IT for ID - Using Information Technology (IT) as a catalyst for altering the constraints of conventional classrooms to cater for individual differences (ID)

利用資訊科技改善傳統課室環境的限制以應個別學習需要

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Abstract

This paper discusses the introduction of an online integrated learning environment (ILE) in two primary schools. The project (currently ongoing) aims to work collaboratively with teachers for three years to explore and establish the potential use of information technology (IT) in primary school classrooms. It aims to assist teachers in developing alternative teaching and learning strategies involving use of IT for coping with individual learning differences. The paper provides the rationale and reports on the progress of the project to date. In the past twenty months practical help has been given to teachers and students to assist them in the use of appropriate IT resources and tools in the classroom. Through the use of an individual study plan, classroom learning and teaching activities have been carefully designed and constructed to provide settings with opportunities for students to take control of their own learning and monitor their own progress. The individualized study plans are designed according to student ability grouping. Through the personal profiling system (PPS), parents, teachers and students can regularly monitor progress. Detailed diagnostic data from the PPS allow teachers to closely monitor and evaluate the impact on student learning.

摘要

*本文討論於兩間小學引入「網路綜合學習環境」(**online integrated learning environment, ILE**)的情況。計劃目前仍在進行，旨在與教師共同合作，於三年時間內探討在小學課室應用資訊科技的潛力，從而協助教師透過資訊科技發展另類的教與學策略，以切合不同學生的學習需要。過去二十個月，計劃已向教師及學生提供實際支援，協助他們於課室內適當運用資訊科技的資源及工具。透過訂立個人的學習計劃，課堂學習及教學活動都經過細心設計及編排，讓學生可自主學習及自我監察學習進度。個人學習計劃乃根據學生能力分組設計。家長、教師及學生可透過「個人資料系統」(**personal profiling system, PPS**)定期監察學習進展。該系統提供了詳細的診斷性數據，方便教師密切留意及評估學生的學習情況。*

Introduction

Current interest in the use of IT in schools is at a high level. Whether we like it or not there is plenty of evidence around to make us realize that computers have changed the nature of the traditional classroom. It has forced educators to see the need for change as reflected in government policies. The extensive support given by the Education Department and the excellent IT infrastructure in schools have established an increased level of use of computers in the classroom and this, in turn, has forced teachers to change their teaching strategies to some extent. It has compelled them to admit that they are no longer the information giver and to begin to grapple with the issues related to coping with individual differences in their classrooms. As Tiene & Ingram (2001:257) rightly put it:

> *Many of us expect that using technology wisely and effectively in education can lead, over time, to a real revolution in how teachers teach and students learn. It will not happen quickly or easily, but it could happen. It will not happen if we simply use technology to continue our old ways of teaching. We all need to learn new ways to teach that take advantage of what the various technologies do best. Learning how to use new instructional strategies is likely to be a more challenging task than learning the technology itself.*

Education reform and the impact of IT

With the push to introduce IT in schools the government wants all pupils to have the necessary skills in this area, hence all teachers need to know and understand the importance of the use of IT in the classroom. As recommended by the official document entitled "IT Learning Targets" (CDC, 2000) the use of IT in teaching and learning must be accompanied by corresponding changes in the school curriculum. How this will affect teachers is explicitly stated in the "Information Technology for Learning in a New Era - Five-Year Strategy 1998/99 to 2002/03" document, paragraph 5.3 which states that the existing curriculum will be revised to enhance the level of awareness and use of IT.

There is no doubt that the reform agenda calls for fundamental changes in teaching practices on the part of most teachers. In some ways the introduction of IT only adds another level of compilation to what is already a daunting task. How does a school get all or almost all of its teachers on board, particularly when many of those teachers have little experience with the use of IT tools?

Fortunately for Hong Kong a huge amount of resources have been allocated for establishing an IT infrastructure in schools. Through the Quality Education Fund a large number of IT initiatives in schools has been funded and projects have been successfully completed. The result of all this flurry of activity is that a high percentage of schools are now very well equipped and many have indeed developed extensive resources for sharing among teachers. Given this scenario at the present time, it is reasonable to say that practice in teaching and learning in Hong Kong schools could *change radically* if the teaching profession grasped the opportunities available though use of the internet and other forms of online communication technology; for example digital cameras, digital video cameras, scanners, video conferencing, voice-operated software and read-back options on software and much more.

We all know that any radical change is going to take a long time to achieve. The sophistication of hardware or software does not determine the potential for educational reform. Teachers may use either simple or complex technologies to assist them to achieve their individual visions of good educational practice. In time, different patterns of IT use will emerge. On the one hand, some teachers may welcome the use of IT as a vehicle of empowerment. In their classrooms, IT will be used to facilitate active, student-centred investigations. On the other hand, a greater number of teachers as is currently evident may employ technology merely to reinforce traditional, teacher-centred practices. For IT to become an integral part of teaching and learning in schools, many things will have to change.

Hong Kong teachers are not alone in this quest to integrate IT into classroom teaching. Teachers around the world are feeling the same pressure as governments produce statements about how their teaching force is trained to work with this sort of technology. Senior management is also affected. Since the 1998 launch by the Education Manpower Bureau of the Information Technology for Learning in a New Era: Five-Year Strategy 1998/99 to 2002/03 school administrators have had to grasp the initiative and make the most of these serious opportunities to enrich teaching and learning in order to meet the significant challenge to the traditional role of teachers. All stakeholders are keenly aware that the extent of the impact of these government policies concerning use of IT in schools will greatly depend on teachers changing their practice in the classrooms. Before any of this takes place a great deal of resources, planning time, and effort must go into developing technology-based instructional materials. A huge effort by everyone in the school community is required to change the culture of the school. The value of collaboration has to be shared by all teachers. The student-centred approach needs to be supported by the key notion that the teacher needs to create an environment where learning can be meaningful and where individual learning differences can be catered for.

