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microLESSONS™: A Tool to Encourage Student-centred Learning

Shanti Divaharan & Philip Wong

Abstract

Information and Communication Technology (ICT), if integrated and applied in the right manner can encourage student-centred learning in the classrooms of today. However, in order to conduct a successful student-centred learning environment and to engage students in learning, teachers will have to plan and integrate ICT effectively. The reality of the situation in schools is that, due to time constraint and the lack of resources that are customised to students' needs, teachers often resort to traditional ICT teaching methods. This article attempts to present a solution to overcome the constraints faced by the teachers. It is hoped that with the training provided to the trainee teachers in the National Institute of Education (NIE Singapore), these trainees will be equipped to plan and design microLESSONS™. These student-oriented ICT based lessons will enable them to customise content according to students' learning potentials. microLESSONS™ are small multimedia learner-centred instructional packages presented to the students. The structure is usually in the form of an ill-defined problem, a case study, a scenario, or a situation. The students are then required to use the scaffolds provided to explore possible solutions to the problem presented.

Introduction

The traditional views of learners and learning have been undergoing changes in the present education arena, especially with the introduction of Information and Communication Technology (ICT) in schools. The introduction of ICT in schools increases the potential of varied instruction in the classroom of today. As opposed to the traditional view of learning where learners are viewed as passive, the new view of learning places emphasis on the dynamic interactions between learners, teachers, and the environment. Learning is viewed as making connections, solving problems and constructing knowledge (Simonson & Thompson, 1997). The teacher adopts the role of a facilitator of student learning, with the focus on the *activity* that the students are engaged in. However, the question is not so much about the potentials of ICT, but how it is used in education to engage students in dynamic learning situations and environments. Thus, this paper suggests how ICT should be integrated into lessons to engage students in active learning. The paper recommends the use of

microLESSONS™ as a form of tool to encourage student-centred learning. The paper discusses how the trainee teachers at National Institute of Education (NIE), Singapore, are trained to plan, design, create and implement microLESSONS™ for their students in the schools.

microLESSONS™

microLESSONS™ are small instructional materials that use the power of ICT to teach certain specific objectives. They are small units of instruction, which are self-sufficient for teachers to use within larger lesson units. The microLESSONS™ developed span many curricular content areas, and are suitable to support a wide variety of learning outcomes. More information on microLESSONS™ can be found at the following website: <http://www.microlessons.com>.

Most of the microLESSONS™ are student-centred materials incorporating various computer features (e.g. animation, graphics, sound, interactivity) that help to enhance the teaching–learning process within a classroom. The microLESSONS™ could consist of instructional activities, simulations, games, problem-solving activities and mother-tongue materials. They are developed to fit the instructional needs of teachers and students and their production is based on sound Instructional Design principles. It is hoped that these instructional materials would entice students to think and apply knowledge rather than just rote learn. Furthermore, it is hoped that these instructional materials would provide opportunities for trainee teachers in NIE to infuse ICT into the classroom in the constructivist way of learning.

Figure 1 shows some examples of the objectives that can be achieved through the use of microLESSONS™.

Objectives

The primary objective of creating microLESSONS™ is to develop small-scale learning materials that use the power of ICT to enhance the learning process.

The figure displays two examples of instructional objectives from a microLESSON interface. The left example is titled "HELP OUR FRIEND SAM MANAGE HIS TIME!" and features a cartoon character named Sam looking confused with question marks around his head. Below the character, it states "By the end of this lesson, you should be able to:" followed by two bullet points: "Identify and prioritise activities according to how much time you need to spend on them and their importance." and "Plan your time wisely by deciding on what needs to be done, what to do more, what to do less and what not to do at all." The right example is titled "Objective" and lists three objectives: "1. Recognise the features of expository texts, specifically movie reviews", "2. Compare and contrast the contents of two reviews expressing different opinions with respect to the same movie", and "3. Write a 150-word critique based on the review that they have read". Both screenshots include navigation buttons like "QUIT", "BACK", and "NEXT".

Fig. 1. Examples of instructional objectives.

