OECD/CERT ICT PROGRAMME

A Case Study of ICT and School Reform at
School 5

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OVERVIEW

History

1. School 5 is a co-educational primary school started in 1956. The school is popular with parents vying to send their children to the school because of its good academic performance. The school has consistently produced good Primary School Leaving Examinations (PSLE) results that are higher than the National Average. (Refer to Appendix C - PSLE Results)

1. The school was selected by the Ministry of Education (MOE) to pilot the Gifted Education Program (GEP) in 1984. It is currently one of the nine primary schools in Singapore to offer the programme. The aim of GEP is to equip intellectually gifted pupils with the intellectual tools and attitudes necessary to cope with the challenges of a fast-changing society. It also seeks to develop their abilities and values so that they will be in the forefront of change and progress, working for the betterment of society. [1]

1. At the start of 2001, the school moved to its present premises built by MOE under its Programme for Rebuilding and Improving Existing (PRIME) schools. The programme aims to provide a physical

environment conducive to learning and creative thinking and ensure that all students have access to facilities, such as Information Technology (ICT) infrastructure. The new 6-storey school building houses a pupil population of about 2,900 in 72 classes. The pupil population is double the size of most primary schools in Singapore, a testimony to the popularity of School 5. The pupil population is expected to peak to about 3,000 in the coming years.

The School Environment

1. The school environment gives us the impression that it is a school bustling with activities. Beyond curriculum time, different Co-curricular Activities are carried out. At times, groups of pupils can also be seen sitting at seats placed along the corridor outside the General Office and other parts of the school, engaged in discussions and doing school work. Sometimes, there are parent volunteers helping pupils with craftwork or projects. The school also proudly displays pupils art pieces on walls along some corridors.

The School Staff

1. The school has more than 120 teachers who are divided into five departments including the Gifted Education Department. The school is currently headed by a new but experienced Principal, who was posted to the school in January 2001. She has one Vice- Principal to assist her in the running of the school. The large size of the school entitles it to another Vice-Principal but this position is currently vacant. According to one Head of Department, about half of the teaching staff is new to the school.

Community Relations

1. The school has an active Parent Teacher Association. The association organises seminars and workshops for parents. Some of its parent members also participate in the school s programmes as volunteers. For example, some parent volunteers help out in the school library.

ICT in the school

1. The school currently houses 3 PC labs, one i-Mac lab and one teacher resource lab. However, two of the PC labs are currently not in use as the school has just moved into the present premises. These labs are maintained by a full-time Technology Assistant provided by MOE under the Masterplan for IT in Education.

1. The school has broadband Internet access as they are involved in Infocomm Development Authority of Singapore s FastTrack@School Programme[2]. It is also one of the 10 schools piloting the Digital Media Repository (DMR)[3]. Generally, most of the teachers are using CD-ROMs and open tools in teaching and learning. MS Office tools are generally used for administrative work. The GEP teachers, who are more ICT competent, are exploring the use of the Internet such as WebQuest and discussion forums.

The Reform

1. The reform in School 5 is to create an expanded and enriched learning environment to enhance teaching and learning. This is achieved through an online repository of teaching and learning resources called The Portal, which seeks to provide interactivity and connectivity for teaching and learning. It is equipped with administrative and academic modules, and is envisaged to be an integral and indispensable part of the school s online culture, promoting web literacy among staff and pupils.

1. In the administrative module, teachers are able to send their announcements electronically, reserve school facilities online, access and update the online school calendar and communicate via a web mail utility. To promote web literacy among teachers and pupils, the academic module, which consists of lesson and project development utilities, enable users to create web lessons, web projects and web quizzes directly on the Internet. Finished products by teachers and pupils can be showcased

in the online gallery, which is also accessible to the general public. The school hopes that over time, they will be able to build an online repository of teaching and learning resources in The Portal.