In planning for this project research informs us that using new media to deliver the same content in the same way will not result in any better or different learning (Becker & Riel, 1999; Bennett, et al., 2000; Grabe & Grabe, 1998; McFarlane, 1997; Means & Olson, 1995; Tiene & Ingram, 2001). Instead we need to look at what the new media do especially well and take full advantage of those characteristics. Digital resources can have more up-to-date information; can provide animation, sound and video; and are capable of interactive features such as self-graded tests and online discussions with other students. But can these capabilities significantly improve learning, or will these gains be significant enough to justify the costs?

Although for this project the schools were given additional funding, in this paper we will not discuss costs per se but rather will focus on the types of costs (in particular - human costs) incurred when using information technology and the types of benefits that might be realized from using it. Not all of these benefits are measurable or readily converted into dollar amounts, which can make it more difficult to compare different uses for the limited funds that schools have.

It is also problematic to connect the use of specific technologies such as the ILE to improved test scores or other measurements. Converting educational benefits to some common measurement (such as money or test grades) which allows easy comparisons is equally uncertain. Therefore, we

strongly concur with Tiene & Ingram (2001) that one possible way of classifying the potential benefits of educational technology is by looking at three aspects: effectiveness, efficiency and appeal.

* *Effectiveness*- refers to whether students actually learned anything important.

* *Efficiency* of the instruction resulting from the use of technology - suppose there were two ways to teach a topic; one paper-based and one that involves a variety of technology - CD-ROMS, Internet - one may take longer to prepare but could result in the next benefit to students.

* *Appeal* - how much students seem to enjoy working on computers.

As teachers we should always bear in mind that the technology in and of itself is not the critical issue. *Usually, technology can be shown to result in learning gains only when it is used effectively*. Therefore all teachers involved in the project need to emphasize the educational use of the technology as the focus, not the technology itself. So what kinds of new skills do teachers need?

New skills for teachers

It is precisely in the context described above that the project takes place. It is argued that through the use of the integrated learning environment (ILE) (Figure 1 , P.21), learning can be qualitatively different. The process of learning in the classroom can become significantly richer. Besides textbooks students will now have access to new and different types of information. They can manipulate the information on the computer through graphic displays or engage in interactive activities in ways never before possible. They can also communicate their results and conclusions in a variety of media to their teacher (by email or through the personal profiling system), to students in the next classroom (by email or video conferencing), or students in another school or around the world (by email, video conferencing).

In order to help teachers to develop new skills in the two schools, the project team had the following main objectives:

a. to provide practical suggestions and advice to teachers based on sound educational principles underpinned by research to facilitate exploration and implementation of useful and effective learning experiences for their students -- paying particular attention to children of lower academic abilities -- through integration of the use of IT in the areas of Chinese, English and Mathematics;

b. to facilitate a well-developed understanding by teachers of the teaching and learning objectives that particular models of IT use can facilitate in coping with individual differences;

c. to assist teachers in managing the integration of IT resources (use of the ILE and development of individual study plans) in a way which will maximise their impact on learning;

d. to provide the mechanism for teachers to become reflective practitioners who will be able to continually evaluate and reflect on the successes of the strategies used in the classroom (teachers have been keeping logs, journals and reflective statements - six teachers have been chosen for in-depth case study);

e. to assist teachers to recognise the breadth of opportunity that IT offers in assisting and enhancing the intellectual development of the

learner as a whole; and,

f. to establish a resource base and networking mechanism comprising a collection of 'tried and tested' IT tools and resources such as schemes of work, lesson plans, documentation of teacher experiences, effective teaching strategies, student learning outcomes, and evaluations of student and teacher change processes, all of which can be disseminated to schools and the wider education community.

Context for the use of IT to cater for individual learning differences

In addition to the above objectives, we had to arrive at a common understanding with the schools on the following aspects:

* as schools are currently organized, it is not always possible for each individual student to receive the appropriate educational experiences without more targeted efforts to deal with individual differences (ID);

* equal opportunity in education means that school-based curriculum can be adapted and developed to meet specific needs of each child to reach their optimal potential;

* the demand for tests and examinations, as well as the meeting of teaching schedules may often inhibit the development of each child in the classroom;

* the excessive demands on teachers may prevent them from exploring new ideas and teaching strategies;

* children in schools may have varied interests or levels of comprehension of classroom tasks, therefore, may have difficulty in conforming to existing practices;

* teachers need to have a comprehensive understanding of student individual differences in order to have more success in educating students better.

A shared view on individual differences

Prior to introducing the ILE to the schools it was essential for the team to establish a shared view on ID. This was stated as follows. Teachers need to recognize that each student is unique and differs in interests, needs, experiences and abilities. However, given the opportunity, each child can reach its optimal learning level. We proposed that teachers had to be conscious of the following:

* In order to cater for ID teachers need to provide opportunities for the optimal development of each child in the classroom. This is not limited to just provision of content and information but in creating the necessary environment for the child to develop. This includes the use IT tools and resources where appropriate.

* Right from the outset of the project, teachers will need to familiarize themselves with the concepts of individual differences, intelligence, creativity, optimal learning environments, and the potential of use of IT tools and resources to cater for individual differences.

