

---

Title	Enhancing paradigm shift in teaching through use of eduPAD: A case study
Author(s)	A. Lourdusamy, Philip Wong and Hu Chun
Source	<i>New 'Literacies': Educational Response to a Knowledge-based Society, Vol 1: Education</i> (pp. 839-847)
Publisher	Educational Research Association of Singapore (ERAS)

---

Copyright © 2000 Educational Research Association of Singapore (ERAS)

This document may be used for private study or research purpose only. This document or any part of it may not be duplicated and/or distributed without permission of the copyright owner.

The Singapore Copyright Act applies to the use of this document.

Citation: Lourdusamy, A., Wong, P., & Hu, C. (2000). Enhancing paradigm shift in teaching through use of eduPAD: A case study. In J. Ee., Kaur Berinderjeet, N. H. Lee. & B. H. Yeap (Eds.), *New 'Literacies': Educational Response to a Knowledge-based Society, Vol 1: Education* (pp. 839-847). Singapore: Educational Research Association of Singapore.

This document was archived with permission from the copyright holder.

## **ENHANCING PARADIGM SHIFT IN TEACHING THROUGH USE OF EDUPAD: A CASE STUDY**

A.Lourdusamy, Philip Wong & Hu Chun  
National Institute of Education  
Nanyang Technological University

**Abstract:** There is a growing concern that the present approach to education is unlikely to prepare the young for new circumstances and new problems that they may face in the future knowledge-driven economy. The young have to be schooled in the use of ICT and develop the habits of lifelong self-directed learning. The eduPAD Project under the IT Master Plan initiative is an attempt to make learning more student-centred in the Singapore school system. In this paper we explore the usage of the eduPAD by a particular teacher in the trial school by comparing a lesson in which the device was used with a lesson in which it was not used.

### **Introduction**

Teaching is a culture, a set of learned beliefs and practices with which each one of us as teachers is comfortable. Wanting to change that, is not an easy task and there are no easy approaches. In fact this tenacity of the teaching culture into which we are imbued explains why attempts at education reform falters. So we can say that teachers have little choice but to teach the way they do, for they are constrained by what they have absorbed during the 17 years as students on the other side of the teacher's desk. This ethos of schooling is so powerful that breaking free of it would require great effort. The widely shared beliefs and expectation that underlie teaching are so fully integrated into teachers' views and belief systems that they fail to see them as changeable (Stigler & Hiebert, 1994; Anderson & Piazza, 1996; Olson, 1999). But change is necessary if we are to succeed in the new millenium. Salvin (1996:4) talking about American Education System points out that "Students achievement cannot change unless teachers used markedly more effective instructional methods".

Many countries are taking a fundamental look at their education systems, assessing their strengths and weakness and putting in place reforms to better prepare their people for the future knowledge-driven economy. Though Singapore education system has been widely recognised for having produced high level of achievement among learners at all level, there is a growing concern that the present formula for success is unlikely to prepare the young for the new circumstances and new problems they will face in the future. Singapore's attempt is set out in the vision "THINKING SCHOOLS, LEARNING NATION" (Goh, 1997). In relation to this the Ministry of Education has come up with a number of initiatives that are being implemented in stages in the schools. The core initiatives are i) IT Master Plan, ii) Thinking schools with emphasis on critical thinking and creativity, collaborative learning, life-long learning and self- motivated learning, and iii) National Education. Associated with these initiatives are content reductions in the curriculum, changes in the assessment and greater school autonomy. There is an attempt to reduce the curriculum content by 30 percent so that more time can be devoted to the development of creative and critical thinking skills and the use of IT in the teaching-learning process. For this vision to be successful there has to be some change in the teaching learning milieu.

Some fundamental shift in mindset will be necessary in order for the teacher to feel comfortable with the required changes. Basically, the fundamental shift required is a shift from the teacher-centred examination oriented education to learner-centred holistic education. But the society, the schools, the teachers and the pupils are happy and comfortable with the success of the present system. The change required needs teachers to be able to cope with new learning environment were the teacher might not always know more than their students. He/she must be prepared to explore, experiment and learn together with the students. This is certainly a departure from the current situation where teachers feel in control because they know more than their students. The system faces an enormous task but it is imperative that it brings about the required changes for the good of the nation in the future.