THE PAST
History of ICT

11. As School 5 was a pilot school for the Accelerating the Use of IT in Primary Schools(AITP), it was chosen as a Phase 1 school when Singapore s MasterPlan for IT in Education was first implemented in 1997. One of its roles is to provide other schools with concrete local models of innovation in teaching and learning strategies and in school administration. [4] As such, the school has the hardware and infrastructure provided by MOE, namely two computer laboratories and a pupil-computer ratio of 6.6:1. In 1997, all teachers received training in basic ICT skills such as using MS Word, MS PowerPoint, etc. In addition, they underwent 30 hours of training on integrating ICT into the curriculum, such as evaluation of courseware, lesson design and the use of open tools. To equip the teachers with more ICT competency skills, the management also organised training on other applications software and new technologies such as dataloggers. Teacher 1 mentioned that the management would introduce new courses and they would get external people to come introduce and conduct the courses. (9 March 2001).

12. It was from this experience of using courseware and other ICT tools that the school saw the need to create their own web portal for teaching and learning. With the creation of The Portal in mind, the school submitted a proposal to be involved in IDA s FastTrack@School Program in 1999. Its proposal was accepted and it was given a 45 Mbps line, which is much faster compared to the standard 2 to 5 Mbps line given to all schools.

History of the Reform

13. The teachers were provided with CD-ROM courseware by MOE, as well as the school, for use in their lessons. However, some of them found these courseware lacking in terms of relevance to the curriculum. Teachers also found it tedious to source, acquire and access the courseware, especially when they are not in school. Hence, the management decided to embark on a reform by providing a web-based platform, which allows for easy access to resources from school as well as from home. They also wanted a portal which would allow the school to exercise security in terms of access via password as well as control over the resources put up. It should also facilitate exchanges between teachers and parents and amongst teachers and pupils.

14. The web was chosen as a platform for the reform because the objective was to enable teachers, pupils and the community to log on to The Portal, anytime anywhere. Teacher 1 commented we have to bring the children to the lab and the children got to finish their work there, but if your resources are on The Portal, they can do at home, that s the difference. (9 March 2001). In support of this statement, Pupil 1 said, things are much different already because last time we just stayed in class and did our work, we never go anywhere else to do (30 March 2001) during the focus group discussion. Parent 2 interviewed also mentioned if you want to know more information on that particular topic, then they can access this from home. They don t have to waste time in school, so this is important. (9 March 2001).

15. The Portal was conceptualised in November 1998. The school management, a small committee of teachers and parent volunteers and representatives from a private ICT company[5] brainstormed ideas for The Portal. Funds for the development of The Portal were obtained in April 1999 and the private company involved in its conceptualisation undertook its development.

16. The idea of providing the platform and implementing the reform is largely credited to the Head of IT Department (HOD/IT) who saw the value in using the web to solve the teachers problems. He is also the key player in setting the direction and driving the reform in the school. Admin 2 said that the HOD/IT has

lots and lots of ideas, so I think he also came up with this The Portal together with the ex-Principal. (23 March 2001). Admin 1 also mentioned that, it s the IT head. We have a pool of teachers, the committee that is with him. (24 February 2001). Teacher 3 supported this by saying he is a very driven person and he helped made The Portal what it is now. (21 March 2001).

17. The Portal was formally launched in February 2000. Once the portal was set up, the HOD/IT started training a small committee teachers and a small group of parent volunteers on its functionalities. They, in turn, trained parents of Primary 1 and 2 pupils who volunteered to attend the training sessions so that they could help their children with their school assignment. Besides these training sessions, the teachers also shared among themselves knowledge, tips and skills on the use of The Portal. These sharing sessions were generally informal and carried out in an ad hoc manner.

18. The first group of people who used [The Portal] were the teachers from the Gifted Education because at that time when they were using CD-ROM, they find it [CD-ROMs content/utilities] quite restrictive for them, noted Admin 1.(24 February 2001). GEP teachers generally expose themselves to more ICT use and are more ICT competent as they have to meet the demands of the GEP curriculum for primary schools which specifies that GEP pupils in Primary 4 and 5 are required to take computer courses to enable them to use IT tools effectively for learning. [6]

Barriers

19. The school encountered some barriers that they had to overcome. Teachers were overwhelmed by the new skills and knowledge they had to acquire in order to use The Portal. Teacher 2 pointed out that, no matter how hard sometimes you try to learn [ICT skills], you just can t retain ... the knowledge so with the CD and even the search engine, a lot of teachers can t do so. (9 March 2001). Some teachers also felt that although the training for The Portal was carried out, there was little attempt to train teachers on how the applications in The Portal they had learnt can be applied in teaching and learning. Teacher 3 noted that, so often we are interested in training you to use the software, to use the program, to use the features but we don t look at training you how to use this with your teaching. (21 march 2001).