It was a conscious reminder to the project team that throughout the project teachers will be assisted

to:

* develop a heightened awareness of the many different approaches in evaluating students;
* understand that their belief about how students learn (or how intelligent they are) influences the way they plan for the educational development of students in their charge;
* provide opportunities for students to express their creativity in a wide range of ways - including intuitive and affective domains - to ensure a safe place for creativity to be expressed and to value its expression;
* establish a learning and teaching environment which responds to individual student needs through the provision of an array of experiences in and out of the classroom to encourage optimal learning;
* develop a clear understanding of school-based curriculum development and curriculum adaptation which incorporates effective design principles in lesson planning-including variations of pace, level and grouping (use of the PPS);
* actively provide stimulation to create opportunities for learning to develop the hidden potential of each student-encourage student choice, participation and involvement; and
* realize that the opportunities provided in the classroom allow students to enhance their abilities (through the PPS) whereas the lack of such opportunities inhibits their development and may even retard.

Project outcomes to be achieved

Having laid down the foundations we hope to achieve the following:

* provision of excellent opportunities for student ability to develop (with encouragement from friends and family);
* carefully planned frequent and continuous opportunity for students to practice and extend their special abilities and to progress as they are able (use of ILE) ;
* opportunities for close association of students with others of similar abilities and for teachers to recognize that diversity exists;
* design and development of situations in the classroom where students attain real accomplishments within their capabilities, but with increasing challenge as teachers learn to modify their expectations and apply alternative ways of learning (a key feature of the PPS); and
* provide strong success experiences and recognition of these successes by teachers and parents (feedback via the ILE).

Notions of intelligence, creativity, use of IT for ID

In addition to the factors discussed above, teachers would also need to fully understand the related concepts that needed to be considered within the context of this project namely intelligence, creativity, and the notion of use of IT for ID.

Intelligence

It is important not just to think of intelligence in terms of school activities or rational thinking - it should include physical ability, emotional health, creative and insightful intuition, along with the linear and spatial thinking - it encompasses all of our brain functions. Each aspect of intelligence should be used to create powerful learning situations which promote an integrative approach to achieve optimal learning for all students (i.e. not to take each intelligence separately but to integrate them into all domains - cognitive, affective, intuitive and physical).

Creativity

Creativity can be developed and must be nurtured if ID is to be given proper recognition in the classroom.

Information Technology and ID

Research findings including good and convincing best practice models can assist teachers to develop educational values about the use of IT in relation to how the organization of learning activities in the classroom is adopted to cope with ID. The team is in accord with Clark (1983) who very early in the piece argued that it is the way a lesson was presented, not the medium used, which determined how effective it would be. For teachers to maximize the use of the new digital technologies, they need to pay particular attention to instructional design. It requires a lot of thought to be given to how well-organized the material is, how clear the objectives are, how relevant the examples are, how clearly the material is explained, whether there are exercises that provided some practice with the material, whether feedback is included for students, and so on, all of which influence effectiveness.

Teacher reticence to the use of IT may eventually dissipate if our team is able to provide the advice and support to teachers on instructional design as and when needed. With this supportive environment teachers could:

* recognize that they can maximize the positive effects of IT in the classroom;
* use learning objectives to drive the use of IT in the classroom - teachers are clear about the learning outcomes to be achieved and the processes involved in achieving them (use of individual study plans on the ILE);
* use IT tools to facilitate authentic learning (learning that has personal meaning and substance for the learner) - provide scaffolds for meaningful learning;
* achieve integrated use of IT within the curriculum to extend student learning;
* establish an integrated learning environment with the capacity to provide explicit and in-depth student profiles (use of the PPS);
* understand more critically the use of IT to promote student understanding and acquisition of knowledge and how these can be reflected in the learning outcomes;
* be aware of the values inherent in software, IT tools and systems they use; and
* be sensitive to possible re-orientation of their values to the use of IT.

Change in school culture and structure

In working towards putting the above in place, it did not necessarily mean that all teachers had to be totally aligned to the innovation from its inception. For the project to succeed we needed a team of committed, accomplished, expert teachers who were willing to change. This group would comprise teachers who would view IT tools as a catalyst for ensuring that new approaches to teaching can, in time, gain a firm foothold in their schools. For the project to have any meaning for the teachers the above strategies and outcomes had to be carefully integrated at the following levels:

* **Teachers** - attitudes of teachers - the level of expectation communicated by the teacher can impact the performance of the student;
* **Environment** - a variety of learning experiences at many levels must be provided so that students can develop the skills and abilities they choose to their level of ability;
* **Activities** - curriculum to focus on exploration, manipulation and play - attention to pace, depth, and differing interests of students.

In summary, for the project to achieve successful implementation it depended mainly on three things: (a) teacher belief and attitude to change; (b) supportive school administration, and management; and (c) greater involvement of parents and the community at large.

Increased family involvement

It is envisaged that for the two schools involved IT would offer new and exciting ways for families to increase their level of input in their children's education. For example, at one school, students with computers at home and modems to connect to their schools' network, are already increasing the amount of time they spend on educational activities outside of school. Parents are able to spend time with their child on these online activities. It is already evident that both parents and students have improved their computer skills. Over the next few months parents will be able to communicate more with their children and their children's teachers. They will be able to have better awareness of their children's homework assignments which are posted online, and at the same time continue to enhance their own computer skills.

As part of the project, the team initiated workshops for parents at weekends and in the evenings in order to:

* provide parents with initial word processing skills and the Q9 Chinese input method;
* assist parents by providing practical activities which could be carried out at home with their children using the computers;
* support parents in their understanding of the objectives of the project, and the role they can play in supporting their children in this process.

To date, feedback from parents has been very positive. However, a critical issue, which is key to the success of the project, must be taken into consideration.

