

Report for

**OECD/CERI
Programme on ICT and the Quality of Learning
Case Studies of Organisational Change**

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Exeutive Summary

1. This is a summary of the 5 case studies conducted in Singapore for the OECD/CERI "Case Studies of

Organisational Change"

Site Selection

2. Seven main criteria were established for selecting the sites:

Table 1. Selection Criteria

S/N	Dimension	Criterion
1	Planning	A programme of reform which involves the use of technology to improve pedagogical practice(s).
2	Role of Technology in School Reform	For the school as a whole, technology has played a substantial role for at least two years .
3	Extent	The reform should be school wide in nature or planned to be school-wide in nature. School wide means that at least 50% of the teachers are/will be involved.
4	Significant Changes	School reform results in positive and significant changes in at least ONE pedagogical practice. These changes in the pedagogical practice(s) can be manifested in various ways, such as: <ul style="list-style-type: none"> ● of teachers and students ● practices ● of the curriculum ● materials"Infrastructure
5	Role of Technology in Pedagogical Practice	For the pedagogical practice, technology plays a substantial role in the practice in that technology should not merely replace previous practices but add value to the pedagogical practice.
6	Innovative Pedagogical Practices	The pedagogical practice should be innovative in nature, showing evidence of shift towards active student-centred learning . It should either be original or have significant enhancement over existing practices.
7	Sustainability and Transferability	The pedagogical practice is sustainable and transferable . There should at least be evidence or reasons to believe that the practice is able to be sustained and transferred.
8 *	Measurable Student Outcomes	Pedagogical practice shows evidence of measurable positive student outcomes . These outcomes could include: <ul style="list-style-type: none"> ● academic results ● motivation ● incidence of student-centred learning ● as spelt out in the Desired Outcomes of Education

* Criterion 8 is an additional criterion which will strengthen the case of a potential school reform/IPPUT candidate being selected.

3. A letter was sent to all primary schools, secondary schools, junior colleges and Higher Institutes of Learning, inviting schools to apply for participation in the study. In their application, schools were required to describe, in about one to three pages, the school reform and the use of ICT in the school.

4. 3 schools responded to the invitation. 4 schools were nominated by the Educational Technology Division in the Ministry of Education and encouraged to apply to be involved in the study. The schools were ranked according to the extent to which they met the 8 criteria, based on their description of the reform and use of ICT. The final selection decision was made by Singapore's National Expert Panel, which was formed for the purpose of SITES M2.

Overview of the Schools & Reforms

5. The 5 schools are listed in Table 2 with basic school information and a brief description of the reform.

Table 2: Selected Schools and their Reforms

School	Ages	Highlights	Description of Reform
1	17-19	Provides technical education; 1,500 students Mostly working class families	To enhance teaching and learning anytime anywhere using a web-based intranet platform.
2	17-22	Offers diplomas & advanced diplomas; 14,378 students	To realise the vision of learning anytime, anywhere using a web-based intranet platform. The focus of the study is on computerised tutoring and assessment and a mobile computing programme.
School	Ages	Highlights	Description of Reform
3	13-16	1,415 pupils; ICT demo school; Mostly middle & higher income families	To develop an effective communication channel so as to build a community within and outside the school and at the same time develop a caring and service-oriented culture using ICT. The platform used is web-based.
4	13-17	1,458 pupils; ICT demo school	To promote administrative excellence through the use of a web-based platform.
5	7-12	2,910 pupils; ICT demo school; Offers gifted programme; Mostly middle & higher income families	To create an enriched learning environment using an online platform.

Conclusions Regarding Hypotheses

Table 3: Summary of Hypotheses

School	H1-ICT as catalyst?	H2- Traditional diffusion?	H3- Staff competence as key?	H4-ICT & digital divide?	H5-ICT & higher standards?	Sustainability & transfer?
1	Y	A	Y & A	N	N	Y
2	A	Y	Y & A	N	Y?	Y
3	Y	Y	A	N	N	Y
4	A	A	N	N	N	Y
5	Y	N (provisional Y)	Y	N	N	N

6. Table 3 provides a summary of the hypotheses for the 5 case studies. A "Y" indicates that the hypothesis was confirmed. An "A" indicates that the alternative hypothesis was confirmed. An "N" indicates that no conclusion could be made.

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."

