

## A Digital Classroom Revisited: Five years on...

### Case Study

#### ***Introduction***

This is a case study research project, which investigates the critical success factors in a digital classroom in an intermediate school. The original research was carried out in 2005 during a Master thesis on the critical success factors involved in the implementation of a digital classroom. The purpose of the study is to investigate the changes over a five year period in the critical success factors necessary for the implementation of a digital classroom in New Zealand. A single class teacher will be interviewed. A case study methodology will be used from which a profile of the classroom will be developed. The changes that have occurred in the digital classroom will be analysed. The results of the research will outline the changes in the success factors in the digital classroom model compared to the research undertaken in 2005 and the resultant change in the digital classroom model.

Ethics approval: The digital classroom teacher interviewed has signed an ethical contract with the researcher. Information sheet and consent form attached.

#### ***Main Question: How have the critical success factors involved in the implementation of a digital classroom changed over a five year period. What has influenced the changes?***

Sub Questions:

1. What is your definition of a digital classroom?
2. Has there been any change in the hardware/software/networking resources that a digital classroom needs?
3. What professional development have you taken in the last two years and how has this helped in the implementation of the digital classroom?
4. Has there been any change in the day to day organization of your digital classroom? If so what are the important changes?
5. How has your pedagogy used in the digital classroom evolved? What are the important factors?
6. How has your digital classroom continued to receive income and support from the school?
7. Early on your digital classroom was a pioneer concept in your school. Has there been any change in the perception of a digital classroom by the major stakeholders? School administration, parents and Board of Trustees?
8. What are the major changes that your digital classroom has undergone in the last four years and what is the reason for the changes?
9. What are the positive aspects of the digital classroom environment?
10. What are the negative aspects of the digital classroom environment?

11. Where do you see the digital classroom environment going in the next five years?

### Methodology

Case Study methodology: a profile of the digital classroom in 2009 will be developed then compared to the 2005 profile.

According to (Creswell, 2003, p. 105) "In qualitative study inquirers state research questions, not objectives or hypothesis. These research questions assume two forms: a central question and associated sub questions."

Creswell (2003, p.15) states that "Case studies, in which the researcher explores in depth a program, an event, a process or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time".

### Case Study Protocol

1. Design the case study protocol:
  - a. determine the required skills
  - b. develop and review the protocol
2. Conduct the case study:
  - a. prepare for data collection
  - b. distribute questionnaire
  - c. conduct interviews
3. Analyze case study evidence:
  - a. analytic strategy (define)
4. Develop conclusions, recommendations, and implications based on the evidence

This study aims to:

- Examine the changes in a digital classroom over five years
- Examine the influences on the changes that have been made
- Analyse the critical success factors
- Examine the original thesis digital classroom model and identify any changes that need to be made

In planning the case study I have used the following table for guidance:

1. The particular circumstances of the case	a. The possible disruption to individual participants	Contact by email to organize interview and question preview
		Organise interview at a time that suits teacher.
		Giving a maximum time period for the interview
	b. Negotiating access to participants	Working through the teacher
	c. Negotiating ownership of the data	Copy of case study will be given to teacher
	d. Negotiating release of data	Giving an approximate time when casestudy will be completed
2. The conduct of the study	a. The use of primary and secondary sources	Interview of teacher
	b. Opportunities to check data	Transcript emailed to teacher
		Interviews transcribed and re-checked
	c. Triangulation	Achieved by checking against thesis data and by sending analysis back to interviewed teacher
	d. Data collection methods	Used open-ended interviews
		Following correct interview practice
	e. Data interpretation and analysis	Analysis of interview transcripts
		Coding used to interpret interview transcripts
	Writing of the report	Separate conclusions from evidence
Balanced illustration with analysis and generalisation		