20. To overcome the problem of teachers not being able to cope with the new skills required for using ICT and The Portal, the HOD/IT conducted refresher courses for teachers during the school holidays. Some Level Heads of other departments assisted by encouraging teachers in their departments to seek their help. Teacher 1 said, If you want you can always come in to watch me or if they need help they tell me, I will go in and help. (9 March 2001).

21. On top of grappling with technology, the teachers found that The Portal required them to put in more time and effort in learning new ICT skills for producing customised resources and using the utilities in The Portal. Teacher 1 indicated that   a lot of time is needed to come up with the resources and on top of that, there are so many areas to see to and their markings are also quite heavy and there are other aspects that they have to do. (9 March 2001). Given the time constraint, some teachers have resorted to getting pupils to assist them in uploading resources and simple troubleshooting. As pointed out by Teacher 2, pupils, we re training them so they can also help their teachers and their peers. (9 March 2001). In addition, they also obtained the help of parents to gather resources and assist in giving comments to work put up by the pupils in The Portal. (9 March 2001). Parent 1 mentioned that, they publish it and I put comments, because they allow comments...the children after reading my comments, they put in more work. (9 March 2001).

22. The school also had some problems with the ICT infrastructure as it was situated in the old school premises when the reform was implemented. The network and computers in the old school site were often down which caused much frustration to the teachers. Teacher 1 recalled that part of the frustration in our old school, our labs are not really working that well, and many a times when you go in, you will find that some computers are not working and I suppose some teachers are really, really frustrated. (9 March 2001).

As they were moving to new premises by the end of 2000, the school did not make improvements to the infrastructure.

THE PRESENT
ICT in the School

23. As the school is in the 5th year of IT implementation under the Masterplan for IT in Education, they have set a general guideline for all teachers to integrate ICT in at least 30% of the curriculum time. Teachers in general, are using ICT in their lessons but in different ways based on their ICT competency levels. The GEP teachers who are generally more ICT competent, are venturing into web based learning such as creating and using WebQuests and online discussion forums. All the teachers interviewed mentioned that the majority of the teachers have attempted using CD-ROMs and other applications software such as MS PowerPoint.

24. The positive impact of ICT can be seen in the statement made by Teacher 3, IT has opened up a whole different world to the kids...my kids had people responding to their writing...[usually] the only people who read children s writings are their teachers who mark, or evaluate but the web...other people could respond to it, real people who responded not just in terms of marks, but in very real ways. (21 March 2001). ICT, especially the use of the Internet, encourages pupils to be more independent in their learning as pointed out by Pupil 1 we have been learning how to look for information. (30 March 2001). There are teachers who experiment with innovative uses of ICT in teaching and learning. For example, Admin 1 said, pupils use dataloggers when they go for fieldtrips doing project work. (24 February 2001). As The Portal uses the Internet as a platform, parents are more involved in their children s learning. Pupil 2 stated that, my mother goes into The Portal and found games, stories, quizzes... (30 March 2001).

25. While there are positive impacts, teachers also raised concerns about the use of ICT. One concern brought up is the difficulty in verifying the authenticity of pupils work. Teacher 3 said that, quality of work can be disguised...being online enables them to manipulate things such as copying and pasting information from the web.(21 March 2001). Another concern raised is the lack of supervision of the pupils when they go online, especially at home. Teacher 3 pointed out that monitoring children s work online is one of our biggest challenge. (21 March 2001). Due to the large amount of information on the Internet, Teacher 3 believes that teachers have to ensure that pupils acquire information gathering skills.

Reform in the School

26. Currently, the school is using The Portal to try to address problems that the school has encountered, namely, the limitations of ICT resources available, difficulty of access to these resources and time spent on administrative work such as making announcements.

