Abstract: This study reports on a study that examined what actually happens when young learners in a primary school go from learning about information and communication technologies (ICTs) to learning with and through ICTs. The study focuses on how the students used learning technologies and how teachers perceived the affordances of technology before and during the time when Swine Flu closed the school for 3 weeks, and teachers were required to use ICTs to support learning at home. This gave the researcher a unique opportunity to assess the capacity of young digital natives to use Web 2.0 technologies to support their learning, and the impact on teacher views and practice. Design Research methodology was used to guide the study. Data generated included interviews with teachers and examples of student’s work. The data provides a unique insight into how teachers and students responded when Web 2.0 applications and a Learning Platform were placed at the centre of the learning environment. The study proposes an ‘Energy of Activation’ model to explain how changes in the balance of forces that normally maintain the status quo can create a ‘tipping point’, creating conditions that foster innovative teaching practices. The findings also demonstrate how confident and comfortable young learners are with new technologies but questions the prevailing assumptions about the capacity of digital natives to re-purpose Web 2.0 as learning tools. The author examines whether the levels of interest, participation and engagement by students seen in this study can be sustained in the long term once the use of Web 2.0 technologies become more persuasive. Further work is needed to study how young people respond as more teachers use greater varieties of technologies, more of the time.
I hereby declare that this dissertation (or project) represents my own work and that it has not been previously submitted to this University or any other institution in application for admission to a degree, diploma or other qualifications.

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(Date)
<table>
<thead>
<tr>
<th>Chapter One</th>
<th>Justification for research questions and area of enquiry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theoretical Perspectives</td>
</tr>
<tr>
<td></td>
<td>Justification for research questions</td>
</tr>
<tr>
<td></td>
<td>Introduction to the School</td>
</tr>
<tr>
<td></td>
<td>Outbreak of Swine Flu</td>
</tr>
<tr>
<td></td>
<td>Curriculum Design</td>
</tr>
<tr>
<td></td>
<td>Theoretical Perspectives</td>
</tr>
<tr>
<td></td>
<td>Energy of Activation</td>
</tr>
<tr>
<td></td>
<td>The Drivers for Systemic Change</td>
</tr>
<tr>
<td></td>
<td>Innovative practices before Swine Flu Closure.</td>
</tr>
<tr>
<td></td>
<td>Innovative practices during Swine Flu Closure.</td>
</tr>
<tr>
<td></td>
<td>Energy of Activation Model</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter Two</th>
<th>Literature Review</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affordances of Web 2.0</td>
</tr>
<tr>
<td></td>
<td>Case for Educational Reforms</td>
</tr>
<tr>
<td></td>
<td>Sustainable innovations</td>
</tr>
<tr>
<td></td>
<td>Curriculum Design</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter Three</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lessons from the Literature</td>
</tr>
<tr>
<td></td>
<td>Research Design</td>
</tr>
<tr>
<td></td>
<td>Data Sources. Pre Swine Flu Closure</td>
</tr>
<tr>
<td></td>
<td>Teachers’ attitude survey</td>
</tr>
<tr>
<td></td>
<td>School Leaders Survey</td>
</tr>
<tr>
<td></td>
<td>Students’ use of technology prior to Closure</td>
</tr>
<tr>
<td></td>
<td>Students’ use of technology during the Swine Flu closure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter Four</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teachers’ perceptions of technology before the school closure</td>
</tr>
<tr>
<td></td>
<td>Rogers Model. Issues</td>
</tr>
<tr>
<td></td>
<td>Teachers’ perceptions of technology during the school closure</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
</tr>
<tr>
<td></td>
<td>The impact of the Swine Flu closure on students’ learning behaviours</td>
</tr>
<tr>
<td></td>
<td>Analysis of Forum Posts in Years 2, 4 and 5</td>
</tr>
<tr>
<td></td>
<td>Analysis of all Digital Content from Years 2, 4 and 5</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter Five</th>
<th>Discussion and Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How did teachers’ perceptions of ICTs change?</td>
</tr>
<tr>
<td></td>
<td>The impact on students learning</td>
</tr>
</tbody>
</table>
behaviours
Does the evidence support this view?
Do Digital Natives have distinctive learning styles?
Are students feel disconnected from the schools and education?
Conclusions

References and Appendices A to E

Figures and Tables

Figure 1: Rogers’ Diffusion Model of Change. After Rogers (1995 and Norman 1998)
Figure 2: The Energy of Activation Model. Exothermic or Sustainable Change Version
Figure 3: The Energy of Activation Model. Endothermic or Non-Sustainable Version
Figure 4: Influences on students’ experience of ICTs
Figure 5: Alignment Model
Figure 6: Rogers Diffusion Model. Amended
Figure 7: Page views on the Learning Platform by students during school closure from June 13th to End of Term
Figure 8: Analysis of email correspondence during Swine Flu closure
Figure 9: Total Number of Posts and Views recorded by students in Years 2, 4 and 5