3. Consequences of research for participants	a. Anonymizing of the research participants	Coding used for names

Table 4: Case study guidance

Source: Cohen, L., Manion, L., & Morrison, K. 2000 p.189

### Interview Protocol

1. Interviewee was identified and contacted.
2. The purpose of the interview was explained and a date/time arranged for the interview.
3. From the research questions a list of open ended questions was formulated.
4. A interview consent form was sent to the Interviewee.
5. The signed consent form was given to the Interviewer prior to the Interview.
6. Permission was asked to digitally record the interview.
7. The interview was started; the interviewer did not take notes during the interview. The interviewer tried to make the teacher feel at ease by asking them to define a digital classroom at the start of the interview.
8. Interviewee was thanked at the conclusion of the interview.
9. Interview digital recordings were transcribed by the researcher.

### Introduction

The years from 2004 to 2009 in educational ICT terms have been marked by the introduction of the Web 2.0 internet applications. The internet has gone from the big CD ROM in the sky concept where web pages were to be just read to a collaborative social environment where web users can read, write and comment on web pages. Learning Management Systems have become more widely used for online learning. With the rise of the cloud computing environment may applications such as word processors can be accessed via a broadband web connection. The introduction of blogs and wikis has meant that people now have a voice on the web and an authentic audience to write to.

It is interesting that in my interviews conducted in 2004 the internet did not play a major part in the digital classroom other than a information resource and even then it was limited due to poor internet connections. No digital classroom had any use of a LMS (Learning Management System) and all software was sourced from the school network or loaded onto the local computers.

The purpose of re-visiting this digital classroom is change. How has the school/classroom changed? Have the students changed? How has the teacher changed? While society and the

whole school have undoubtedly changed in five years the aim of this research is to identify what changes have occurred in the digital classroom, teacher and students.

### Definition of a Digital Classroom

2004: It's not about computers really. It is about the pedagogy of teaching. The teacher needs to change the teaching style so it would fit in with the digital classroom environment using an inquiry process to learning.

2009: An effective teaching and learning environment where the use of ICT is apparent and being used in different ways. It is about developing skills more in the inquiry process.

Over the five years the teacher did not think her definition had changed. The development of an effective teaching and learning environment is still paramount where ICT is used to enhance the classroom learning environment. The inquiry process is still an important factor in learning. The focus is still on learning and teaching rather than on the 'digital' (technology, software, hardware factors). The teacher is also passionate about using ICT to enhance the learning in her classroom.

### Hardware/Software/Networking needs

2004: The class had a total of 20 desktop computers with the addition of 8 laptops which were owned by the individual students. The computer ratio in the classroom was one computer to one student. The computers were setup on tables around the perimeter of the classroom. The classroom size had been expanded to fit the computers in. The computers were run under a citrix dumb terminal server system where the computers downloaded their resources and programmes from a main server. The computers were slow however this was more cost effective than stand alone computers. The classroom also had access to school video and digital cameras, microphones, webcams. Broadband was available however students had to be staggered onto the internet. Air conditioning had also been installed in the classroom to keep the room cool as the computers generate heat when operating. Considerable thought had gone into the planning and modification of the classroom.

2009: All the computers are now stand alone and have been updated to multimedia specifications. Movie making is very processor intensive and the new machines cope very well. There are now four servers in the school and the cabling has been updated to fibre optic standard with a considerable increase in speed. The networking resources are now available in every classroom in the school. The computer ratio has also changed from one to one to a ratio of one computer to three students with an increase in groupwork on computers this will have implications for classroom organisation and pedagogy.

There are fewer students bring laptops as the school has a total of 250 computers in the school where as before there were far fewer computers available. There have been some liability issues where laptops have been dropped or the hardware has failed leading to issues between the home and school. If the students bring a laptop to school then a contract has to be signed which clarifies the liability. With the network being more sophisticated there are also issues with network access.

Adobe Visual Communicator is also used extensively by the students. Every morning the students create a daily television broadcast that is shown to all the school every day through

the school network. A television studio has been built where the screenings are recorded. The students present the news, school notices, weather, sports reports, birthdays and interview people. The visual communicator is also used for presentations in the classroom.