27. In general, teachers interviewed found the administrative module useful as they can easily check the availability of facilities and book them online. They also found the online announcements convenient as they can check announcements from home. Teacher 4 said, We don t have to go from person to person which sometimes [the message] get lost but through The Portal, I think it is definitely more effective. (27 March 2001). There is greater usage of the administrative module as compared to the academic module because of the school s effort to encourage teachers to use it by removing the manual notice board and making all announcements in The Portal. Likewise, the school gives priority to bookings done online. Admin 1 highlighted this effort in his statement, we did it so people have no choice but to go into The Portal to see announcements. (24 February 2001). Admin 3 also mentioned that priority is given to those who book online and there is no argument about it. (23 February 2001).

28. However, the academic module does not seem to be faring as well in terms of usage and amount of resources put up. Teachers are required to produce their own resources. This, in turn, requires them to put in

additional time and effort, which can be overwhelming. Teachers and parents interviewed expressed this concern. Teacher 1 mentioned that coming up with the resources requires ICT skills as IT is a different area, it takes time and a lot of helping hand. (9 March 2001). Parent 1 noted that it is additional work for the teachers as getting teachers to do all this extra workload, teachers being human are resistant to the idea. (9 March 2001).

29. As the Level Heads of the GEP and Primary 3 English teachers are pushing the reform, these teachers adopted the reform first. They found the experience of using the Academic module in The Portal to be encouraging for themselves as well as their pupils. Teacher 1 said that, it enhances the lesson and makes the children more interested. (9 March 2001). Teacher 4 said, because the pupils are more interested, information goes in better. Whatever they have learnt is better remembered. (27 March 2001). The parents interviewed also agreed that it is motivating for pupils because according to Parent 2 if you make use of the school s The Portal program to publish whatever work into the students gallery, other classmates can read this information so some of them are quite encouraged. (9 March 2001). During a classroom observation, it was noted that the pupils were actively discussing while working with applications in The Portal. (27 March 2001). Pupil 4 also mentioned that on top of enjoying learning, he was able to find more information unlike previously. (30 March 2001).

Barriers

30. The reform went through a period of lull from the second half of last year to the first quarter of 2001, as the school was busy packing to move to its new premises. The school moved to its new premises with better ICT infrastructure and facilities at the end of 2000. Although the new premises have better facilities, the school was unable to continue with the reform in the first quarter of 2001 as the infrastructure was not in place. According to Teacher 4 we haven t started using it as yet, because when we move in here, I think the lab was just ready sometime ago, about 2 weeks ago. (27 March 2001). One department made use of this down period to build up resources for their subject area by working with a private company[7] to develop applets for teachers use in The Portal.

31. Teachers generally find that they have to put in additional time and effort to produce their own resources for The Portal. In order to produce them, they also need to learn new ICT skills such as web page design which can be overwhelming.

32. The management is still grappling with the problem of getting teachers to see the value of using ICT and The Portal in teaching and learning. Since the school has been producing good academic results, teachers in general feel that there is no need to change the way they teach. Teacher 2 mentioned that, I m so comfortable using my old conventional method and I ve been producing this type of results, what makes me think that having IT will improve results? (9 March 2001). Teacher 5 showed apprehension about ICT s impact on the quality of learning as she said, children go in click, click, click. I do not know whether how much they are absorbing from that lesson. (10 April 2001).

33. Another barrier is the reliance on the commitment of the various Heads of Instructional Programmes to drive their teachers to put up as well as use the resources in The Portal. However, some Heads of Instructional Programmes and many teachers are resisting coming on board as Admin 3 highlighted in his statement, they [Heads of Instructional Programmes] are still trying to gather the Level Heads in the other levels [to come on board]...they are [also] not getting teachers to come on board quickly. (23 February 2001).

34. Another possible reason for the lukewarm response to the reform is the hassle of logging into the system as mentioned by Parent 2, not every teacher and pupil has the time to log in everyday. (9 March 2001). Some pupils also find it difficult to remember their password as highlighted by Pupil 3, I don t know how to go into The Portal because it s very hard to remember the password. (30 March 2001).