Table 1. Comparison of UK ICT curriculum model with the School’s Learning Technology Model
Table 2. Models of Change
Table 3. Comparison of BECTA and Newhouse Frameworks for evaluation of ICT curriculum
Table 4. Timeline of Project Milestones
Table 5. Summary of Data Sources used during the Academic Year
Table 6. Analysis of Teachers’ Professional ICT Attributes at the School
Table 7. Learning Activities used to expand learning capacity using Web 2.0 and a learning platform
Table 8. Learning Activities used during the Swine Flu Closure
Table 9. Summary of Data Sources used during the Swine Flu Closure
Table 10. Themes identified from student-generated content during Swine Flu Closure (see also Appendices B to E)
Table 11. Examples of how technology was used to enhance and extend the learning outcomes of existing activities
Table 12. Examples of how teachers adopted Learning Technology during work at home
Table 13. Examples of student Posts from Forums
Table 14. Examples of Dextrous Digital Natives
Chapter One

Introduction

Justification for Research Questions

Watching videos such as ‘Did you Know’ (http://www.youtube.com/watch?v=pMcfrLYDm2U) or ‘Pay Attention’ (http://t4.jordan.k12.ut.us/t4/content/view/221/35/), often to the haunting music from ‘Last of the Mohicans’, creates presentations which suggest that we are in the throes of a digital revolution. Alarming statistics declare the exponential growth in computing power, ubiquitous access to technology by a generation for whom connection to the internet is woven into their DNA and who claim they have to ‘power down’ when they are in school. It is a heady cocktail instilling in some a sense of moral panic and for others the euphoria of techno-romanticism. Within the research community this has spawned papers about the learning behaviours of ‘digital natives’ and the capacity of schools to meet their learning needs. At the same time questions are being asked about the validity of the evidence and whether this supports the claims for significant reforms in current education and classroom practice. Technology has often been linked to radicalisation of education and this episode is especially seductive because the drivers for change come from the learners themselves not from the leaders. This opens up are two interesting lines of enquiry which form the basis of this study.

Areas of Enquiry

Two strands are identified, the first being the advocacy for a ‘new age’ in education is supported, on the one hand, by the wealth of statistics from studies such as Lenhart and Madden (2005) on teenage use of the internet or the CERI study on the New Millennium Learners (2007). These papers present extensive data contrasting young
peoples’ use of technology in and out of school and suggest that the use of technology by young people has reached a pandemic order of magnitude. Prensky, in two papers (2001a) and Prensky (2001b), draws on this data and introduces the concept of Digital Native and Digital Immigrant. Prensky describes a generation who do not know a world without Google, and who inhabit a digital landscape which has changed the way they think. This is supported by the writing of Tapscott (1998) who argues that the ICT capabilities of Digital Natives are so extensive that it is simply no longer appropriate to even attempt to define their learning through an ICT curriculum.

However a literature review (Bennett S, Maton, Kervin 2008 and Kennedy. G., Krause, K., Judd, T., Churchward, A. & Gray, K. 2006) reveals that there are questions about the evidence base for these claims and there is a need for more research on how students use ICTs and Web 2.0 technologies in an educational as opposed to a social context. This suggests a line of enquiry about the prevailing notions of digital natives, and whether they can transfer these skills into productive learning behaviours and whether existing learning environments have the capacity to meet their learning needs.

The second strand emerges from the sense of moral panic evidenced in studies which examine the wider impact of ICTs such as Web 2.0 on the design of schools and curriculum. There is a view within the educational community that the democracy of Web 2.0, where everyone is a potential author, publisher and critic and where access to information is just a click away, must inevitably undermine the traditional hegemony enjoyed by educational institutions about where, how and when learning takes place. The source of these concerns often comes from outside education. For example Wikinomics by Tapscott and Williams (2006) theorises and celebrates the idea of
widespread collaboration between producers and consumers – the Prosumers – mediated by new technologies such as Web 2.0. Tom Friedman's in *The World is Flat* (2005) argues that the arrival of global connectivity has fundamentally changed the dynamics of human relationships. Brown and Adler (2008) in 'Minds on Fire: Open Education, the Long Tail, and Learning 2.0 summarise many of the arguments for educational design to be transformed. What this amounts to is a gap between the hopes and aspirations for ICTs as an agent for reform and the evidence base which informs us about how young people actually use these technologies. These observations suggest that more questions need to be asked about teachers perceive the implications and affordances of new technologies and, in particular how this impacts on their perceptions about the relationship between learning technologies and curriculum design. From these two strands two key questions emerge:

1. What is the impact on student learning behaviours when they move from learning about ICTs to learning with and through ICTs?

2. What is the impact on teacher behaviour and attitudes when circumstances force changes in the way students’ learning is managed?

These then suggest the following lines of enquiry:

3. How well do students understand and how able are they at applying ICTs such as Web 2.0 and other social media?

4. Are all digital natives are the same are they equally enthusiastic about creating and publishing content through social media. In other words how motivated are they to re-purpose and normalise ICTs such as Web 2.0 into their learning behaviours?

5. How valid are the claims of Prensky and others that the Net Generation are adept at processing information quickly and prefer non linear ways of thinking?
6. How valid are the claims of researchers such as Selwyn (2006) and Levin and Arafeh (2002) that today’s students feel digitally disconnected when in school, and are bored and indifferent to what happens in conventional classrooms?

7. How do teachers and school administrators respond when new ICTs such as Web 2.0 are introduced into their school and what influence does this have on their perceptions about the relationship between technology and learning?

It will use evidence from a long term study in an international primary school where ICTs such as Web 2.0 and a learning platform became normalised within the learning environment (in this study the use of ICTs focuses on Web 2.0 applications).