7. We had difficulty defining the meaning of "catalyst". After much discussion, we decided that it could mean:

a)technology sparked off/ignited the reform

b)technology caused the reform to take place at a faster speed than without the technology (it speeded up/added great value to the reform)

8. Although all five of our case studies involved the use of the World Wide Web, the researchers concluded that technology is a strong catalyst in only three of the cases. In these three cases, technology served as a catalyst in the sense that it was the value add that technology could offer which started the reform. In all three cases, the school staff viewed the reform as synonymous with the technology used. The objectives of the reform were possible or enhanced because of technology.

9. One interesting phenomenon is the different conclusion for school 1 and school 2 although both reforms were implemented as a result of the anticipation that the workforce of the future require technological skills. While the researchers studying school 1 saw technology as the catalyst, the researchers studying school 2 saw the mission of school 2 and their staff members to prepare their students for the future as the catalyst. In both schools, technology played an important role but so did the recognition by the schools that it is important to prepare their students for a future which involves the extensive use of technology. That having a vision is important is the conclusion for the study of school 4.

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."

10. For the two schools that did not follow the traditional diffusion pattern, the diffusion was top down. One reform involved the use of technology for administrative functions. To ensure the use of technology, alternative ways to perform these administrative tasks were removed so teachers had no choice but to adopt the reform. Although the other reform involved the use of technology in teaching and learning academic modules, the issue of who comes aboard the reform is purely an administrative decision, based on whether the module is considered a core module.

11. It is premature to reach a conclusion for school 5 because the reform cannot be considered diffused. However, there is evidence that school 5 plans to diffuse the reform in a way that reflects the traditional diffusion pattern.

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."

12. This hypothesis yielded many permutations of conclusions. The researchers also experienced difficulty deciding which factors determined the successful implementation of ICT.

13. It is premature to reach a conclusion for school 4 because it is too early to gauge if the implementation of ICT (the creation of web-based resources by teachers for instruction and learning) is successful. However, there is evidence that school 4 believes that staff competence is critical.

14. It is interesting that the conclusion for school 5 is also that staff competence is crucial. Both schools 4 and 5 involve teachers in the creation of web-based resources, which require technical skills and instructional design skills.

15. For the study of school 3, the focus was on the use of ICT for communication purpose rather than on the integration of ICT into instruction and learning. For this school, the technological infrastructure was the key issue; a break down in the infrastructure leads to a breakdown in communication.

16. With regards to school 1, besides staff competence, the researchers concluded that the technological infrastructure was also crucial. Teachers interviewed felt that their teaching is badly affected if the infrastructure is down.

17. Of the 5 schools, it is interesting that it is only in school 2 that student ICT competence is considered critical. School 2's strategy was to focus their beginning effort on students, to push their staff to use ICT by first getting their students to use ICT.

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."

18. Across all 5 cases, it was difficult to make any conclusion for this hypothesis as schools did not have relevant data on this issue.

19. It is interesting that teachers at school 1 and school 4 pointed out that motivation and discipline play an important part in determining academic performance, regardless of the ability of the student.

20. In school 2, the design of the computerised tutoring and assessment programs appeared to benefit the weaker students more in that they could learn at their own pace and take the final examinations only when they had achieved a certain level of mastery.

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."

21. It was difficult to make any conclusion for this hypothesis as most of the schools did not have the relevant data. Instead, the evidence pointed more towards an increase in motivation, team work, creativity, better understanding of concepts et cetera.

22. School 2 was the only school that did a comparison of failure rates amongst students who were involved in the ICT reform and those that were not. However, even in the case of school 2, the conclusion is not firm. It can only be concluded that the use of ICT may be one factor that led to better academic performance.

Sustainability and Transferability

23. As the reform in school 5 is still in the early stage of implementation and initial efforts to diffuse the reform were not successful, it is too early to conclude if the reform will be sustainable or transferable.

24. For the other 4 schools, there is a high possibility that the reforms will be sustained due to several factors:

1. plans to expand/improve the existing infrastructure
2. plans to extend the scope of the reform
3. clear vision with regards to ICT that is articulated to all staff members
4. school culture that encourages innovation
5. general belief that the use of ICT is unavoidable, is part and parcel of life in the future

25. With regards to transferability of the reforms beyond the schools, the reform at school 1 will be transferred to the other schools within the same institute as school 1. School 3 shared its reform with other schools within its cluster and 2 of these schools have come up with their own modified versions of the reform.