### **EduPAD Project**

As part of the IT Master Plan, the Ministry of Education's (MOE) Educational Technology Division (ETD) mooted a plan to device and develop an electronic personal computer (eduPAD) and trial it in a school. The development and testing of eduPAD in a trial school is one of the efforts on the part of the Ministry of Education to bring about a paradigm shift in teaching in Singapore schools, that is, to make the learning process in schools more student-centred. The eduPAD development and research is an inter-agency collaborative project involving the following Singapore institutions:

- National Computer board (NCB) - developing the hardware devices in conjunction with local IT industries
- Kent Ridge Digital Labs (KRDL) - educational IT software development
- Dunman Secondary School - involved in trailing the eduPAD system
- Ministry of Education, Educational Technology Division (MOE-ETD) - overseeing the project
- National institute of Education (NIE) - pedagogic evaluation of the use of eduPAD

### **The eduPAD Device**

The eduPAD is a hand-held electronic device. It is connected to the Internet through wireless technology. It is designed to enhance teaching and learning in schools. Teachers can use the eduPAD to create and carry out class activities as well as facilitate the distribution and collection of class exercises electronically. Pupils on the other hand can use the device as a platform for their work, on which they can carry out hands-on and collaborative activities as it allows learners to communicate with each other's terminal. Pupils can also make use of their eduPAD to explore learning resources on their own. The eduPAD device can store items, such as entire textbooks, on a storage card the size of a postage stamp.

Clearly, as an IT communication tool, eduPAD offers tremendous pedagogic potential for learning both in the classroom and at home. The exact nature of what constitutes the best pedagogic practice for optimizing the use of eduPAD in the classroom is the key research question that this whole project hopes to answer. The device is currently on trial in Dunman secondary school in a number of lower secondary classes. The authors of this paper are members of the research team evaluating the impact of the introduction of eduPAD. The present study is a preliminary investigation of a

teacher's change in teaching approach *if any* as a result of the use of eduPAD device in the classroom.

### **Methodology**

In 1994 Stigler started the use of videotaped lessons to study and understand teaching that goes on in classroom. To bringing about change in the learning climate there is the need to look at what actually happens in the classroom and let the teachers be aware of it. And that is where videotape comes in handy. It reveals exactly what teachers say and do and how students respond. In "The Teaching Gap", Stigler and Hiebert (1997) advocate using video for what they call "lesson study". This strategy was employed by us to get a thumbnail sketch of a teacher teaching science to a secondary 2 class at Dunman Secondary School. Video recording of lessons taught by the teacher was made prior to the introduction of eduPAD device and with the use of the device. The pre-eduPAD lesson was recorded in January 2000. This formed the baseline data for comparison. The eduPAD lesson was recorded in August 2000. The videotaped lessons were analysed using an episode-time analysis observation form devised by the researchers. The main episodes recorded related to teacher initiated and student initiated events in the lesson. In this manner a picture of the dynamics of the lesson was captured. After the analysis of the pre-eduPAD lesson, the videotape and the report were shown to the teacher. After the analysis of the eduPAD lesson comparison was made with the baseline data to determine the shift in the way the teacher conducted the lesson with the use of the eduPAD. An interview was also conducted to get the views of the teacher. Through this study answers to the following questions were sort:

1. Is there a shift from teacher centred-teaching to student-centred learning?
2. Is the teacher comfortable using eduPAD as a tool to help her in the teaching process?
3. Is the eduPAD engaging the students in self and cooperative learning processes?

### **The Pre-eduPAD Lesson**

The lesson reviewed was a pre-lab science lesson conducted in the classroom. The objectives of the lesson were to instruct students i) how to read volume in a measuring cylinder, ii) how to measure volume of an irregular object and iii) how to measure the volume of a floating object using a sinker.

Class organisation - the students were seated in small clusters. The overhead projector was positioned in front of the class in the centre. There was ample space between the clusters of desks for the teacher to move round the class.

### **Overview of the Pre-eduPAD lesson**

The science lesson reviewed had three distinct components: exposition, discussion and consolidation (*Appendix 1*). The lesson was teacher-centred at first and slowly developed into a teacher-student interaction lesson. The teacher did most of the talking during the first eight minutes of the lesson. The teacher explained and demonstrated the correct way of reading the volume of liquid in a measuring cylinder. During this period the teacher asked no less than thirteen questions and most of them (8) were rhetorical questions used to emphasis a point. The rest of the questions were directed to the class and the class answered with a one or two word answers.