The opportunity to explore these issues through a longitudinal study became possible when the author returned to teaching in an international primary school. This also created an opportunity to ask what Selwyn (2008) calls ‘state-of-the-actual’ questions about what actually happens when technology meets the classroom from the lived in perspective of those who are using (and those who are not) technology in their school.

**Introduction to the School**

The study was situated in an established international primary school which had consistently enjoyed a strong reputation for the quality of education and excellent examination results. Until 2008 the primary curriculum was largely based on the UK National Primary Strategy but, with recent changes in leadership, this model was being adapted to incorporate the best of practice from the International Baccalaureate (IB), Canadian and Australian curriculum designs. A distinctive feature of the curriculum model was the number of subjects taught by a specialist teacher and the secondary nature of the timetable in years 3 to 6 with children having up to four teachers. During
the period of the study the staff were undertaking a curriculum review and re-writing
the curriculum in all subjects.

Previously the provision for the use of information and communication technologies
(ICTs) followed the conventional model of weekly discrete double lessons for each class,
taught by an ICT specialist in a well equipped ICT Room. The previous ICT teacher left in
2008 and this gave the school the opportunity to change the focus from teaching about
ICT to learning with and through ICTs. The Deputy responsible for Learning Technology
and Head of Primary actively sought to appoint a teacher who could facilitate much
closer links between Technology and Learning. Prior to this shift in focus ICTs were
perceived and delivered as a separate subject and the students experience of ICT was
carefully aligned to the UK’s National Curriculum for ICT. A few additional topics were
added to reflect the expertise of the teacher but students largely learnt how to use
applications like Word, Excel and PowerPoint – which they did well. They learnt how to
create and manipulate databases and use simple control devices like Turtle. They
enjoyed doing digital Art using Tizzy’s first Tools or Textease (both from
http://www.lightbox-ed.com/) and some created videos. Other teachers were happy
with this model as it reflected the general practice of other specialist subjects in the
school.

The arrival of a new ICT teacher/researcher experienced in the use of Web 2.0 and
learning platforms, supported by a senior management keen to see greater integration
between technology and learning, created an ideal environment within which to study
the assumptions about digital natives. This began as a long term study using Design
Research methodology to collect data on students learning behaviours, staff perceptions
of technology and leadership expectations with the aim of creating a 360 perspective on
what actually happens when new technologies and new ways of learning are introduced.

**The Outbreak of Swine Flu**

However the outbreak of Swine Flu in June 2009 created a unique opportunity and the project became a story in two parts. The first half covers the period during which the primary students in an International school are exposed to Web 2.0 technologies and a custom designed Learning Platform. The second half is a moment of exceptional opportunity close to the end of the academic year, when the Swine Flu Pandemic enforced the closure of the school for three weeks. The students were required to work at home and the teachers had to manage learning from school both had to find creative ways to use the digital tools and resources available to them. In 2007 the school implement a contingency plan to support on-line learning in the event of a school closure. This used the school’s website to publish learning resources for parents to access. All parents had access to this through a Portal and a trial was conducted in 2007, from where they could download worksheets. In September 2008 a Learning Platform was deployed in the International Primary School Department and this was largely managed by the new ICT teacher and this was also used to support on-line learning during the school closure in 2009.

Put together these events created a moment of serendipity that served to bring into sharp relief the actual behaviours and capability of young digital natives. It is not a study proclaiming the technical agility of digital natives or the promises of 21st Century Learning; rather it is a story about a typical school with good connectivity and access, committed teachers concerned about getting the best for their children, who begin a journey into the digital frontier. It is not about a school that has deliberately set about
to transform itself into a school of the future or has embarked on an expansive 1-to-1 laptop programme.

**Curriculum Design**

Previously the provision for the use of information and communication technologies (ICTs) followed the conventional model of weekly discrete double lessons for each class, taught by an ICT specialist. The arrival of the new ICT teacher resulted in the ICT Curriculum being largely abandoned especially in Key Stage 2 and being replaced by a series of ICT activities designed specifically to support existing schemes of work, mainly in General Studies. In effect a retro-fit model of ICT planning was adopted. By the Spring Term these changes became formalised as part of the on-going curriculum review and a new curriculum model for Learning Technologies was proposed based on the Tasmanian ICT Framework. Table 1 compares the school’s ICT previous curriculum (based on UK national curriculum for ICT) with the new ICT Framework. It illustrates the shift from planning for technology to planning for learning or learning with and through technology, rather than about technology. The Learning Technology curriculum was built around learning skills – about increasing learning capacity rather than ICT capability. So, for example, learning technology activities were designed to promote learning outcomes such as communication skills, thinking skills, enquiry skills – skills which were readily understood by non ICT specialists. In practice the new curriculum made it far easier to make connections with class teachers because it was possible to mould the ICT lessons around the topics the students were doing in their mainstream topics. This issue is discussed in more detail using the Alignment Model in Chapter 4 which shows how changes in curriculum design can facilitate stronger integration between the affordances of technology and learning outcomes.
Table 1. Comparison of UK ICT curriculum model with the School’s Learning Technology Framework