Changes to hardware/software resources: over the five years the computers have become faster and capable of running multimedia applications. The networking and broadband connection has improved. The introduction of Adobe Visual communicator in the school has meant that a group of students are responsible for the daily running of the television studio broadcast for the school. More importantly the digital classroom has moved from a one to one computer student ratio to one computer to three students. This will be discussed later in this case study.

### Professional Development

2004: The school was part of an ICTPD cluster. The facilitator visited the school for one day every five weeks. The teacher did not get satisfaction from the professional development offered by the cluster: the professional development was not all aimed purely at ICT and went in other directions. The ICTPD cluster contract did offer opportunities to attend ICT national conferences and an opportunity to visit best practice schools. There was some peer support from other teachers in the cluster. A mixed bag of professional development, at this stage the teacher was not leading ICT PD within the school because of the cluster support.

2009: The teachers main role is a leadership role in facilitating ICT PD to the staff in the school. The teacher has been leading a group of teachers in the school in developing their own concepts and pedagogy in a digital classroom. The teacher has been undergoing professional development herself in an aspiring principals course. One of the projects was enhancing student achievement through digital learning. The teacher was working with a group of six teachers in the school. However getting the six teachers together regularly for face to face professional development was difficult. The teacher had organised the Learning Management System Moodle to be loaded onto the school server so this was used to provide professional development for the teachers. An online course was set up in Moodle and introduced to the teachers. An area was setup where the teacher could communicate with the teachers and vice versa. Discussion forums and wikis were used to guide the professional development asynchronously. At the beginning a wiki was setup in Moodle to facilitate the creation of a vision statement for what digital learning was at the school. All the teachers went onto the the wiki and modified the original 2004 statement. After a couple of months a brand new statement was developed for the school. This was found to very successful as it meant that all the teachers had a say in the digital learning vision and they were all able to see how it developed over time. Everyone involved also had an ownership of the vision and were more likely to work towards the vision for the benefit for the learners enhancing learning integrating ICT. This also had a flow on effect in that one of the teachers then started using wikis in her own classroom. This also occurred with the other teachers involved in the enhancing student achievement through digital learning project.

The second part of the professional development through Moodle involved the effective use of PowerPoint in the classroom. Online forums were setup on what are the best practice was for teaching and using PowerPoints. Teachers got very involved in reading other teachers postings and commenting on the other teachers views. Examples of PowerPoint's were also uploaded to the forum so other teachers could look at them and comment. The use of PowerPoints moved away solely as a presentation tool to use as e-books and the use of

external hyperlinks. Teachers started experimenting with PowerPoint's and trying new ideas. The professional development was concluded with a discussion on what is the best practice for using PowerPoint's in the classroom.

Changes to professional development: The teacher has moved from a participant in professional development to a leadership role within her school. Moodle has been very successful in meeting the needs of the teachers in delivering asynchronous professional development. The teachers have participating in forming a new vision of digital learning within the school which is owned by the participating teachers. Online learning has also been used to deliver professional development in effective pedagogy to use with powerpoint.

The online professional development has been rated as being very successful, it was available 24/7 and it met the needs of six very busy teachers within the school. The Moodle based online professional development has allowed the group of teachers to access professional development and cooperate together to formulate an eLearning policy document for the school. The teachers are very involved in running events and programmes within the school they have little non-contact time for professional development. While the online professional development met the majority of the teachers a couple of teachers struggled to understand the concept and their participation was limited. For these teachers there was no flow on effect into their classrooms.

#### Organisation of a Digital Classroom

2004: The classroom has been extensively modified with twenty desktop computers setup on tables around the perimeter of the classroom. Five large tables are set up in the middle of the classroom for group work. The classroom had been extended from a normal classroom through the removal of a toilet block.