35. From what has been gathered, the reform is currently in the early stage of implementation. While it is a matter of time for the infrastructure in the new school premises to be put in place, the bigger challenge, which the school faces, is trying to encourage more teachers to use The Portal for teaching and learning.

Hypothesis 1

Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis is that where true school-wide improvement is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the improvements also drove the application of technology to specific educational problems.

1. The study carried out in School 5 indicates that technology is a strong catalyst for starting off the reform and not an additional resource.

1. The school hopes to harness the power of the Internet by building a system that enables them to communicate, collaborate and share ideas and resources among teachers, pupils and parents, both locally and abroad.

1. From interviewees responses, it is evident that technology sparked off the reform. It was the value-add that technology could offer which started the chain of events. Admin 3 stated that, some teachers had gone to the Web and discovered some sites that gave them free accounts to create online assessments, quizzes, post online projects...so the thought dwell on me, why don t we have our own portal...if we have our own server, then we can allocate space and will have control over our contents. (23 February 2001). Teacher 3 said, we wanted to create a system and we know it had to be web-based... to harness the different utilities that the web could offer. (21 March 2001). In addition, Admin 1 said, The original intention was how to get the medium, the ICT medium where it will satisfy all the teachers in the school... (24 February 2001).

1. While most interviewees mentioned a high degree of management support and understanding, these evidences point more to the implementation of the reform. The idea for the reform came about after the school had discovered the power of the Internet, which enables communication, collaboration and sharing of resources both within and outside the school.

1. As the reform is still in the early stage of implementation, there is no clear evidence to show that technology speeds up the reform.

Hypothesis 2

The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and that therefore different diffusion patterns occur.

41. There is evidence to show that the school had intended the reform to be diffused in a way that is similar to the traditional diffusion pattern outlined by Rogers (1995). However, currently, the reform cannot be considered as having been diffused.

42. The school set up a small committee, comprising teachers, parents and a private company to brainstorm ideas for a system that is able to create an expanded and enriched learning environment to enhance teaching and learning. When the system was successfully set up, the HOD/IT started with training members of this committee in the functionalities of the system. The committee in turn helped to train other teachers and parents.

43. The management wanted the various Heads of Instructional Programmes to diffuse the reform to all the teachers in their departments. However, two interviewees mentioned that the HOD/IT faced the problem of convincing some of the Heads of Instructional Programmes of the value of the reform for teaching and learning. HOD/IT admitted, I would like very much to go down as a department head in charge of a subject...to translate this vision to another department head who is involved directly in mobilizing the teachers. It is very difficult, sometimes because they don t see the same outcomes as you have intended for. (8 March 2001). Teacher 1 highlighted the same problem in her statement, once he (HOD/IT) implements it, it will go to the Heads of Instructional Programmes to implement and drive their teachers. I think, he has problems with the instructional program heads and the instructional program heads have problems with our teachers. (9 March 2001). This problem, coupled with the fact that it is not made compulsory for teachers to come on board resulted in only a small number of teachers (GEP and Primary 3 English teachers) adopting the reform as pointed out by Teacher 4, at the moment, it s a very small group of us who are using the online lessons, it s a very small group. (27 March 2001). Teacher 5 also mentioned that, right now, not all levels but there are some teachers who have published e-lessons (online lessons) in The Portal. (10 April 2001).

44. Realising that only a small number of teachers and Heads of Instructional Programmes are adopting the reform, the HOD/IT formed a new committee called the IT Cube at the end of 2000. It comprises ICT competent teachers to help ensure the continuity of the reform and, at the same time, diffuse it to the larger teaching population. Teacher 2 pointed this out in her statement, He [HOD/IT] came up with a committee to assist him and train other teachers as well...in basic things...how to access The Portal, ...post announcements there, teach your pupils...and we [the committee] even have like small groups to help one another to sort of access it and put our lessons up there and we will present to them [other teachers] what we have done and how they could use the resources available. (9 March 2001). The HOD/IT said, the IT

Cube committee...my objective is for them to be trained in the administrative module and doing something like an online item bank and also training the other teachers. (8 March 2001). Teacher 1 also acknowledged the role of the committee in the diffusion of the reform in her statement, he [HOD/IT], has trained his people [IT Cube Committee], I think The Portal can continue, will continue. (9 March 2001).