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<th>UK National Curriculum for ICT</th>
<th>New Framework for Learning Technology</th>
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<td>Learning about ICT defined by four strands:</td>
<td>Learning with and through Technology defined by:</td>
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<tr>
<td>• Finding things out</td>
<td>• Inquiring with Learning Technology (Students use Learning Technologies for inquiry and research).</td>
</tr>
<tr>
<td>• Developing ideas and making things happen</td>
<td>• Creating with Learning Technology (students use Learning Technology to be creative in the way they extend and represent their thinking skills).</td>
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<tr>
<td>• Exchanging and sharing information</td>
<td>• Communicating with Learning Technology (students use Learning Technology to enhance communication).</td>
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<tr>
<td>• Reviewing and modifying work as it progresses</td>
<td>• Operating Learning Technology (students gain an understanding of the systems they are operating).</td>
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- Choice of technology reflects age related assumptions about progression and continuity.
- Choice of technology reflects learning needs.
- Emphasis on using installed applications.
  - Emphasis on using web 2.0 or Free and/or Open Source Software (FOSS) applications and digital tools within the learning platform.
- Self contained units of work; difficult to synchronise with mainstream.
  - Highly flexible learning activities informed by learning outcomes of class teachers.
- Focus on developing ICT Capabilities.
  - Focus on developing Digital and Information Literacies in all activities.

Summary. The change in the ICT landscape as the focus shifted to learning through ICTs, (resulting from the introduction of technologies such as Web 2.0 within a learning platform) combined with a significant change in curriculum design, created the opportunity to assess the impact of ICTs on students’ learning behaviour. Expanding the context in which ICT were used to support learning, especially when Swine Flu closed the school, created the opportunity to study how teachers respond when students’ learning had to be managed on line. Understanding how the teachers responded before and during the school closure is examined in the next section which examines two theoretical perspectives – the Rogers Diffusion model and introduces the new Energy of Activation model/
Introduction to Theoretical Perspectives

This section examines theoretical constructs which can help explain the systemic changes that occurred before and after the arrival of Swine Flu. Without a theoretical construct it would be difficult to make any generalisations or to suggest recommendations from the data about teachers’ behaviours and attitudes. Clearly changes did take place in class teachers’ perceptions of learning technologies and very significant changes occurred as a result of Swine Flu, consequently a model needs to be found to contextualise both events.

A review of existing change models was undertaken (see Table 2) to determine which approach could best answer the following questions:

- Where the changes the result of planned institutional changes, opportunistic intervention or charismatic leadership?
- Where were the drivers for change to be found - within the institutional policies and practices or elsewhere within the ecosystem of formal and informal professional relationships?
- What models of change best represent and explain how use of ICTs and Web 2.0 can become normalised within the mainstream?.
- What model can explain the very significant impact of Swine Flu on student and teachers perceptions of learning technologies and the learning platform?

These questions are further explored in Chapters 4 – Data Analysis – and in Chapter 5 – Discussion and Conclusions.
<table>
<thead>
<tr>
<th>Models of Change</th>
<th>Relevance to the School</th>
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<tbody>
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<td>Influence of Local and National ICT Strategies. External drivers push for school improvement linked to wider use of ICT to support learning. This is often linked to improvements in school performance (see Harnessing Technology Hong Kong Education Bureau ICT Strategy reports).</td>
<td>The leadership team was aware of the targets set by the Hong Kong Education Bureau regarding use of web 2.0 and the UK Governments targets. They were also committed to shifting the emphasis to learning with and through technology, rather than using technology to improve grades.</td>
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<td>The Innovations Model. Was technology acting as a catalyst or a lever for change? (see Venesky;2002). This contrasts technology being used to speed up existing practice as against being used to leverage new and different ways of working</td>
<td>Innovation was not a declared aim and neither were innovators the focus of the study. No new software or hardware was purchased with the exception of adoption of Web 2.0 applications by the ICT teacher and the licence for a school based learning platform.</td>
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<td>Did investments in ICT Training and Professional development lead to changes in pedagogy and outcomes? For example the Newhouse et al Framework on Professional Development and Mishra &amp; Kohler TPACK Model (2006).</td>
<td>There was no significant change in provision for professional development; only two staff attended a specific ICT training event in the year. The Newhouse model was used to categorise the staff profile.</td>
</tr>
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<td>Models which evaluate the impact of Curriculum Design for ICT on teaching and learning. Examples – The BECTA Report on the impact of ICT in schools and assorted Office for Standards in Education, Children’s Services and Skills, UK (Ofsted) reports on ICT in UK schools (see <a href="http://www.ofsted.gov.uk/Ofsted-home/About-us">http://www.ofsted.gov.uk/Ofsted-home/About-us</a>).</td>
<td>No explicit programmes were in place but there were on going discussion throughout the year about changes to the Curriculum Model for ICT. This did lead to the introduction of a new Learning Technology Policy to support a more integrated approach to use of Learning Technologies.</td>
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<td>The Organisational Change model. In which Rogers (1995) sees schools seen as loosely coupled systems.</td>
<td>This sees changes as being a function of the organisation of staff, the innovation and the information disseminated about the purpose.</td>
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**Theoretical Perspectives prior to Swine Flu Closure**

This study began by adopting Rogers’ diffusion model of change because the drivers were largely non-institutional, emerging from the fabric of informal professional dialogues and relationships, rather than from the advocacy of school leaders. The Teacher ICT Attributes profiling identified that the issue was likely to about beliefs and values rather than resources or infrastructure. In the Rogers model schools are seen as
loosely coupled systems or communities of practice, where each sector enjoys some autonomy. This was certainly the case for the year and subject teams within the primary section. Rogers (1995) in discussing the characteristics of innovation, argues that for innovations to be adopted there has to be compatibility between existing values and experiences and the needs of users. Rogers sees the driver for change coming from the gap between the *early adopters* and the *pragmatic technology users* (see Figure 1), or between the *conservative technology users’* and the work of the ICT teacher.