Then she engaged the class in discussion. The discussion part of the lesson lasted for nineteen minutes. The teacher discussed with class the formulae for calculating the volume of regular objects and the methods for measuring the volume of irregular objects and floating irregular objects using measuring cylinder, displacement can and sinkers. The teacher used the recitation method during the discussion. Questions were generally directed towards specific students. Teacher received the responses, evaluated and elaborated on them to reinforce the ideas. The student-talk was mainly to respond to teacher's questions. Three students volunteered suggestions during the discussion. One of the students suggested the use of lower density liquid for floating objects. Though the teacher accepted the suggestion she dismissed it as not being practical in the lab situation.

The last three minutes of the lesson was utilized by the teacher to summarise the lesson by recapitulating the main points by using rhetorical questions and class questions.

The pace of the lesson on the whole was brisk and students were kept attentive with a flow of questions. The teacher-talk was generally for giving information, clarification and elaboration of student responses. The teacher used notes and diagrams on transparencies/whiteboard to help her in the delivery of the lesson as well as help students' understanding. The teacher also provided examples to illustrate her points. The development of the topic was well sequenced and the students had no difficulty in following the lesson. The flow of the lesson was smooth.

On the whole the lesson may be classified as expository with interjection of discussion via recitation and elaboration. The recitation was of the pattern where teacher asked a question, received the response, and evaluated and elaborated it. Teacher elaboration formed the major component of the discussion.

### **EduPAD lesson**

The lesson recorded was a theory lesson conducted in the classroom. The objective of the lesson was to teach students how to classify organism using dichotomous keys.

Class organisation: the students were seated in ten small groups of four. The students had their eduPAD device with them. The overhead projector was positioned in front at the centre of the class. There was room for teacher to walk between the groups.

### **Overview of eduPAD Lesson**

The eduPAD science lesson had the following sequence of events: direct teaching using the recitation approach followed by individual seat work with the eduPAD, collaborative group work with reference to eduPAD and class presentation (*Appendix 2*). The teacher spent the first four and half minutes to teach the idea of using dichotomous keys to classify organisms with use of examples. Students were referred to one example in the eduBook. Students were engaged in the learning process using the recitation strategy.

The students were then engaged in individual seatwork. They were required to refer to the exercise on page 161 in the eduBook and complete it. This was followed by a question and answer session based on the exercise. Teacher elaborated the students' answers where necessary.

The class was then set a collaborative task to be done in groups of four based on information on page 162 of eduBook. They were required to develop a classification chart for vertebrates using dichotomous keys. The students spent about nine minutes on this task. The chart was sketched on a transparency and not on the eduPAD. At the end of which the teacher called on group leaders to present their chart to the class. There was time only for four groups to present their work. Two groups had acceptable solution while the other two groups did not use the dichotomous key to develop the chart. The class and teacher provided feedback to the group.

The development of the topic was well sequenced and the activities used were appropriate. Students had no difficult in following the lesson but the concept of dichotomous key has not been fully understood by the students. The flow of the lesson was smooth. The use of the eduPAD was minimal that is, just to look at examples and make reference to the exercises in the eduBook

### **Comparison of Pre-eduPAD and eduPAD Lesson**

To highlight the similarities and differences between the two lessons, the sequence of episodes in the two lessons are tabulated for easy reference. Table 1 lists the sequence of episodes in the pre-eduPAD and eduPAD lesson.

Table 1.  
Comparison of pre-eduPAD and eduPAD lesson

Episode-time	Pre-eduPAD Lesson	Episode-time	EduPAD Lesson
1 7mins	Teacher explains the correct technique of reading volume in measuring cylinder. Students engaged in lesson through Q&A.	1 4mins	Teacher explains the use of dichotomous keys to classify organisms. Uses two examples, one of that is from the eduBook.
2 4mins	Teacher discusses volume of regular objects - formulae.	2 5mins	Students are engaged in individual seatwork using eduBook.
3 8mins	Teacher discusses how to find volume of irregular objects - immersion and use of displacement can.	3 3mins	Teacher checks on exercise using recitation technique.
4 7mins	Teacher discusses how the volume of an irregular-floating object may be determined.	4 9mins	Students are engaged in collaborative group work using information from the eduBook to develop a chart to classify vertebrates using dichotomous keys.
5 3mins	Teacher consolidates the lesson by reviewing the main points.	5 7mins	Group leaders' present work to class. Class and teacher provide feedback to the group.