A critical issue: the role of IT in catering for ID

In the field of IT in education research, it has

long been assumed by many researchers that teachers who use IT in more innovative ways to support constructivist classrooms might be able to teach students more effectively when compared to the effects of teaching that apply traditional teacher-centred modes. Nevertheless, it is important to indicate that up till now no research has suggested that lessons developed for new sophisticated technologies should be better than teacher-led or textbook based lessons. Very little research exists on the effects of using IT for ID per se. Consequently, for the project we have adopted a broad overview that IT facilitates constructivism. We believe that the use of the ILE will provide teachers with the opportunity to develop more engaging lessons and facilitate the communication of information in more dynamic ways than the non-interactive print media. This tool should also provide an instructional advantage that will induce educators to 'want' to use it. When teachers are given every opportunity to develop high-level capabilities with use of IT they will communicate effectively with students and will be more confident about experimenting with different ways of catering for independent learning. Once the teacher becomes the facilitator he/she is free to focus on one child, or one area at a time and not to spend ninety-nine per cent of the class time focused on whole class teaching (Figures 2a-2d , Page demonstrate some features of the ILE).

Using IT to cater for ID can succeed when the relationship between goals, structures and resources have been recognized in the school's implementation planning. To date, the school principals have been very supportive. For example, the timetable has been adjusted to allow for project activities to take place, teacher release from some teaching has been achieved, generous provision of relevant resources have been matched with the demands of the expanded educational goals of this project. On the whole, within one year of the project the traditional structures, which appeared to inhibit the innovation in its early stages, were both challenged and changed.

Since the introduction of the ILE to the school it was important to ensure that the technological innovativeness of a school was not judged by the mere presence of computers, the number of educational software produced, online platforms or the number of multimedia classrooms. Teachers had to be constantly reminded in sharing sessions that it is not having a computer or software that is important but how it is used. By the same token it is not just having the ILE and how many resources a school has but how these resources will be used by the majority of the teachers that will make this project a success. It is essential that the extent to which IT tools offer opportunities to 'liberate ' learners in classrooms - by giving them a degree of individual control at each stage of the learning process, and by giving teachers freedom from mundane organizational tasks in which to pay more attention to learner's individual needs (Davis et al., 1997) is welcomed by teachers.

In the next phase of the project it is crucial to establish whether teachers can utilize the ILE to develop a contructivist approach to their teaching which values student-centredness, and the capacity of students to create and construct their own learning. At the same time we have to work a lot harder to ensure that parents have a complete understanding of the philosophy of the project. Thus far, thanks to teacher willingness, hard work and commitment, a core of enthusiastic staff has been established who are keen to meet the challenge and to become the driving force behind the innovation in the school.

Conceptual Framework for the ILE in teaching and learning

The project team adopted the following framework based on three presumptions:

1. If teachers are to use the ILE for maximum benefit, then they have to become pedagogical design experts and facilitators of learning. They have to be prepared to change their traditional teacher roles to include using technology appropriately to create alternative and meaningful learning paths for their students. It is only then that they will be able to cater for the individual learning differences of the students in their classrooms.

2. Teachers need to present materials in interesting ways to stimulate intellectual curiosity. Careful thought needs to be given to provide clear explanations and quality feedback. They will observe student behavior by using the monitoring system and be ready to provide clear structure and organization to the materials presented. Individual student profiles will provide data for further follow-up action.

3. Teachers need to be learner-centered and always willing to listen to students to better understand how students make sense of the curriculum so as to decide how to change it to cater for individual differences. Any changes made must aim to make a difference to student motivation, learning, and achievement.

In the long term, when the ILE is smoothly functioning within the school, teachers will gain more confidence in using the ILE. Subsequently, they will be able to focus more on maximizing natural learning and motivation with instruction that

* is meaningful and relevant from the individual learner's perspective;
* provides appropriate learning activities;
* attends to the climate and context in which learning occurs;
* provides choice and caters for individual interests and creativity; and
* adapts to a variety of individual differences.

Teacher perceptions and feedback

In summary, at this stage of the project a number of teachers are working towards developing classrooms that are:

* Learner-centred
  Case-study teachers are beginning to develop strategies that shift the activities in the classroom from a teacher-centred to a student-centred approach.

  As one English teacher stated it:
  It was obvious that students enjoyed reading and commenting on other student's work. It gave students a new perspective on how they could write better in future after looking at the work of all their classmates.

* Constructivist (students construct knowledge)
  Case-study teachers now plan lessons that are less teacher-directed and which are geared towards providing more opportunities for students to construct knowledge. Given the opportunity and the right context there is already evidence that students are in fact doing this in

class lessons.

As another teacher noted in one of her lessons:
When asked to perform group work students took up the responsibility to organize the activities for each member in the group, although there was a lot of confusion at first as this was the first time that students experienced group-based activities in class. Despite this, it did not take long for students to invent their own ways of finding solutions to the problem. These ways were not given to them by the teacher. By exploring the possibilities students discovered the calculator tool that was on the screen so they used it to quickly produce an answer.

* Able to cater for individual learning differences
Case-study teachers as well as teachers involved in the project are seriously contemplating the possibilities of designing learning activities that could cater for the individual learning differences of the students in their classes.