The computers are used for core subjects in the morning until interval. Extensive use is made of group activity on the central tables for brainstorming and group work. The students then go to the individual computers to complete individual tasks. After interval the students have a technology period in which they go to the specialist teachers. In the afternoon the students complete the topic based subjects where ICT is integrated as much as possible. An example is claymation videos are made with the students. Internet activities such as working on the Learnz projects have been carried out.

2009: There have been major changes in the internal organisation of the curriculum programming within the school and this has impacted on the digital classroom. In 2004 the school was running on a modular timetable where all students in a block had English, Social Studies and it ran on a timetable like a High School. Now the school has changed to an integrated system where the teachers have their own classes more and the curriculum is more integrated. The day is now divided up into a morning session, a middle session and an afternoon session. This means within a digital classroom the flow happens more smoothly where as with the modular system once the bell went the students had to stop what they were doing and move to another class. This means the teacher can play for more integration between subjects and merge subjects together. For example the inquiry could last a whole morning where the students can be collecting their resources using ICT and move onto the next inquiry stage seamlessly. It is up to the teacher to plan how ICT is integrated into the morning sessions.

The negative impact is that the teacher no longer has her class in the afternoons to concentrate on a specific ICT activity. For example in the afternoons the teacher might plan a unit around creating Claymation movies. The teacher feels that the opportunity has gone for the students to engage in the fun and motivating part of ICT they are only seeing the work side of ICT. In the past in the afternoons the students would spend time creating movies, entering web site creating competitions and working in groups on an ICT integrated presentation. During the core subjects time in the morning ICT is integrated but the students are not using ICT in depth like they used to.

## Digital Classroom Pedagogy

2004: The overriding pedagogy used was the constructivist pedagogy. The teacher's aim is to set up her students for independent learning. The teacher takes a facilitators role and often takes a step backwards to observe the learning in the digital classroom. The initial setup of the classroom takes a lot of effort but once established the classroom runs very independently. During the year the teachers role moves from being initially teacher directed to a facilitators role. This is a key part in the organisation of a digital classroom: the teacher's pedagogy. The teacher aims to empower the students so they become responsible for their own learning. The students are highly motivated and use the inquiry process as a major part of their learning. The integration of ICT helps to facilitate this process.

An inclusive supportive class atmosphere aids the learning. Through collaboration and shared learning the students produce a large amount of work. This is usually saved electronically. The teacher uses the ICT environment for planning, guiding and evaluating the learning.

2009: The teacher reflects that five years ago the pedagogy wasn't about the learning, it was about the thinking. Now it is about empowering the students to facilitate their own learning. The teacher is trialling a system where the students are involved in planning their own learning. The students have identified their preferred learning style. This identification of their preferred learning style leads on to working in groups with students who have similar learning styles. They also have investigated Blooms taxonomy and the Solo taxonomy pedagogy. Together as a class they are designing their own learning programme. The students use a rubric system to design their learning activities. For example if the student is a kinaesthetic learner they design the kinaesthetic learning activities under the umbrella of the topic.

The teacher is personalising their learning. In the class for example the kinaesthetic learners would work together and come up with some activities that suit their learning style. Not only do they design their learning activities but they come up with some success criteria as well. The personalising learning also leads to the students being more active in the learning process and also success criteria as well. This leads onto the importance of self assessment in the digital classroom. Students have ownership of their learning: they are empowered learners.

One of the things that haven't changed is that the students are still doing the majority of the work in a digital way. Previously in the one to one digital environment the students were working longer individually on the computers. In 2009 there is more emphasis on group work using the computers. There is now one computer to three students in the classroom. At times when a one to one ratio is needed then the teacher takes a group of students while one group works independently and the other group works individually on the computers. With the one to three ratio there is more collaboration and group work happening in the classroom. There



is considerable movement in the classroom as students move between the different learning zones, working in a collaborative group, working with a teacher and working individually or in groups on a computer. An example is they can sit next to three computers together and work as a group or they can work at the central group tables and send one student to the desktop computers as the need arises to locate information that the group needs.