From the above description of the two lessons it is quite obvious that there are both similarities and differences in the structure of the two lessons. In the pre-eduPAD lesson the teacher plays the central role in directing learning through direct teaching using mainly the recitation approach. In the eduPAD lesson the students were engaged in individual and group work for about 50% of lesson time. Teacher acted as

a facilitator for learning to take place. Teacher integrated the text in the eduBook into her lesson and used them as resources for the individual and group activity.

Both lessons began with whole class direct teaching approach where the teacher taught a concept or skill using examples and kept the students on focus through questioning them continuously about what she is teaching. This led to discussion on the focus issues of the lesson in the pre-eduPAD lesson whereas in the eduPAD lesson students were engaged in individual and group work. The difference may be due to the introduction of the eduPAD device, which indirectly forced the teacher to plan learning activities incorporating the device into the lesson. This made the lesson to be more student-centered than the pre-eduPAD lesson or it may be just due to the nature of the lesson itself.

The students were certainly more directly involved in the learning process in the eduPAD lesson through independent seatwork and collaborative group work. During the group work there was substantial interaction among group members. They discussed and exchanged ideas with the aim of completing the assigned task.

### **Teacher's View on eduPAD Lesson**

The teacher was interviewed in August 2000, to get her views on the use of eduPAD device in the teaching-learning process. She said that she had incorporated eduPAD activities in 10-12 lessons so far during the trial period. They were mainly used to set quizzes to assess pupils' understanding of the lessons that were taught. She said that this was the most popular use of the eduPAD as the quizzes were auto-marked and analysed for the teacher. The other uses were to refer to the eduBook for examples, illustrations and exercises. On one occasion the device was used to link to the Internet to search for information during a lesson on Periodic Table.

With respect to this particular lesson she used the device only minimally because she felt that the use of the device would slow down the pace of the lesson. She used it to refer students to exemplars in the eduBook and to do an exercise from the eduBook. She directed the students to do the exercise in their notebooks instead of on the eduPAD because she felt that it would slow down the students. For the same reason she did not allow the students to sketch the flowchart on the eduPAD itself when it came to the collaborative group work. The device was used merely as a source of information for the exercise and the collaborative task.

From the interview it was also gathered that the full potential of the eduPAD device was not utilised in the design and execution of the lesson. The teacher was not adventurous in the use of the device mainly because of her encounters of technical problems and loss of teaching time during its use with the class.

Teacher reported that she has not seen any marked increase in interaction between her and the pupils or between the pupils with the introduction of the device. The teacher is of the view that the technical aspects of the device have to be improved before it can become functional in the classroom setting.

### **Conclusion**

From the review of the two videotaped lessons and the interview with the teacher concerned it appears that the eduPAD device still needs further improvements to

become fully functional in the classroom setting. The developers of the device are currently attending to some of its shortcomings. In the eduPAD lesson pupils were not able to do the exercise directly on the eduPAD. The answers were written in their notebook. In the group activity the pupils were not able to sketch the chart on the device itself and send it to the teacher to project on the screen for class discussion.

Though there is a difference in the pre-eduPAD lesson and the eduPAD lesson it is hard to say whether it is due to the eduPAD. Certainly, the eduPAD lesson was more student-centred than the pre-eduPAD lesson where the teacher played the central role using the direct teaching approach. However, the textbook could have easily replaced the eduBook in this lesson without any change in the quality and effectiveness of the lesson. In fact this was the view of the teacher.

The eduPAD device has the general features and potential to engage pupils in independent and collaborative work but has to be made more versatile if it is to function as a teaching-learning tool in the classroom setting. As it is, it is a great device for self-directed learning by the pupils and for communicating with their teachers and their peers.

This report is based on a single lesson conducted by a particular teacher. So we must be cautious in drawing any firm conclusion from it. There is a need for more observations of how teachers use this device in the classroom before we can say anything with some certainty. In conclusion it can be said that with greater use of an improved version of the eduPAD device in the teaching-learning process there is a greater likelihood of teaching becoming more student-centered than it is presently and leading to the achievement of the major objective of the eduPAD Project. That is, to empower the learners to become more independent in the learning process so that they would develop the attitude and skills for lifelong learning.

### References

- Anderson, D., & Piazza, J. (1996). Changing beliefs: teaching and learning mathematics in constructivist pre-service classrooms. *Action in Teacher Education*, 18(2), 51-62.
- Goh, C. T. (1998). Shaping our future: thinking schools, learning nation. In Quah May Ling and Ho Wah Kam (Eds.). *Thinking Processes: Going beyond the surface curriculum*. Simon & Schuster, Singapore: Prentice Hall
- Olson, S. (1999). USA, education system and policies. *The Teacher Magazine*, 10 (08).
- Salvin, R. E. (1996). Reforming state and federal policies to support adoption of proven practice. *Education Researcher*, 25 (9), 4-5.
- Stigler, J. W. & Hiebert, J. (1997). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom*. New York: The Free Press.