45. The responses gathered from the interviews, therefore, clearly point to the fact that although the school tried to diffuse the reform in a way that reflects the traditional diffusion pattern, it did not occur as planned. Recognising this, the HOD/IT decided to diffuse the reform through a small group of teachers who form the IT Cube committee, to get the teachers who need help to approach them (IT Cube Committee) because they sit in the staff room with the rest of the teachers...more accessible for them (the teachers) to go to them (IT Cube) than to come to me in the HOD Room. (23 February 2001). Perhaps the IT Cube committee members may turn out to be more influential and effective than the Heads of Instructional Programmes in helping to diffuse the reform.

Hypothesis 3

 Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumes that teachers mediate ICT applications when they are successful, and that ICT s academic value relates positively to teacher competence. The rival hypothesis is that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.

46. In this case study, responses gathered from interviewees support the hypothesis that the successful implementation of ICT depends largely upon staff competence in the integration of ICT into teaching and learning.

47. Teacher 4 pointed out that the lack of ICT skills is a hindrance to successful implementation in her statement, Some of us still have problems in terms of doing a web page...you put IT at the back of your head [mind] because it s difficult to do...we really can t, we don t know where to fit it in. (27 March 2001). Teacher 5 also mentioned, Technology itself is a plus point but it needs a bit of coping...I ve heard of teachers who have sleepless nights over one lesson they have to prepare on PowerPoint...let the younger lot being more in touch with technology move faster...let the older teachers gain the confidence before they teach [using ICT]. (10 April 2001). Teacher 1 said, a number of teachers are still fearful of computers...no matter how hard you try to learn, you just can t retain...so with CD and even the search engine, a lot of teachers can t do...to carry out [ICT] effectively is not easy. (9 March 2001).

48. In the case of School 5, many teachers are not adopting the reform for teaching and learning because they are required to create e-lessons (online lessons) which also means they need to have the ICT skills to create web pages. Although all teachers were trained in FrontPage, they are still grappling with basic ICT skills. As a result, the teachers are not able to integrate the system into their teaching.

49. Staff competency in designing effective lessons is another factor which affects the successful implementation of the reform. Teacher 3 mentioned that a teacher determines the effective use of

technology in teaching and learning in his statement, It depends on the teacher, The Portal [technological infrastructure] will not decide how a lesson will be taught...You can have the most wonderful ICT thing on The Portal, the content may be there but if it s not within the context of the children s learning [pedagogy may be missing in the content], they will not learn. (21 March 2001).

50. The responses, therefore, clearly show that successful implementation depends largely upon staff competency in both in terms of technical skills and in terms of creating content for effective learning.

Hypothesis 4

Gaps in academic performance between high and low ability students will not increase when all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to high ability students increasing the performance gap with low ability students.

1. From the interviews conducted, there is no evidence to show that equal access to ICT will increase the gap in academic performance between high and low ability students.

1. Although Teacher 1 indicated that, they [higher ability pupils] also move at a faster pace [with the use of ICT] and you have to attend to the slower ones, it is difficult to pair them up, they want to work at their own pace, (9 March 2001) other interviewees gave the opposite picture. Teacher 3 said, I have seen low ability pupils really do marvellous things using computers...I have seen high ability pupils not knowing what to do, for me I think IT can be an equaliser. (21 March 2001). Teacher 5 added that, children nowadays, whether they are academically good or not, to them computer is something that they sort of like...the advantage will go to children who are more computer literate. (10 April 2001). Teacher 4 shares the same view in her statement, I don t think in any way it s going to affect the lower ability...in terms of going into The Portal and looking at lessons, I don t think there s any problem for the lower ability group. (27 March 2001).

1. As none of the teachers commented on academic performance in terms of grades, there is no evidence to confirm the hypothesis or the alternative hypothesis.

Hypothesis 5

The use of ICT will lead to the same or higher academic performance. The alternative hypothesis is that ICT use will lead to a lowering of academic standards.