These materials are not major development units as can be found in many CD-ROM materials. They are not intended to cover a whole lesson or a section of the curriculum. CD-ROM types of materials are usually intended to encompass an entire "lesson" of instructional content (such as teaching students how to multiply fractions). *microLESSONS™*, as the name implies, are small instructional materials that are specific enough for teachers to use within larger lessons. Ideally, the activities within *microLESSONS™* could be completed within a one-hour lesson instead of extending over a few weeks period, as the term "micro" implies. *microLESSONS™* are student-centred where students are engaged in learning activities and teachers act as resource persons and facilitate the process of learning.

Besides preparing resources, this project intends to help new trainee teachers to teach in a different way and to move them from the traditional didactic manner to a student-centred one. By designing a constructivist learning environment through the creation of *microLESSONS™*, trainee teachers will have a better understanding of the theoretical principles of constructivist learning and they can use the approach to create learning activities that are student-centred and that will encourage them to think and explore new learning.

Another objective of developing *microLESSONS™* is to make the lessons available to all Singapore teachers in an easily accessible form. If teachers from different schools exchange and share these *microLESSONS™*, there will be a good collection of these learning materials. The *microLESSONS™* developed span many curricular content areas, and will be suitable to support a wide variety of learning outcomes. These *microLESSONS™* will be additional resources to support for teachers' use of ICT in their teaching. This is one way to help overcome the shortage of appropriate software to match our school curriculum.

Software Tool Used

microLESSONS™ could be developed with any multimedia authoring tool. However, we are using Microsoft PowerPoint as the multimedia tool because it is easily available and all schools have Microsoft PowerPoint installed on their computers. If other kinds of software are used, then the schools will have to buy additional software and install various kinds of application programs. The aim of developing *microLESSONS™* is to keep it simple for teachers to use with a tool they are familiar with and which is widely available, as the teachers have all been trained to use Microsoft PowerPoint. In addition, teachers can easily edit or modify the *microLESSONS™* to customise and suit their students' learning needs. They can add slides if there is a need to further explain some concepts, update Internet links, correct any errors or modify the content. Thus, the use of Microsoft PowerPoint is beneficial to all parties concerned. Moreover, *microLESSONS™* use the "kiosk" mode of Microsoft PowerPoint and this enables the designer to control the contents viewed and the flow of the lesson.

Instructional Theory to Support microLESSONS™

The development of microLESSONS™ is guided by the *Anchored Instruction* educational principle. This approach encourages trainee teachers to move away from the traditional classroom environment where the students are receivers of information from the teachers to one where the students are engaged in active learning.

Anchored instruction focuses primarily on the learning of domain specific problem solving based on situated cognition. In anchored instruction, teaching is situated in an engaging environment with lots of diverse problems – possibly ill structured type of problems. The assumption is that the individual mind functions within the environment and thus the authentic context should be created for learning to take place. This approach calls for “situated” approaches that relate knowledge to real-world experiences (Wilson & Myers, 2000). These kinds of rich problem-based environments allow students to not only create answers to these problems but also to generate problems from the rich medium. Using this approach, teachers can relate classroom learning to real-world situations for students to make better meaning of their learning. Learning becomes relevant to the students, who will be encouraged to pursue further knowledge. Originally, anchored instruction was developed using video-based problems but other kinds of media could also be used (Roblyer, Edwards & Havriluk, 2000), as illustrated below.

Design of microLESSONS™

The approaches to developing microLESSONS™ have evolved over time. In this latest approach, the learning paradigm has shifted from knowledge transmission to one which allows students to explore, construct and create knowledge through various computer-based learning activities. Generally, the microLESSONS™ will consist of two parts.

- (i) In the first part, students will be presented with some multimedia instructional materials and these could be in the form of an ill-defined problem, a case study, a scenario or a situation.
- (ii) In the second part, the students will access some linked documents that will require them to be involved in some form of higher order activities such as generating possible solutions, solving complex problems, accessing the web to collect information, exploring a simulation or collaborating on a piece of work.

Five different learning models have been proposed as a guide for the trainee teachers in the development of the microLESSONS™ package. They are:

- (i) Problem-based learning (PBL);
- (ii) Case-based learning (CBL);
- (iii) Resource-based learning (RBL);

- (iv) Collaborative learning (CL); and
- (v) Simulation-based learning (SBL).

The Five Suggested Learning Models

(i) Problem-based learning

In the PBL approach, students are required to search for solutions to life's messy problems (Fogarty, 1998). The basic characteristics that define PBL are:

- (a) It is inquiry learning;
- (b) It begins with an ill-structured or open-ended problem scenario; and
- (c) Investigations continue until appropriate and acceptable solutions emerge.