## APPENDIX 1

### Lesson sequence of a pre-eduPAD lesson

Time	Teacher	Students
1 <sup>st</sup> . min	<p>Teacher explains the importance of reading the measuring cylinder accurately. Using a figure on a transparency she explains the shape of the meniscus and how to read the volume. The need to keep the eye level horizontal was emphasized. During the exposition she used a number of rhetorical questions to emphasis her points.</p> <p>At this point she reviewed the units for volume. She asked the students to take down some notes.</p> <p>She the demonstrated using a water bottle how to read the water level. The need to place the measuring cylinder on a firm base and viewing the meniscus at eye level was reaffirmed.</p>	<p>Students were mainly listening to the teacher passively, answering occasionally questions from the teacher. Generally with one or two words answers</p> <p>Students recorded the given information.</p>
8 <sup>th</sup> . Min	<p>Teacher then discussed with the class how volume of regular solids is obtained. Formulae were provided.</p>	<p>Class responded to teacher's questions.</p>
12 <sup>th</sup> min	<p>Teacher then discussed with the class how to find the volume of irregular objects.</p> <p>Teacher expanded the suggestions put forward by the students. The teacher explained the need to use displacement can if the object is too big to go into a measuring cylinder.</p>	<p>Pupils provided examples of irregular objects and gave suggestions how their volume may be measured.</p>
20 <sup>th</sup> min	<p>The teacher then questioned the class how they would measure the volume of an irregular floating object and discussed it with the class.</p> <p>Teacher elaborated on the use of sinkers.</p> <p>Teacher accepted the suggestion in principle but she Dismissed it as being not very practical.</p> <p>Teacher then posed the question how to find the volume of the sinker.</p> <p>Teacher elaborated the pupil's response and asked the pupils to take down some notes from the board</p>	<p>Pupils provided examples of irregular shape floating objects</p> <p>Two pupils suggested the use of sinkers.</p> <p>Another pupil suggested the use of lower density liquid.</p> <p>A pupil was called to respond and she provided the correct procedure.</p>
27 <sup>th</sup> min	<p>Teacher consolidated the lesson by reviewing the main points using the recitation approach.</p>	<p>Pupils respond to teacher's questions</p>
30 <sup>th</sup> min	<p>Class ended</p>	

## APPENDIX 2

### Lesson sequence of an eduPAD lesson

Time	Teacher	Students
Start	Teacher explains the concept of dichotomous keys using an everyday example. She called on students to provide suitable dichotomous keys for classifying students in a class. For this section of the lesson the teacher used the recitation approach with elaboration and clarification of students' responses where required.	Pupils listened to teacher's explanation and answered questions directed at them.
2 m 30sec	Teacher called on the students to refer to page 161 in the eduBook in their eduPAD device for an example how plants are classified using dichotomous keys. Teacher explained the use of the keys to the class.	Students referred to the text in the eduBook.  Students listened to teacher's explanation.
4 m 30 sec	Then teacher referred the class to the exercise on page 161/162 in the eduBook. Teacher requested students to work individually and complete the task.	Students work on the exercise. Some students requested teacher's help. Teacher responded.
8 m 45 sec	Teacher questioned the class about the exercise, received responses from the students and elaborated where necessary.	Students responded to teacher's question and listened to teacher's elaboration.
12m 30 sec	Teacher set a collaborative task to be done in groups. Teacher explained the task to the class that is to classify the vertebrates using dichotomous keys. Examples of vertebrates and a set of characteristics were provided.  Teacher instructs students to refer to eduBook for more information on classification.  Teacher provided each group with an OHP transparency and marker pen to chart the classification of vertebrates with the given information.  Teacher went round the class to monitor the group work. She encouraged them to think and work together to come up with the solution.	Students referred to eduBook for information and worked on the task in groups of four.
21m 30 sec	Teacher stopped group work and called on groups to come up and present their solution to the class. Teacher used group presentation to discuss, elaborate and provide feedback.	Group leaders came up to present the solution of the group.  Class listened to the feed back from the teacher.
27m 15 sec	Lesson ended	