One particular case-study teacher discovered very early on that she could in fact begin to consider three levels of activities for her students. In a small and manageable way she could design activities that were pitched at three levels - lower, average and higher ability groups. She expressed the following views:
By the second trial lesson of using the ILE I was aware that activities and exercises could be designed in ways that would stimulate the students to learn and yet at the same time the students themselves would not be aware that they were given different work. I gave students the opportunity to read a set of other students' work on the ILE - they could start this in class and continue at home by accessing the ILE - the lower ability students may only need to read one piece whilst the more able students could read and comment on several pieces. The higher ability students were given extension work so that they could write an additional piece if they finished early or they could log in at home and complete the set work. By having all the writing pieces on the ILE, students could access them at any time and continue to work on them at their own pace ... Students really enjoyed this activity... they were so excited.

* Provide ample opportunities to enhance student learning
Using the ILE provided teachers with ways to cope with students of different learning abilities. Another teacher in the school who taught Mathematics discovered that when using the ILE it came to his attention that one particular problem student who was not normally motivated at all in the traditional classroom setup was performing at a much higher level when he completed activities on the ILE.

The following is taken from an interview with a Mathematics teacher:
This particular student will not do his work but his examination results are good and he is capable. In class he will not pay attention or do any work but when he used the ILE his work was excellent and he did not have to write down any steps as he did the calculations in his head. ...At the beginning I had nagging doubts about whether the mathematics software that I was using on the ILE would have any effect on student learning. Was it worth spending so much of my time to prepare and produce such teaching materials? ... But after putting the work on the ILE, I found that students were very keen to learn, their self-motivation was high and they would log in and complete the work after school. ... the

more able students could complete the work and were also provided additional links to extend their work while the lower ability students could access the PowerPoint resources on the ILE and revise the topic as many times as they liked before they needed to do the exercises. ...

* Promote new ways of teaching where the ILE is a central feature used in conjunction with everyday classroom activities

  In using the ILE the teachers have been conscious of developing new ways of teaching as well as thinking of ways to make the ILE a transparent tool in the classroom. Some comments from teachers will attest to this change.

Teacher One:

In one of my lessons, attention was particularly given to the oral aspects of English as students did not normally get the opportunity to practice their speaking in class. Each student was called to the front of the class to give his/her opinion of why the piece of writing was chosen and why it was good. This gave students a lot of confidence, as they had never talked in front of the whole class. The student's speech was captured on video and placed on the ILE. Parents could access the lesson and view the events and activities from home ... all work completed was scanned and placed on the ILE as well, for sharing and for parents to see if they wanted to join in.

Teacher Two:

For my Chinese class the life stories of four musicians and five recordings were found and placed on the ILE. Students would read and listen to the recordings and summarise them. Each student would be asked to comment on the piece they had read. Since students were not used to this activity they had trouble pronouncing some words. In the past they looked at pictures and then talked about it but this time it was more challenging since they had to read a passage on the ILE and then present to the class. This gave them a good chance to practice their oral skills and to gain confidence in speaking... the next time I do this kind of lesson again I will improve on several aspects like the timing of the pieces to be read and give more guidance to students about how to summarise the read passages and so on.

Teacher Three:

Using the ILE freed up some of my time and I could move around and spend time with students from the lower ability group. It was also interesting to see how the students were deeply engaged in the work in class when the ILE was used - students were so happy that they took the initiative to inform me when they had finished one set of exercises when previously if they worked on worksheets they would not bother to tell me at all. Even at this early stage I can see that there are benefits as the ILE promotes student self-learning and students are more motivated to learn.

* Promote higher-order-thinking skills, collaborative learning, and problem-solving

  Although teachers had begun to try out these approaches in class it was still too early to have any concrete outcomes. Several classes had tried collaborative learning techniques and various lessons have concentrated on problem-solving scenarios. More work will be done in the next few months in this area.

During the last twenty months, teachers, principals and students were interviewed and data from classes observations were kept. Case-study teachers wrote reflective accounts of their experiences. Parents' views were also collected.

Student feedback

Within the ILE, students could provide feedback for each lesson as well as at any time when using the system. For a number of lessons, a common set of evaluation questions was used although teachers had the option of changing the questions at any time. Within the lessons, preliminary results to date show the following. For the set of questions used as shown below, the answers were always "Yes".

Q1. I like this lesson.

Q2. In this lesson, I enjoy group work.

Q3. In this lesson, I like to use the computer.

Q4. This lesson is fun.

Q5. This lesson is very interesting.

On the whole, it can be seen that students generally liked the lessons conducted on the ILE and found the lessons fun and interesting. Other comments provided by students were:

* I learnt a lot of new words from this lesson.
* I like reading the story on the computer.
* I like to use computers to learn English.
* I like this lesson - it is interesting.
* The pictures are cute.
* I can see my friend's work on the computer.

Parents' feedback

A series of parents' computer classes were organized as a means of sharing and disseminating information about the project. Some feedback was obtained from parents about the use of computers in the schools and are listed below:

* Learning on the web is more interesting for my child.
* The lessons can be more interesting and effective.
* The ILE can help to reinforce what the students had learnt in class although this puts pressure on parents as it is one more thing to follow up besides homework. (parents were of the view that extension work on the ILE was similar to homework and that students had to complete them just like doing homework - therefore resulting in more pressure).
* The activities on the ILE are very creative and students can do them as many times as they like until they understand the work.
* I am happy to see that parents can send feedback directly to the teacher and the school when using the ILE.
* Parents will be better informed about the child's progress since parents can also log in with the child to view schoolwork placed on the ILE.
* As a parent, I am not particularly interested in computers but I am coming to this parents' class as I am keen to know more for the benefit of my child. If my child is to gain any benefit from the ILE, then I must make an effort to be actively involved as well.
* I am very happy that parents can attend this type of computer classes where I can learn new things

... I hope the school will be able to give us more of these in future.