![Figure 1: Rogers’ Diffusion Model of Change. After Rogers (1995 and Norman 1998)](image)

In Chapter 4 on Data Analysis, it will be shown that the teacher data pre Swine Flu supported the notion of a gap or chasm, but it was also becoming evident that this did not fully explain what was driving teachers to change their attitude to ICTs and, furthermore the chasm between the *enthusiasts* and *pragmatic users* was not the issue. The evidence suggested that the gap or chasm was actually between the *conservative sceptical users* and the *deeply conservative sceptical users* – an issue which became even more evident when the teacher date during Swine Flu was examined (see Chapter 4).
So while the Rogers Model was able to position the teachers’ behaviours and attitudes towards ICTs, it fell short when it came to explaining the drivers for change. This may be because the perceived affordances of learning technologies like Web 2.0 are influenced more by underlying professional beliefs and values than by technical proficiency. What is often overlooked by commentators of Web 2.0, is that few of these applications are designed for education. In order to be adopted they need to be re-purposed and reconceptualised, within existing schemes of work, if they are to support learning effectively. The issue then becomes the context in which this is done, in order to ensure the gap does not become so large that teachers fail to understand the purpose. Get this wrong and one teacher’s innovation becomes another one’s nightmare!

Fullan (2005) makes a similar point when he talks about the diffusion of change and argues that for innovation to be adopted staff must be able to see and understand what the change means for them, or in other words, they need to be involved if they are to understand the process behind the re-purposing of a Web 2.0 application. This prompted the development of a new model of change based on Energy of Activation, described in the next section.

**Theoretical Perspectives during Swine Flu and Energy of Activation**

The school closure resulting from the Swine Flu pandemic, created a unique set of conditions, which in turn required a different perspective to understanding the innovative practice that emerged during this three week period. The school closure was sudden, within 24 hours the school was closed to all primary students and teachers were required to work at school. The school implemented a pre-prepared plan called ‘work@home’ for distributing work to families via the school web site. Teachers were required to upload suitable work onto the website by midday, for parents and students.
to be downloaded at home. In the earlier trial this involved extensive scanning of worksheets.

For students such cases are extremely rare but ironically create a situation where students have to work at home and access on-line resource. It was realised that the outbreak of Swine Flu created a serendipitous situation in which to assess the diverse claims made about the capabilities of young ‘digital natives’ by Prensky (2001a; 2001b) and Tapscott’s case for the ‘net Generation’ (1998). This event created the second half of the study.

This situation immediately created two problems for teachers, namely how to manage:

- the task of uploading files; and
- students’ learning

The impact on teachers’ behaviours and priorities was evident immediately. The gentle innovation of the previous year was suddenly brought into sharp focus and teachers from Years 3, 4 and 5 began to discuss and propose new ways of using the existing technology to support student learning at home rather than just keeping students busy at home.

The impact of Swine flu meant that teachers had to work differently and had to solve new and unfamiliar problems, which in turn required a change in priorities and re-direction of their efforts, in a very short space of time. As will be shown in Chapter 4, the diffusion model was not appropriate for such an extraordinary event but, as the evidence will demonstrate, there were significant changes in teachers’ behaviours and attitudes to learning technologies. One way of representing this is to use the concept of Activation Energy; an analogy which has its origins in chemistry (Woodhead and Kennedy, in press).
Activation Energy describes how all (chemical) changes require the input of energy in order to proceed. In this analogy, the Activation Energy is the energy required by the teacher or an institution to achieve change. Traditionally this may have involved professional development and ongoing discussions with staff to inculcate changes desired by management. Or it could be led by personal desire to improve teaching practice. For example, resistance to change can be represented as an Energy of Activation (Ea) (Figure 2). Schools, like all systems, exist in a steady state maintained by a balance of forces. For example teachers who actively resist change often argue that the issue is one of time and competing priorities, and see little reward (e.g., pedagogically or workload) in change for its own sake. In a traditional learning environment this Energy of Activation can be become so great as to stifle change before it gets started. The model assumes that there is always some resistance to change.

Figure 2 provides a visual representation of the initial conditions for change, including the energy required for change (the Ea). For example:

- time invested and skills needed to be acquired by teachers in order to implement change;
- pedagogical beliefs of teachers about how learning meets students’ needs;
- support from administration and line managers;
- technical infrastructure;
- attitudes of parents;
- expectations of students; and
- changes in the design of curricular (particularly assessment) that exploit the affordances of different learning technologies.

This investment of time and effort is larger when there is no specific imperative to change, raising the energy required for adoption of learning technologies. The advent of Swine Flu reduced the energy required to change (e.g., students were not available F2F,
the parents’ desires for interaction and learning were strongly stated, and the administration demanded it).

![Figure 2: The Energy of Activation Model. Exothermic or Sustainable Change Version (Woodhead and Kennedy, in press)](image)

However, in Figure 2 there are two curves. The upper curve represents the (nominally) normal situation where the resistance to change can be very significant. In contrast, the lower curve represents the resistance to change by teachers after the advent of Swine Flu and enforced closure of the school. Change was driven by circumstances and fortunately the school had already put in place the learning technologies to support the resultant changes in practice.