Using the problem-based learning approach, microLESSONS™ can now be used to present "instructional problems" in a multimedia fashion through activities formulated to engage students in the process of investigation and problem solving. Through problem-based learning, students discover the necessary knowledge that they need to solve the problem at hand. Teachers can act as facilitators and lead students to where possible information can be found, rather than providing students with the information. Hence, students will not only learn the skill of doing but have to learn to make decisions as to which information is relevant. Students will have to use their power of discretion to make decisions as to the relevance of information as well as whether the method of going about solving the problem is good.

(ii) Case-based learning

Another learning model which the trainee teachers can utilise is CBL. The main difference between PBL and CBL is the fact that in the former approach, students are presented with ill-structured problems while in the latter they are presented with well-structured situations, scenarios or problems. Another difference is that in CBL, students have already acquired the necessary knowledge to solve the problem. However, in PBL, students acquire knowledge in the process of solving the problem. Hence, through microLESSONS™, students can be exposed to a well-defined problem with specific variables which the students have to take into consideration before working towards solving the problem. Teachers can employ this method of an ICT-infused lesson to monitor students' learning after they have learnt a new concept. Teachers can design microLESSONS™ to tap on the learning model to create an environment where students will have to apply and show evidence of what they have learnt in order to solve a problem.

(iii) Resource-based learning

The resource-based approach is not a new approach to many educators. Consciously or unconsciously, many educators would have introduced this approach

into their classrooms. Brown and Smith (1996) suggest some resources that have increasingly been used, such as open learning materials, study guides, workbooks, video tapes, to name a few. However, with technological developments, many more resources can be added to this suggested category. They are:

- (a) Computer-based learning packages;
- (b) Computer conferences;
- (c) CD-ROM, multimedia;
- (d) Computer-mediated discussion groups;
- (e) Interactive video discs;
- (f) Materials on the World Wide Web; and
- (g) Teleconferencing and video conferencing.

Thus, through the microLESSONS™ package, trainee teachers can design lessons which encourage students to access various resources to collect information, facts and opinions to subsequently synthesise them or compare the different viewpoints. Here, again, the teacher can act as a facilitator, directing students in the right direction or making them think through the best method possible for collecting information.

(iv) Collaborative learning

The CL approach can be described according to three models. They are consulting, coaching and teaming (Fishbaugh, 1997).

- (a) Consulting (Expert) is where information flows one way as in the case of students consulting the teacher who in this case would be the expert;
- (b) Coaching (parity) is where there is two-way information exchange taking place and two or more people take turns to advise each other; and
- (c) Teaming (Interactive) is where all members of the group have equal opportunity and ownership to the problem given to them and the task of finding a solution.

The consulting approach is a common phenomenon in the classroom. The aim of the microLESSONS™ package for the CL approach is the Teaming model which would encourage students to work with various members within groups or to work together with other groups to solve a given task. This approach provides the opportunity for trainee teachers to design lessons in which their students are engaged in active learning, interacting with one another in the quest for knowledge and learning skills.

(v) Simulation-based learning

In the SBL approach, the students learn from experience. In simulation, the students actively participate in the task given. It is unlike a case study, which is static.

Simulation is dynamic. Action and interaction takes place, with changing situations. Students have to take note of the effects and realise that their decisions have consequences (Jones, 1980). Therefore, microLESSONS™ packages could be used to create simulations where students can observe particular phenomena and learn from the processes and the variables that will affect the simulated actions. Fortunately, because microLESSONS™ can be linked to Java applets (for example) and other applications such as the geo-meter sketchpad, simulations become a reality.

Designing microLESSONS™ – CAT

The first step to designing microLESSONS™ is to define the lesson objectives. Trainee teachers are required to have only two or three realistic and achievable objectives.

Context (C). The trainee teachers are to design a context in which learning can take place. In designing the context, trainee teachers are to keep in mind that the situation is as authentic (as real life) as possible and something, which their students can relate to. Figure 2 shows an example of a context created for the students to work on.