Regarding assessment there is a lot of self assessment happening in the classrooms. Along with peer assessment self assessment are the strongest points of assessment used. Summative assessment is still used at the conclusion of the learning. Self assessment and peer assessment are used as formative assessment. Overall there is a mix of summative assessment directed by the teacher and formative assessment that is carried out in their learning groups.

The students save the records of learning in their own network folders. The school is in the planning stage of introducing an ePortfolio system which will integrate into Moodle. Mahara is the software that is being looked at.

### Stakeholder perception

2004: The teacher felt very well supported by the Board of Trustees. The Board has provided funding and support for the modifications to the classroom and the installation of air conditioning to keep the classroom cool in the summer.

The Principal is also very supportive of the digital classroom concept and has an interest in the use of ICT to support learning. The teacher has also reported that the parents are very supportive of the digital classroom concept. The teacher has constructed a webpage as part of the school website where students homework is posted and there is a gallery of classroom photos available. The parents check the website regularly and at a parents evening there was a 95% turnout.

The digital classroom is well supported by all the major stakeholders from the school in the areas of funding, teacher support and parental support.

2009: The digital classroom is still funded by the school and there is no charge on parents. The principal and Board of Trustees are still very supportive. If the teacher requests anything to support the learning in the digital classroom the response is positive.

The feedback from the parents is that they wanted their children to be in a purely digital classroom are feeling frustrated that “their digital kids” no longer have the opportunity to learn in a digital programme.

Some students still bring laptops to the school and the school provides software under the license with the Ministry of Education and Microsoft. However the practice of students bringing along their own laptops is not encouraged as at the end of the year all the school software has to be removed. Also a laptop was dropped and another had the hard drive wiped which put the school in an uncomfortable position. A contract is now signed between the school and the parent which clarifies any liability issues.

In 2004 the digital classroom was full on digital, every student could access a computer on a one to one basis. Now the philosophy has changed and the school has put between six and twelve computers in all the classrooms. The concept is now that all classrooms are digital.

The view of the teacher interviewed is that although all classrooms are digital not all the teachers in the classrooms are digital. The use that the ICT equipment gets varies, some computers don't even get turned on during the day while other teachers want more computers in their classrooms. The teacher feels that making every classroom 'digital' has weakened the digital classroom concept. In the first years of the digital classrooms the students had to go through an application process to gain access to the digital classrooms. Entry to the digital classroom was then seen as special. The students were genuinely interested in using ICT to enhance their learning and were well motivated. This was also indicated by the student survey that was taken in 2004 (Roberts, 2005). Now the students are just placed in a classroom which is no longer identified as being specially digital. There is no longer an application process or interview setup for those students who want to be in a digital class. Even students who have not applied to be in the interviewed teachers digital class are placed in the classroom as part of a mainstream placement. Every classroom is digital and mainstream. Although the teacher has identified that students in her class identify the classroom as being more digital than others, not because of the ICT equipment but because the teacher teaches in a digital way.

The specialised concept of the digital classroom has gone, every class is now identified as digital. The main difference is that some teachers teach in a 'digital way' where as other teachers teach in the normal face to face way using traditional pedagogy. The interviewed teacher still see herself as a digital teacher because of the constructive pedagogy that she uses.

Changes in the digital classroom concept over the last five years.

2004: In 2004 the digital classroom was a very good example of a constructivist learning environment. The teacher's role was of a facilitator and a student centered learning environment was set up in the digital classroom. The emphasis was not on the technology but on the student and the inquiry process. Most of the student learning took place in the classroom apart from students viewing homework on the school website from home.

Twenty desktop computers were setup around the perimeter of the classroom and the central tables were used for group work. After brainstorming and group work at the central tables the students moved to the individual computers on the perimeter of the classroom for individual tasks. Although each student has an individual computer group work was used extensively in the classroom.