Note also, new ways of working are unlikely to be maintained if the energy required to maintain change is still perceived as ‘costing’ more in the long term (e.g., benefits of using learning technologies are seen as significantly time-consuming and of little pedagogical benefit). This results in what would be called an endothermic reaction (see Figure 3) where the resultant energy state (right side) is still greater than the previous ways of operating. Therefore the investment of time and effort may only occasionally lead to the adoption of a specific learning technology or some significant pedagogical
shift. Only the ‘early adopters’ or ‘hero innovators’ would find this acceptable because of a strong personal agenda to work in ways they find meaningful and engaging.

**Figure 3: The Energy of Activation Model. Endothermic Non-Sustainable Version** (Woodhead and Kennedy, in press)

**Summary.** The Energy of Activation model is a stark reminder that it must be demonstrably clear to teachers that the new ways of working with technology must far outweigh the energy expended in adoption and implementation. Improvements in infrastructure, connectivity and access are, by themselves, not sufficient to support sustainable change. Figures 1 and 2 are used again in Chapter 4 when the data from teacher surveys and interview, before and during the Swine Flu closure, is examined to determine how teachers respond when circumstances force changes in the way students’ learning is managed. The next section reviews the literature to find out what is already known about the affordances of new technologies like Web 2.0 and how this can influence students’ learning behaviours. It also looks at the connections between educational reforms, changes in curriculum design and sustainable innovations.
Chapter Two

Literature Review

This section will examine what the research literature says about:

- the affordances and nature of Web 2.0 applications and whether this is redefining the way young people learn;
- the evidence that schools must be transformed to if they are to meet the learning needs of the New Millennials;
- what drives and sustains the adoption of new technology within schools; and
- what is the relationship between curriculum design and teachers’ adoption of technology innovation

Affordances of Web 2.0 Technologies

Definitions and examples of Web 2.0 are numerous and this can be problematic for researchers. The term Web 2.0 was originally used by Dale Doughty – vice president of O'Reilly Media Inc – speaking in 2004 about the future potential of the internet after the dot.com crash. White (2007) describes Web 2.0 as a metaphor for the raft of new technologies which support Read/Write access and allow users to be publishers, critics and authors in any media. Others observers (White 2006, Gillmor 2004, Richardson 2006) regard Web 2.0 as an attitude to the way people chose to interact with and create content on the web. For the purpose of this study we will define Web 2.0 applications as those which support the active participation, connectivity and the sharing of knowledge and ideas – technologies which put people in touch with people like themselves.

Interestingly Tim Berners Lee (1999) reflected that the original version of the internet was an environment to support peer collaboration. Web 2.0 may simply represent the internet coming of age.

The affordances of Web 2.0 are usefully described in the BECTA Report (2006) which lists possible educational activities associated with selected Web 2.0 applications (p24). This categorisation was used in the study to describe the different ways in which Web
2.0 applications were used by students in the study (see Appendix A). McLoughlin and Lee (2007) identify four themes around which define the affordances of Social Software – Connectivity and Rapport; Collaboration and Information Discovery; Content Creation and Knowledge Aggregation. These themes are consistently echoed by other researchers leading to the notion of Web 2.0 being associated with c-learning (as opposed to e-learning) characterised by connectedness; collaboration; communication and creativity. In the study these ideas informed the selection a new ICT Curriculum model for the school.

There appear to be few studies which examine how young people use Web 2.0 in an educational setting. Many of the statistics published by researchers such as Lenhart and Madden (2005) for the Pew Institute, or the CERI study of New Millennium Learners (2007) focus on the social uses of technology by the 11 to 25 age group – ownership of laptops, use of iPods, downloading of music, sharing of photos, gaming etc. While the empirical evidence is extensive, there seems to be an assumption that these skills can be easily transformed into productive learning behaviours. Little is known about the extent to which young people are content creators or innovators; furthermore the assumed homogeneity of the age group assumes similar behaviours are widespread when this may not be the case. Even less seems to be known about how young people actually use Web 2.0 technologies in a school settings and indeed whether they want to use them in this context.

In contrast to these studies the BECTA Report (2007) on ‘Web 2 Technologies for learning’ presents a more down to earth picture and cautions against some of the more dramatic claims about the activities of Digital natives observing that the actuality of how...
Web 2.0 is used and understood by younger learners is not well documented. For example the authors state:

Yet while there is a groundswell of enthusiasm for adopting Web 2.0 practices in education, there is little evidence that uptake is happening to any significant degree. This is not helped by the fact that there remains very little research activity guiding the effective application of these new tools and practices. This may reflect the fast-changing nature of services and, therefore, the reluctance of researchers to aim their interest at such a moving target (p. 7)

The lack of research evidence is illustrated by the following observations:

Despite the fact that Web 2.0 technologies offer great opportunities to work collaboratively, few learners reported engaging in collaborative learning using Web 2.0 technologies other than to support “chat” about work (p. 6).

The BECTA report found that most learners have access to Web 2.0 and the most frequently used websites are Wikipedia, Google and BBC sites.