Activities (A). In designing activities to complement the context, trainee teachers have to be aware that the activities allow students to apply and learn within the context. Trainee teachers must take care that the activities planned do not just engage their students in recall knowledge activities. Instead, they must ensure that

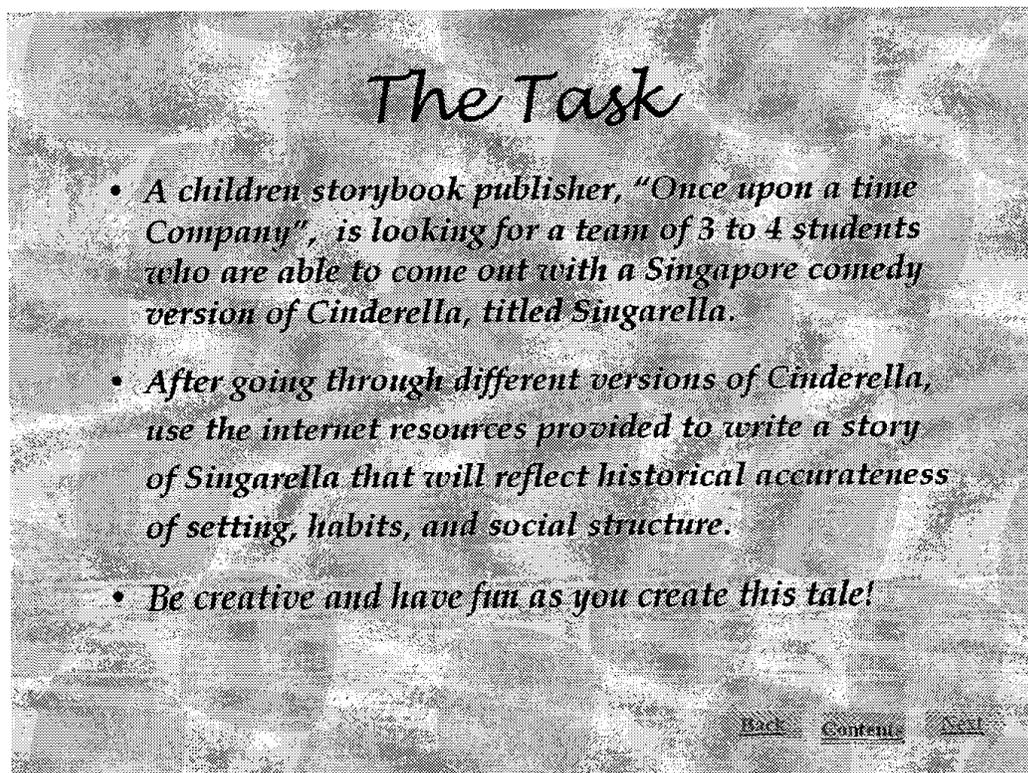


Fig. 2. An example of a context.

The Process

Fairy Godmother is missing!!!



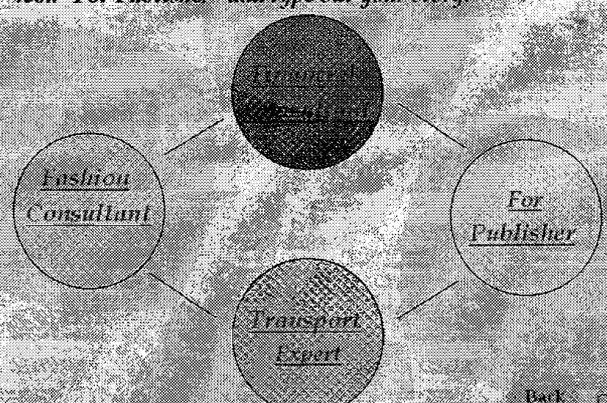
Before writing your original, Singapore comedy version, your team will help Singarella get to the ball by taking up different roles:

- *Becoming a transport expert : Help Singarella choose the most appropriate route to get from her house to the party.*
- *Becoming a fashion consultant: Choose a dress and the relevant accessories for Singarella to wear.*
- *Become a financial consultant: Help her manage her tight budget.*

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Who's who?

1. *As a team, decide the roles among yourselves.*
2. *Click on the icon that represents the role you have chosen.*
3. *Once every member has completed the individual task, click on the icon "For Publisher" and type out your story.*



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Fig. 3. Examples of possible activities to engage students in.

the activities encourage students to be involved in higher order thinking. Figure 3 consists of some examples of related activities that the students have to go through before they can complete the task set for them.