2009: The biggest change since 2004 is the introduction of the learning management system Moodle into the classroom. The teacher feels Moodle has opened up the classroom in amazing ways. The students feel they are very special and are extremely motivated to use Moodle. Each student has their own user name and password which gives them ownership of their learning space. The students are very motivated to login to Moodle and the students complete every task the teacher loads up for the students to complete.

Most of the class work is now Moodle based, the teacher loads up forums/discussions and the students can access their homework tasks through Moodle. The previous class was also

submitting their completed learning tasks through the Moodle assignment tool. The teacher has also set up quizzes for the students to complete. One example is a quiz called word power. The students have 10-15 questions to complete on word meanings with a time limit. They work in teams with a dictionary and thesaurus to try and solve the questions within the time limit.

Another course that has been set up is called thinking. In this course the teacher has placed templates for all the graphic organisers. So if they are doing their work and need a Y chart or Venn diagram they log on to Moodle and download the templates. The students then save the document to their network space and work on it from there. The thinking Moodle occurrence has become an online resource for higher order thinking skills and inquiry. The students can log on to the site when needed and download ICT tools to help them in their learning. In this way they are developing independent learning skills.

A recent example of the use of Moodle is the unit on Destination New Zealand. The aim is to understand why New Zealand is being promoted as an international tourist destination. In the moodle site the teacher had loaded some activities for the students to complete and links to websites to assist with their study.

Moodle chat was used last year with the students, initially the students went through a social chat stage, informal chats which led onto chats where the students chatted to share information about their studies questions pertaining to their inquiry investigations. This years class is not so mature and did not make the transition from informal chat to chats centered around learning. The chat application has been disabled for this year's class as it was used more as a putdown rather than being constructive. However this did penalise those students who were using the chat constructively.

Moodle has been used for many things in the teachers classrooms. Student blogs have been setup that only the teacher and the student can access. They are called learning journals to reflect on their learning. The teacher is able to read and comment on reflections which is empowering for both the learner and the teacher.

Forums are also used extensively in Moodle. According to the topic being studied the teacher will post up a forum discussion. The students will then be directed to contribute to the discussion. The students have to post their thoughts and also reply to another students posting. This was started by posting up a current events discussion. The students were then invited to put up a current event, making sure no one else had posted the same current event. They would then reply to another students posting on a current event. They could add their personal opinion or add more facts. In this way a collaborative online discussion was facilitated.

Toward the end of the year a forum was stimulated with one word "Chocolate". By the end of the week everyone had contributed to the discussion. The forum contained facts, recipes and health issues around chocolate. This also led to an interesting informed discussion on obesity. The direction and content was student led and could be contributed from both school and home.

Wikis has not been used by the students it was used just for professional development for the teachers.

Homework is put up regularly on Moodle. Parents have been sent a newsletter explaining that the homework is on Moodle with the login and access details. The students can also login to Moodle from home and access any uncompleted work from class. The quizzes were also opened from home and the students were sharing the quizzes with other members of their families. So Moodle was breaking down some of the barriers between home and school.

Moodle access has been kept open to all students. The main aim of Moodle is sharing, sharing resources. Initially all classes were setup with access to Moodle, however if the teacher does not setup activities then they will not be used by the students. The teacher interviewed was very passionate and active with using Moodle and the students in the class became high users of the learning management system.

The network administrator and the teacher were the only people at the school that had administrative rights to create new courses within the school Moodle site.

The teacher has gained a recent promotion to another school and the students are very concerned that the Moodle site will disappear.

References:

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education*. London: Routledge Falmer.

Creswell, J., W. (2003). *Research Design* (Second ed.). Thousand Oaks: Sage.

Roberts, M. (2005) *The critical success factors involved in the implementation of a digital classroom in New Zealand*. Unpublished master's thesis, Unitec, Auckland, New Zealand.

Tellis, W (1997, August 11) *Application of a case study methodology*. Retrieved August 11, 2009 from <http://www.nova.edu/ssss/QR/QR3-3/tellis2.html>