54. From the interviews conducted, there is no evidence to indicate that the use of ICT will lead to higher academic performance or a lowering of academic standards. While 4 out of 5 teacher interviewees mentioned that ICT use motivates pupils to learn more and produce better quality work, they did not say if ICT has helped improve pupils academic performance. Teacher 3 said, Motivation for learning is definitely there (21 March 2001) and Teacher 1 said, when it comes to computers, most children are positive. (9 March 2001). Teacher 2 said, It is a plus point for them...knowledge, skills, definitely they have beyond the textbook and beyond resources available in school or home. (9 March 2001).

55. In addition, no study or survey was carried out by the school to find out the academic performance of its pupils in relation to ICT use. Hence, both the hypothesis and alternative hypothesis have not been proven.

Projection to the Future

56. According to Admin 3, the management is looking into enhancing the functionalities of The Portal. Admin 1 supported this by saying they are working on version 2 now. It s going to be a more sophisticated product. (24 February 2001). School 5 is working on increasing the number and types of resources in The Portal. According to Admin 3, I am focusing on the use of online databases... I m looking into video repository, virtual instructor, multimedia teaching packages using applets, Flash, Shockwave. (8 March 2001). Although the teachers are generally struggling to cope with ICT skills that they have been trained in, School 5 plans to send more teachers for training in new skills such as creating animation using Flash and digital movies.

57. As the reform is not moving as planned, the HOD/IT set up a committee at the end of 2000, which he calls IT Cube to provide further technical support, training of new teachers and administering The Portal. This committee comprises teachers who are more IT competent. The HOD/IT said, My objective is for them to be trained in the administrative module and doing something like an online item bank and also training the other teachers. (23 February 2001). Admin 2 also mentioned that to drive the reform, we re talking about building a bigger pool of people under the IT department...my other community people, my stakeholders can come in, we can communicate through The Portal too, then The Portal becomes like a whole community. (23 March 2001).

58. In view of the barriers the school needs to overcome, the management faces an uphill task in getting most teachers to come on board. Despite this, all the teacher interviewees feel that The Portal can continue, will continue as stated by Teacher 1. (9 March 2001). Teachers in School 5 generally accept their responsibility in carrying out any school initiative as Teacher 1 puts it, we just have to carry out the initiative, you just have to, it s not whether you re better off or not better off. (9 March 2001).

59. In conclusion, as the reform is in the early stage of implementation, more time is needed before we are able to tell if it can be sustained and further diffused. The same conclusion applies to the transferability of the reform to other schools.

Appendix A

Research Team

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Period of Study

Contact Period	Date(s) and/or Duration
First Meeting	4 January 2001
Data Collection Period	23 February 2000 10 April 2001
Follow-up contact (verification of data)	8 Mar 31 May 2001

Summary of Data Collected

Type and Quantity of Data	Average Time Spent	People Involved
10 Interviews	2 hours per interview	Ex-Principal Principal HOD/IT (Interviews done over two sessions) 5 teachers
2 Focused Group Discussions	2 hours per FGD	6 pupils 1 Parents FGD
3 Classroom Observations	1 hour per observation	3 Teachers and 123 Students
1 Meeting	45 minutes	Principal Head of Department

<u>Legend of Data Sources</u>

Admin 1	Ex-Principal
Admin 2	Principal
Admin 3	Head of IT Department
Teacher 1, 2, 3 and 4	Teachers involved in reform
Teacher 5	Teacher not involved in reform
Parents	2 parent volunteers
Students	6 Students in the Focused Group Discussion

Appendix B

OECD/CERI ICT PROGRAMME
ICT Practices Survey for Teachers at School 2 (Figures in Percentages)
   Number of staff members surveyed: 94
   Percentage of total staff: 78%