On the whole, parents have been very supportive and positive but one reservation they had was that not every family had a computer nor did they have access to the Internet.

In working with teachers in the schools so far, all parties are cognizant of the fact that buying technology for school classrooms is expensive, but easy to achieve as long as funding is available. Much more difficult is changing the way teachers teach so that they use technology effectively, and even more difficult is changing the pedagogical beliefs that drive teachers' choice of instructional strategy (Fullan, 1991).

Hall and Hord (2001) have also asserted that the implementation of technology is problematic, because it is not one innovation, but a combination of many related innovations, including hardware and multiple computer applications.

Data obtained from teacher reflections and interviews indicate that some change in the following dimensions is beginning to become evident.

Teachers' reflections have demonstrated the following changes although they cannot, as yet, be treated as universal phenomenon:

* changes in teaching methods (case-study teachers and some others)
* curriculum changes (each lesson took into account possible changes and were discussed in-depth)
* teacher leadership (case-study teachers were encouraged to share their experiences widely and to engage in conversations with teachers teaching the same subject)
* teacher collaboration (all teachers involved had worked as a team within the subject panels therefore a greater degree of collaboration has resulted)
* student engagement (students given opportunities to take responsibility for their learning and encouraged to present in front of the class and to work in groups or pairs - student confidence has risen for some)
* classroom management - student noise (teachers were uncomfortable with the level of noise but eventually saw the benefits of students communications within groups as they were not just talking but were actually discussing the work that was set and there were positive outcomes)
* student disposition toward learning (students enjoyed learning with the ILE and learning in the computer room - there is some evidence of greater student motivation and willingness to learn independently)
* student collaboration (students enjoyed working in pairs and groups - initially they were unsure about what to do but after a some practice, they were thoroughly engaged and were enjoying it; teachers reported that their students worked together and helped each other)

Although it has taken time to achieve some of the intended or unintended outcomes shown above, it is only reasonable to assume that ultimately what the teacher does in the classrooms and the ways the pupils react to these changes will influence what and how they learn. The ongoing documentation of the teachers' underlying beliefs and approaches will greatly help to explain day-to-day, minute-by-minute

choices that teachers will eventually make in the classroom as a result of the interventions of this project. At this juncture, all inferences can only be interpretative although we are confident that coherent patterns are emerging as the project progresses.

Concluding remarks

Perhaps it is too early to predict with confidence how successful this project will be in achieving the complex aims and objectives. However, our team believes that the creation of the ILE and the impact this project has had on whole school culture is an important first step towards fostering the development of a collaborative ethos among teachers to maximize the potential that IT has to offer to cater for individual learning differences.

Since Hong Kong has a short history of integrating IT in the classroom, it should not be surprising that many IT tools and resources that have been used so far to support the varied activities of the primary school classroom involve practices that are deeply embedded in traditions of teaching and learning. It was therefore vital for the project to continually monitor how users will perceive the ILE as a tool. As the user becomes more experienced with the use of this tool, then perception will shift away from the tools as objects restricting actions, the user will become less conscious of the tool and will be able to focus on the end goal - introduce new ways of teaching, learning, and assessment. Unless this is recognized and accommodated, the intervention is not likely to be successful.

In the last twenty months it has been insightful to discover that when there is a possibility of technological innovation, teachers decisions pass through two stages: first some general conditions have to be met before teachers will admit technology into their practice - leadership, resources, and obligation to prepare students differently. Second, once teachers have accepted the technology, it is the individual teacher characteristics that will determine how technology will be used in each classroom.

The constraints of the classroom and the curriculum are still very evident, and the demands made on teachers extremely high. Many issues are being dealt with at present but many conflicts between the old and the new are only starting to surface and may not be resolved so quickly. Teachers may have to rationalize the content of their syllabus and may have to admit that some of the old content will just have to be abandoned. Teachers would also need to acknowledge that new ideas and methods have proven their worth.