Most learners preferred using Web 2.0 to support their learning. The reasons they gave were: the ease and speed with which information could be accessed; the sheer availability of information; and, less commonly, the opportunity to work within different literacies. The use of wiki technology is limited mainly to use of Wikipedia. Podcasts, online forums or discussion boards are rarely used. Blogging is not a particularly popular activity, but where it occurred it often did so within the arena of a social networking site such as Bebo. (p. 46)

Green and Hannon (2007) writing in the Demos report ‘Their Space’ (2007) is another empirical study of how young people use the internet, adds further weight to this view. It reveals that only 20% of students 11 to 16 are active and productive users of technology. In other words most digital natives are using Web 2.0 as an extension of Web 1.0 and only a few can be deemed to be taking part in ‘ground breaking’ activities, suggesting there is a role for much more scaffolding by more able partners.

**The Case for Educational Reform**

The advocacy for educational reforms come from those who maintain that today’s students are bored and indifferent to what happens in the conventional classroom and only come alive when they return to their digitally connected world. Tapscott argues that the ICT capabilities of Digital Natives are so extensive that it is simply no longer
appropriate to even attempt to define their learning through an ICT curriculum; that teachers should let the students have direct and unfettered access to technology and they will teach themselves.

Selwyn (2006) surveyed students about their perceptions of connectivity and access in school where he contrasts ‘technology-rich learners’ and ‘technology-poor schools’, suggesting (p. 8) that outside schools young people have a ‘richer, more extensive engagement’ with technology and experience a more collaborative environment out of school. Some school leaders have used these arguments to justify sweeping changes in curriculum design, pedagogy and learning environments.

In his article ‘Listen to the Natives’ Mark Prensky (2001) warns that those who have the responsibility to guide our students in a 21st century education will need to be aware of the important characteristics of the 21st century landscape. This means taking into account that today’s students have a high comfort level in the use of computers, video games, and the Internet and they easily work with the most cutting-edge technologies. Prensky warns us that if we fail in this, “We will be left in the 21st century with school buildings to administer – but with students who are physically or mentally somewhere else”. Prensky maintains this position and, in a later paper (2007) and suggests that:

"...our students are clamouring for these [new] technologies to be used as part of their education, in part because they are things that the students have already mastered and use in their daily lives, and in part because they realise just how useful they can be." (P41)

The advocates for reform draws heavily on source such as Tom Friedman in The World is Flat where he paints a vivid picture of the new digital landscape where the arrival of global connectivity has fundamentally changed the dynamics of human relationships:
“What I mean when I say that the world is flat is that sometime in the late 1990s a whole set of
technologies and political events converged – including the fall of the Berlin Wall, the rise of the Internet,
the diffusion of the Windows operating system, the creation of a global fiber-optic network, and the
creation of interoperable software applications, which made it very easy for people all over the world to
work together – that leveled the playing field. It created a global platform that allowed more people to plug
and play, collaborate and compete, share knowledge and share work, than anything we have ever seen in
the history of the world. My book traces how that platform evolved and what it means for companies,
countries and individuals.”

Tapscott (2006) takes a similar theme in his book ‘Wikinomics’ and describes how
massive numbers of people can participate in the economy using social software.

Tapscott describes companies like Lego and Goldthorpe Mining who have used Web 2.0
to define a new relationship between producers and consumers – the Prosumer.

Anderson in his book ‘The Long Tail’ describes how Web 2.0 technologies used by
Amazon and e-bay are changing the fundamental rules of retail where 80% of the profit
comes from 20% of the goods sold.

It is no wonder that these glittering examples have left some educators with feelings of
‘moral panic’ requiring drastic measures if schools are not to become dinosaurs of
learning.

On the other hand Bennett, Maton & Kervin, et al. (2008) question the whole premise of
the digital native by pointing out the lack of empirical data to support the claims about
their unique learning styles and preferences. In their critical review of the digital native
debate argue that there is little evidence to support the claims of Prensky that:

"Today's students have not just changed incrementally from those of the past ... A really big discontinuity
has taken place. One might even call it a 'singularity'-an event which changes things so fundamentally that
there is absolutely no going back. (p. 1)"

They argue that research should focus more on the difference between digital natives
in terms of their capabilities; they also question the view that the digital divide is the
reason for young people sense of frustration and disaffection with school. They
reference papers which suggest that students understand the need for restrictions to
internet sites and that both teachers and students prefer to keep social media out of school. In this study this issues will be explored by examining student response to creating digital portfolios – these being seen as the educational equivalent of Facebook

**Sustainable innovation**

As has already been observed the introduction of technology is often problematic and these ripples of anxiety are significant but can be missed, especially if the focus is solely on the interaction between the user and technology. MacFarlane (2007) speaking at the Building Learning Communities 2007 conference bluntly described the introduction of technologies into schools in these terms:

> ...there is a growing tension between what tends to happen in traditional classrooms and what happens when people use digital technologies in the classroom ... this tension is deeply disruptive, problematic and very powerful ...

Therefore we need to look at the literature to learn more about what factors support or hinder the sustainable adoption of innovative practice with learning technology. The findings from the SITES 2006 comparative study of how ICT is changing teaching and learning across 22 education systems offer a detailed insight into what supports sustainable innovation. Law and Chow (2008) writing in *Pedagogy and ICT* use comment that one of the factors which influence teachers adoption of ICTs is their perception of the quality of support – technical and administrative. They also make the very interesting observations:

> ...that teachers are more likely to use ICT in their teaching if they feel that they and their students are receiving support from the school – support that includes technical and administrative support and that allows students to access ICT outside class hours (p. 218).