A	How comfortable are you with using a computer to do each of the following?				
	Ratings: 1 - Very Comfortable 2 - Comfortable 3 - Somewhat comfortable 4 - Not at all comfortable				
		1 %	2 %	3 %	4 %
1	write a paper	48	33	8	4
2	search for information on the World Wide Web (WWW)	22	36	14	10
3	create and maintain web pages	4	11	36	37
4	use a data base	8	18	27	35
5	develop a data base	6	9	31	46
6	send and receive e-mail	52	23	8	9
7	write a program	1	3	42	44
8	draw a picture or diagram	15	37	26	17
9	present information (e.g., use PowerPoint or equivalent)	25	38	22	7
B	How important is each of the following computer-related skills for your teaching?				
	Ratings: 1 - Very Comfortable 2 - Comfortable 3 - Somewhat comfortable 4 - Not at all comfortable				
		1 %	2 %	3 %	4 %
10	write a paper with a word processor	39	37	10	18
11	search for information on the WWW	24	40	12	8
12	create Web pages	5	21	39	26

13	use a data base	3	15	39	27
14	develop a data base	5	21	33	33
15	send and receive e-mail	23	37	21	8
16	write a program	9	14	27	52
17	draw a picture or diagram with a graphing/drawing application	19	30	30	13
18	present information (e.g., use PowerPoint or equivalent)	26	42	19	5

C	During the past school year, how often did your students on average do the following for the work you assigned?				

Ratings: 1 - Very Comfortable 2 - Comfortable 3 - Somewhat comfortable 4 - Not at all comfortable

		1 %	2 %	3 %	4 %
19	use the World Wide Web	4	10	38	39
20	create web pages	0	2	19	63
21	send or receive e-mail	5	11	26	49
22	use a word processing program	6	18	28	39
23	use a computer to play games	9	6	29	47
24	use a spreadsheet	1	2	7	77
25	use a graphics program	2	2	18	69
26	join in an on-line forum or chat room	0	2	9	78
27	use a presentation program (e.g., PowerPoint)	1	9	31	49
28	use an instructional program (including simulations)	1	2	25	64
29	other computer uses (please specify)	0	4	17	53

		Good %	Fair %	Poor %
30	How would you rate your ability to use a computer?	22	60	8

Answer questions 31 - 38 based on experiences or policies from the last school year.

				Yes %	No %
31	Was student computer use ever evaluated for grading?			15	74
32	Did you create or modify a Web site with any of the classes that you taught?			12	79
33	Did you participate as a student or instructor in a virtual course through the Internet/World Wide Web?			19	74
34	Did you involve your students in collaborative learning over the Internet/World Wide Web with students from other classes?			7	86

		All %	Most %	Some %	Little %
35	What portion of the computer use in your classes was directly related to the course content?	9	20	30	29

36	What portion of the computer use that you assigned was done by students individually?	3	15	25	42

		no restrictions %	some restrictions %	designated sites only %
37	If you assigned World Wide Web searching, how much freedom did you allow students in locating sites to visit?	7	23	31

		several times a week %	several times a month %	a few times %	never %	no computer %
38	If you have a computer at home, how often did you use it for preparing for teaching?	59	9	26	3	2

					Yes %	No %
39	Are you currently using technology to collaborate with other teachers (professional chat rooms, forums, network system or the like)?				20	74

		> 12 %	6 11 %	1 5 %	None %
40	How many e-mail messages do you send each week on average?	26	22	52	21

How many of the following have you ever done? Please tick the appropriate boxes.				
41	made changes to a computer s hardware			13
42	updated an application program (word processor, graphics program, etc.)			22
43	recovered a damaged file			12
44	created a web site			24
45	developed a data base			12

Appendix C

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[1] Gifted Education Programme website - http://www1.moe.edu.sg/gifted/gebr-gep/gebr.htm

[2] FastTrack@School - A project to provide broadband access at schools as well as content development on Singapore One.

[3] Digital Media Repository (DMR)   A repository offering a rich array of multimedia resources to enhance teaching and learning. The resources are housed in MOE server and teachers may view and download resources into the school s server for use in lesson.

[4] IT in Education website - http://www.moe.edu.sg/iteducation/masterplan/summary.htm

[5] Knowledge Village Pte Ltd

[6] The Ministry of Education has a commitment to ensure that the potential of each pupil is recognised, nurtured and developed. This means that it must provide an education of quality and relevance which stimulates individual growth and helps pupils realise their potential. Since children have different abilities, it is only educationally sound to provide all learners with educational opportunities that will allow them to move at their own pace and to develop to their full potential.

[7] asknlearn.com