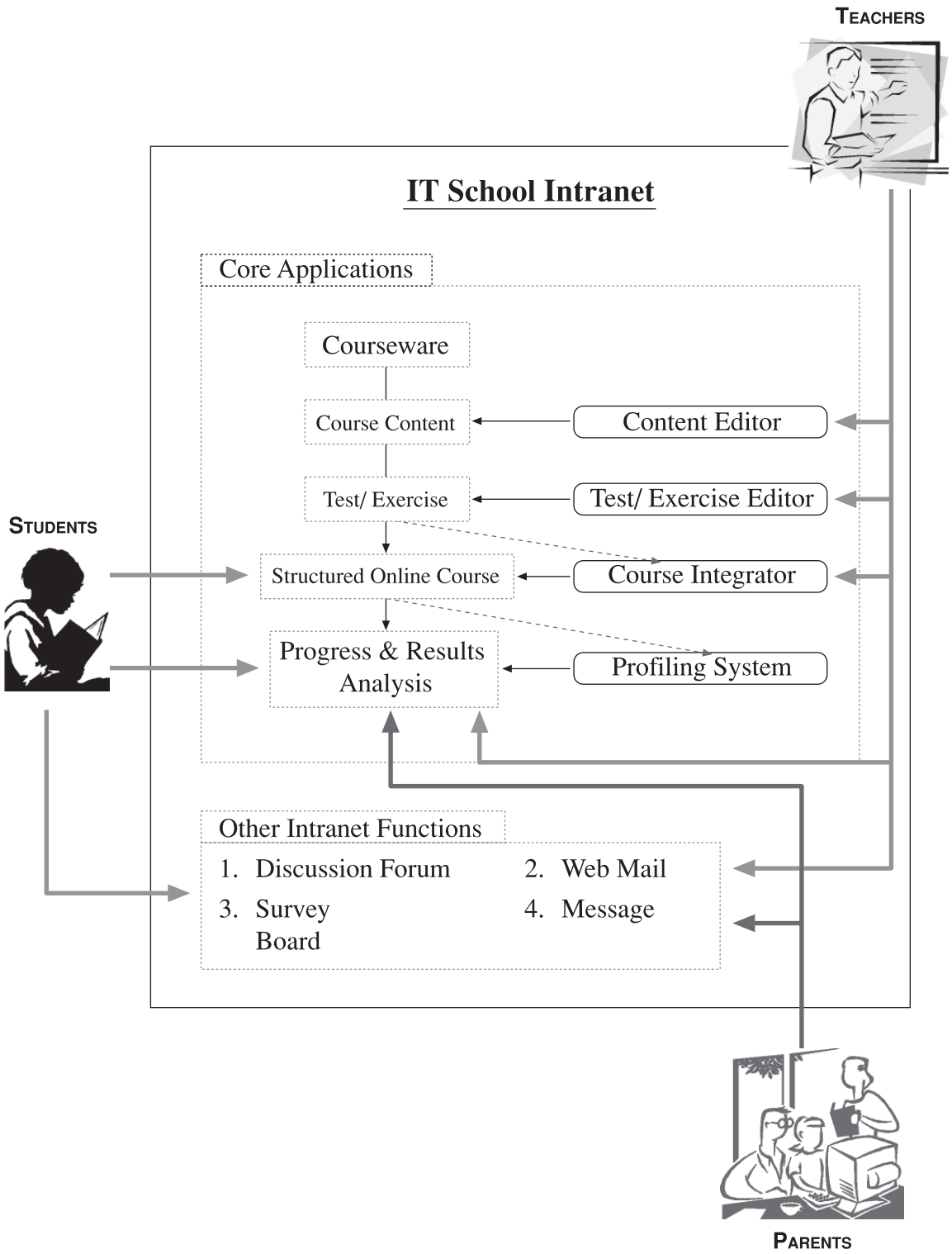
In the end, if this project can encourage teachers to examine the learning process, which allows students to assume personal responsibility and which provides for choice and flexibility in how students learn, then it would be pointless to even try to put a dollar amount to the achievements of this change. It is also highly likely that in spite of this, not all staff will end up embracing the usage of the ILE to the same degree, and not all staff will fully understand why the change was so desirable or important to the Hong Kong education scene. For an innovation such as this, it is still a very undeveloped idea in Hong Kong and it will take time for shared understanding to emerge. In due course, the true value of technology-mediated educational delivery could at best be stated in terms of greater student access to learning (already evident) and experiences that can be provided with technology (the ILE + educational resources) that may otherwise be difficult or impossible. The project has compelled

staff to break away from traditional approaches to instruction. This has meant taking risks and venturing into the unknown. For this we are grateful to the teachers for being so willing to try it.

As the project progresses, teacher orientation may continue to reflect either the formalistic, expert-centred perspective of the traditional paradigm for education, or alternatively, teachers may begin to experiment with learner-centred constructivist paradigm. We are optimistic that some teachers with minimal support will undertake constructivist curriculum innovations that incorporate use of IT, while others may never have enough support to begin such journeys because for them to teach in such a way would violate their essential needs and beliefs.

Finally, if this paper seemed to dwell on points that are critical of the current status of use of IT in Hong Kong, it is because the author feels that no good purpose is served by ignoring real problems. It would be counter-productive to have a situation where teachers will only occasionally use the ILE and often under a sense of obligation rather than of a conviction of its value as an educational medium. With full dedication and enthusiasm from teachers the ILE should become a catalyst for whatever changes they wish to make. It should alter the constraints of conventional classrooms and begin to allow teachers to actively cater for individual learning differences.

Figure 1 : Integrated Learning Environment (ILE)



