) to bring about high levels of student engagement (see Table 3).

Denise noticed that the initial student exchanges in the discussion forum were relatively low level and consisted mainly of standard definition-related questions such as “What is informal settlement? Please define. . .” and “What is urban decay?” Denise went into the discussion forum to model the process of asking higher order questions: “Air pollution people: How are you going to 'implement laws'? Have you considered the political implications of such a move?” (Discussion Forum).
It was observed that the students took their cue from their teacher’s demonstration of the kind of thinking she expected from them and subsequently, the kinds of students’ questions and comments posted improved and there were more higher order questions: “How do u allocate the funds in each aspect? What laws do you want to implement? Where do u wan to start from and where?” (Discussion Forum)

In the words of Denise (post lesson interview), the discussion forum had helped her students make public their learning so that others can actually get that knowledge but also open it up for discussion. An example of how student presenters defended the solutions they had proposed is shown in Figure 2.

Discussions and student collaboration went beyond the lesson when some students returned to the forum later in the day to post more questions or comments. Denise indicated that in a normal class setting, students who processed their thoughts more slowly would be left out of the discussion. Denise commented:

In classroom situations, you ask them to ask questions, [the] tendency is [they think that the] teacher is king, so they won’t ask. They won’t ask unless they are really sure of themselves. . .they will just listen. But in front of a computer, they respond and they are engaged in that. (Pre-Lesson Interview)

**Concluding Remarks**

From the discussion of the case studies, it is clear that the capability of the technology itself will not ensure that there is higher student involvement in learning. It is the teacher’s skill in managing the tripartite partnership of IT tool, learning task, and teacher support that brings about higher levels of student engagement. Our study revealed that there is a difference between students’ physical engagement and cognitive engagement in a task and that the teacher, as a designer of the learning environment, needs to make explicit the
cognitive processes involved in using the tool to ensure students’ effective use of ICT. In addition, the teachers’ understanding of what constitutes effective learning and their roles in students’ learning determine how they design the learning environment. The tripartite model could serve as a frame of reference for teachers to discuss, understand, and analyze the dynamics involved in implementing ICT-based lessons.

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AUTHOR NOTE
References


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Table 1. Tripartite Elements for Denise’s Learning Task using Inspiration

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Technology</th>
<th>Teacher Support</th>
</tr>
</thead>
</table>
| Students took notes of the main points provided by two group presentations. | Inspiration software | First Lesson  
Lack of teacher support  
Denise gave general instructions on how to use the software and some possible categories for organising the information. |
| Redesigned Lesson  
Additional teacher support provided  
Denise modelled the cognitive processes involved in organizing the information, allocated more time to the task, and asked presenters to circulate among the groups. |
Table 2. Tripartite Elements for Andrew’s Learning Task

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Technology</th>
<th>Teacher Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students worked in groups to incorporate the elements of a story (e.g. setting, climax, problem) in their writing of a short narrative</td>
<td>Digital movie clip, digital still images and Microsoft Word</td>
<td>Open-ended questioning to probe students’ understanding</td>
</tr>
</tbody>
</table>

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Table 3. Tripartite Elements for Denise’s Learning Task involving a Discussion Forum

<table>
<thead>
<tr>
<th>Learning Task</th>
<th>Technology</th>
<th>Teacher Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students were to ask higher order questions regarding the presentations.</td>
<td>Online discussion forum</td>
<td>Denise modelled the process of asking higher order questions and of providing comprehensive answers.</td>
</tr>
</tbody>
</table>
Figure Captions

Figure 1. Tripartite model adapted from Oliver’s (1999) learning design construct

Figure 2. Students defending their proposed solution in the discussion forum
Technology
(e.g. knowledge generative use, presentational use, teacher use, student use)

Engaging

Learning Environment

Teacher Support
(e.g. allocation of time, scaffolding, modelling of processes, facilitation of discussion)

Learning Task
(e.g. structured, open-ended, multiple solutions, multiple perspectives, multiple strategies)
Re: Re: Geography ~ Environmental Degradation

denise.c.wdl wrote:

Desertifiers* ~ a lot of the solutions need to be carried out by the government....how are you going to get their cooperation, considering the politics involved?

(*Desertifiers comprised the groups of pupils who were looking into solutions to reduce the process of desertification whereby formerly productive land degraded.)

one avenue could be international pressure on those countries, spearheaded especially by the UN, known for its stand on Human Rights. Highlight the potential problems, both economic and social, that the government may face if the problem is not solved

- EThan AND kALPANA

08-07-2003 at 12:33 AM