Tools and Templates (T). To support students' learning, trainee teachers must accompany their activities with tools. These tools can be in the form of activity sheets, Microsoft Excel spreadsheets, Graphs, concept maps etc. Trainee teachers can scaffold their students' task by providing them with a template, which can

Fairy Primary School	
Name: _____	Date: _____
Class: _____	
Appendix: 3	
<input type="checkbox"/> Financial Consultant	
Gather all the necessary information you need from your fellow teammates before embarking on this worksheet. To enable Singarella to wear pretty clothes and the necessary means to get to the grand ball, she would need a considerable amount of financial assistance. Your task is to help her manage her finances appropriately and also to find part-time jobs for her so as to complement her financial needs.	
<input type="checkbox"/> Section A : Complete the following questions and write your answers in the space provided.	
1. How much would it cost Singarella to cover for the whole journey? (This would together include the travel and returning part.)	Ans: <input style="width: 50px; height: 20px;" type="text"/>
2. How much would it cost Singarella for the total fashion package?	Ans: <input style="width: 50px; height: 20px;" type="text"/>
3. Calculate the total cost that Singarella would spend.	Ans: <input style="width: 50px; height: 20px;" type="text"/>
4. Given that Singarella was offered 3 part-time jobs:	
<ul style="list-style-type: none"> • To be a dish-washer (she will get \$150.00) • To be a tuition tutor (\$250.00) • To be a server at a leading coffee franchise (\$500.00) 	
What job do you think she should take up? Justify your answer.	

Fig. 4. Example of tools and templates.

guide them on how to collate information when they search the Internet. In addition, they can suggest questions or starters for questions so that their students will be able to ask relevant questions during, say, an interview. Once the context and activities have been decided, the trainee teacher has to design templates to accompany the task and to scaffold the students’ activities. An example of tools and templates for the illustration above is shown in Fig. 4.

Besides using Microsoft Word to create tools and templates, Microsoft Excel and other programmes can also be used to create templates. The rationale is that these tools and templates have to be designed keeping in mind that they scaffold students’ activities. An example of such a template created with the use of Microsoft Excel can be seen in Fig. 5.

Discussion and Conclusion

The feedback received from trainee teachers who have integrated microLESSONS™ into their lessons has been encouraging. The trainee teachers felt that these prepared resources were able to meet the students’ learning needs and that options were available to customise these packages to suit different kinds of learning situations. Teachers in schools who have used these microLESSONS™ packages have also given positive feedback in that it saves them time as they do not have to prepare the packages from ‘scratch’. In addition, being student-centred, they give the students an opportunity to apply what they have learned.

PRESS THE **Page Down** KEY TO USE CALCULATOR TO CALCULATE THE CALORIES

MEAL	CALORIES	Your Choice
BREAKFAST	500	B1
LUNCH	800	L1
DINNER	700	D1
TOTAL	2000	MAKE SURE BOB EATS ONLY 2000 CALORIES OF FOOD A DAY!!

PRESS THE **Page Up** AND **ARROW** KEYS TO CHOOSE THE FOOD FOR BOB

After choosing the right healthy diet for Bob, click on the blue arrow at the top left of the screen to get to the previous screen.

Fig. 5. An example of tools and templates created using Microsoft Excel.

The motivation behind developing microLESSONS™ is to attempt to provide trainee teachers at NIE with the skills to develop ICT-infused lessons, which can be used effectively in classrooms. This is also a means in helping teachers to move away from the traditional forms of computer-based instruction of tutorial and/or drill and practice modes. This is one way in which trainee teachers can make the shift from traditional classroom teaching towards a constructivist way of teaching and learning. In addition, it is hoped that these microLESSONS™ packages would enhance students' abilities to acquire life-long and independent learning skills. The microLESSONS™ package can be seen as a support for teachers who find that there is a lack of appropriate resources for them to conduct effective ICT-based lessons. These are learning materials created for teachers by teachers for the benefit of the students.

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Philip Wong is an Associate Professor and Head of Instructional Science Academic Group, National Institute of Education. He is the principal investigator of NIE funded research project on microLESSONS™. Presently, he is working with an industrial partner to improve the microLESSONS™ project.

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