Features of the ILE

Figure 2a: Curriculum content

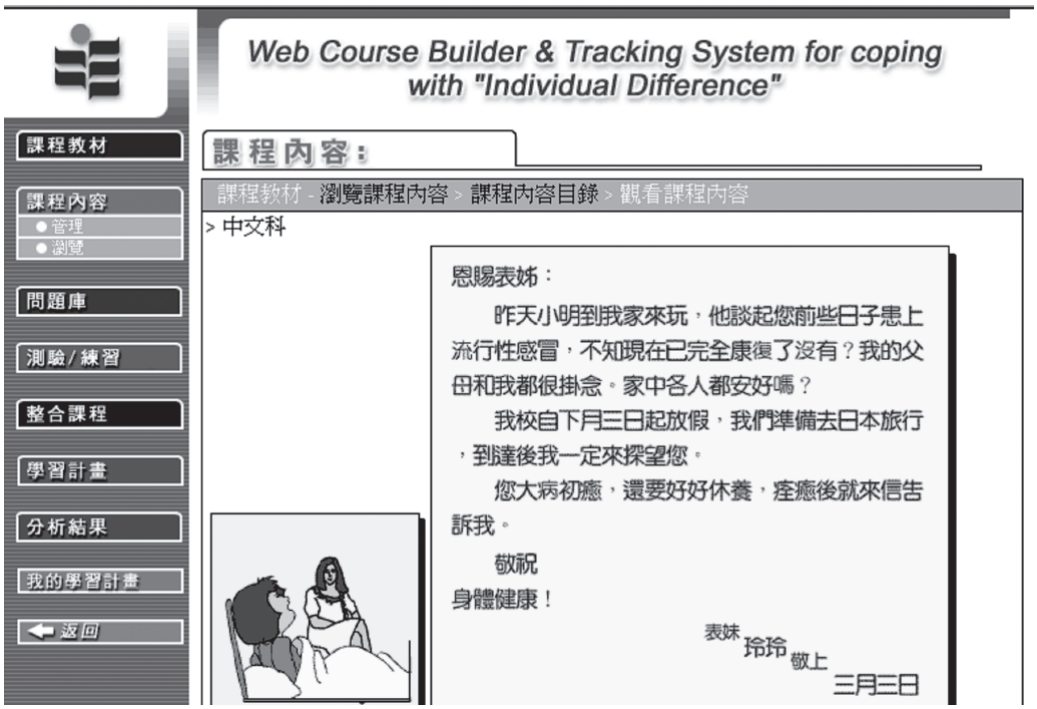


Figure 2b: Web Resources

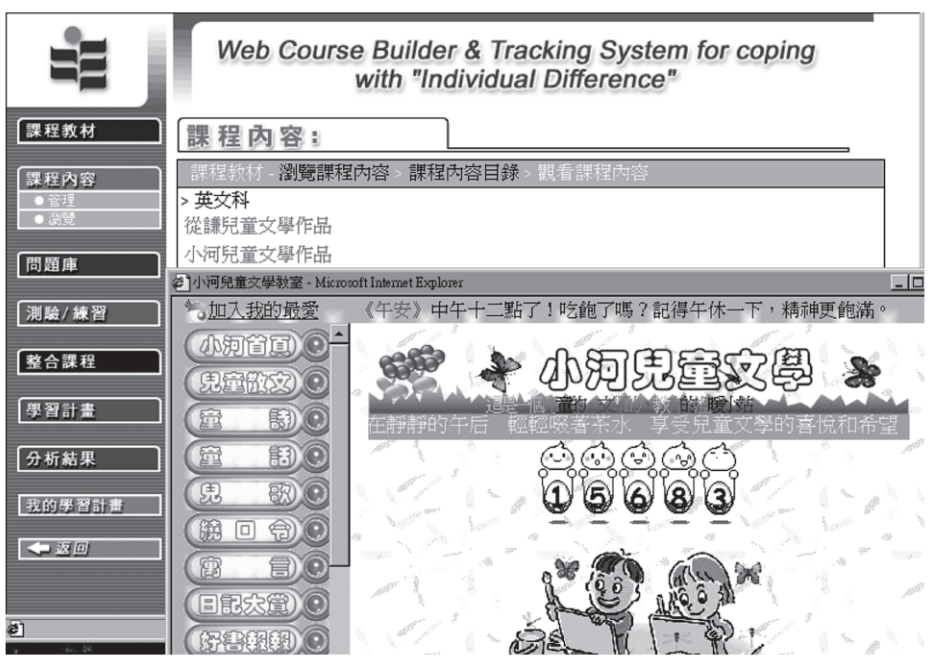
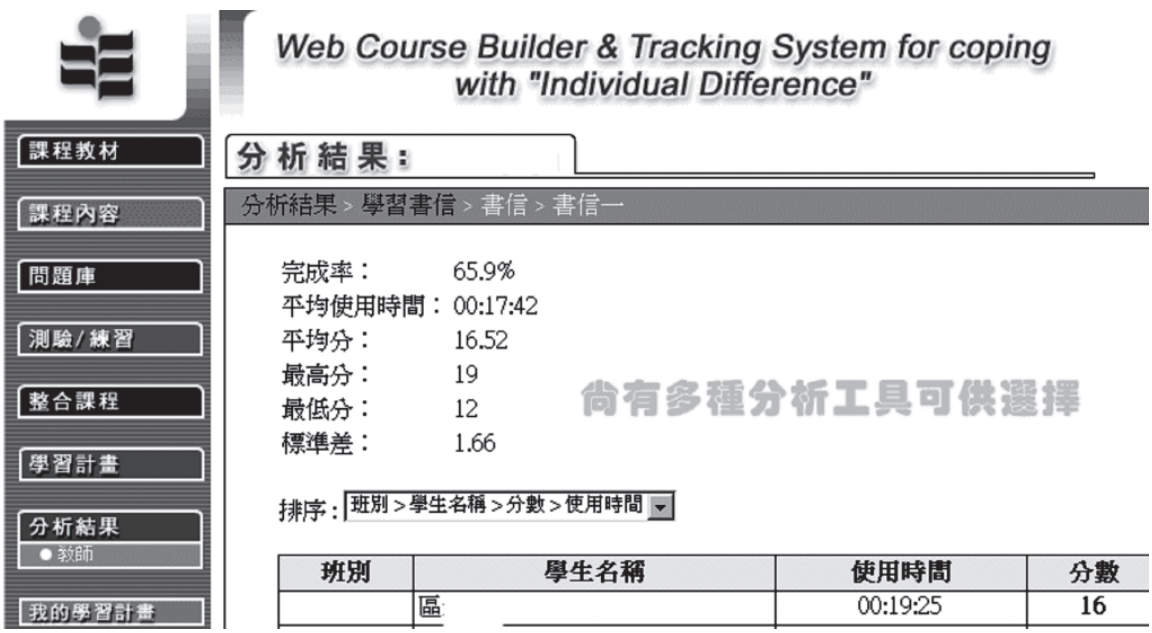


Figure 2c: Parent and Student feedback

Figure 2d: Study Profile



Note

Clark's seminal work in 1983 established the great importance of 'instructional design' at a time when desktop computers were beginning to flood the market and various claims were being made by technologists to equate the computer with a teacher.

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