This proves to be highly relevant to the study because it is the students who are immersed in Web 2.0 albeit supported by their ICT teacher. The situation creates a
unique opportunity to test this hypothesis by observing the way their class teachers respond. The authors go onto comment that length of innovation and ratio of students to computers are least significant factors, two more factors which can be assessed in the study.

Newhouse et al (2002) in a paper which reviews the literature on how ICTs have affected the quality of learning and pedagogy argues strongly that for adoption of ICTs to be accepted the technology needs to solve and unless that problem is well understood, technology will be rejected:

Further, a technology will not be adopted by educators where there is no perceived need. Therefore, when discussing applications of computer technology to education the question must always be asked, “What educational problem(s) needs to be addressed?” This question needs to be asked at all levels of decision-making, from the teacher planning a programme, to a school administrator purchasing hardware and software, to an educational system officer developing policy and strategic plans.

Again this proves to become highly significant when Swine Flu causes the school to be closed for three weeks and teachers are presented with the problem of how to manage students’ learning online.

Pelgrum (2008) writing in *Pedagogy and ICT Use* explores the conditions for implementing sustainable change. He describes the inherent problems when ICT initiatives become the preserve of hero innovators and how hero innovator can unintentionally perpetuate the digital divide because they are so confident at what they are seen to doing technology. This becomes a strong theme in the project as a result of teacher interviews and surveys and commented at length in the Theoretical Framework section of this study.

Other papers describe the importance of establishing a broad mandate for change or what Fullan (2005) describes as the need for Moral Purpose. This is the defining of goals which are not about being the first, but which recognizes the place of technology in
supporting current educational reforms. Fullan outlines the elements of effective leadership in his book *Leading in a Culture of Change*:

The conclusion, then, is that leaders will increase their effectiveness if they continually work on the fine components of leadership - if they pursue moral purpose, understand the change process, develop relationships, foster knowledge building, and strive for coherence - with energy, enthusiasm and hopefulness.

What this tells us is that the vision and mission need to be rooted in connected advocacy so staff can reference their adoption of ICT against wider educational agenda, rather than implement ICT solutions for their own sake.

Fullan (1991) observes that one of the issues in educational change is that teachers do not always have a coherent sense of the rationale or the need for change. Here he is pointing the finger at school leaders and in the context of ICTs, this would translate into not being clear about the role or purpose of technology. What this suggests is that an analysis of the prevailing culture of the school must include data from school leaders.

This was done using the BECTA Self Review Framework for e-leadership which, in the spirit of Research Design, both serves to inform the leadership about the issues of implementing ICTs as well as generating valuable research data.

Laurillard (2007), also comments on the difficulties leader face as they try to knit together the affordances offered by technology and the expectations of education. She argues – as do the authors of *Pedagogy and ICT Use* - that pedagogy is the pivotal point around which we can see the balance shifting from the acquisition of technologies to a deeper understanding of how technology enhances learning:

*Information and communication technology creates a new kind of medium for the discovery articulation and dissemination of knowledge, and therefore affects what it takes to learn the knowledge and skills developing within a culture and society. Conversely, education, as a formal activity designed to assist individuals in learning the knowledge and skills of their culture and society, creates testing challenges for the technology.*
Curriculum Design

Curriculum design is a significant element in this study because, during the year, the school moved from the UK National Curriculum to a model based on the Tasmanian ICT Curriculum. This created an opportunity to examine the influence of curriculum design on teachers’ perceptions of the affordances of learning technology?

The curriculum provides the context in which to understand the reasons for adoption of learning technologies. Researchers such as Schrader (2008) and Davis (2008) argue that without an understanding of context or curriculum and without an understanding of pedagogical reasoning, research into the affordances of ICTs becomes meaningless. The BECTA report on ICT and Pedagogy (2006), after a lengthy literature review, makes a similar point (p. 36), commenting that researchers can no longer afford to ignore what Davis (2008) calls the ecology of the classroom:

*Many researchers have measured teachers pedagogical practices by observing and recording lessons in which ICT is used, in order to identify the actions of the teacher and the teaching strategies which they adopt in their lessons. However some studies have used this approach without capturing the pedagogical reasoning behind the teachers practices, or recording the preparation and planning prior to the lesson, so weakening the chain of evidence between pedagogy and attainment*

For pedagogical reasoning read curriculum design so understanding changes in curriculum design should give a good insight into how learning technologies are being valued and the likely impact on students’ learning.

Two frameworks were used to evaluate the school’s curriculum design for ICT – the *BECTA Self Review Framework* one-leadership and Newhouse (2002) *A Framework to Articulate the Impact of ICT in Schools* take a close look at the place of ICT within the curriculum. These are compared in Table 3.
Table 3. Comparison of BECTA and Newhouse Frameworks for evaluation of ICT curriculum

<table>
<thead>
<tr>
<th>Key Questions. BECTA</th>
<th>Key Questions. Newhouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>BECTA asks very specific questions about the ICT curriculum and does assume a defined and articulated ICT curriculum</td>
<td>Newhouse takes a broader view and sees the curriculum as one element in the whole school environment</td>
</tr>
<tr>
<td>To what extent does the curriculum support development of ICT Skills or ICT Capabilities? Does it support and value the application and integration of ICT across the curriculum? Does it support the planned use of ICT to support learning with and through ICT? Does it effectively map the development of ICT capability with opportunities available in other subjects? How does the curriculum value the acquisition of ICT Capability? Does the use of ICT expand students’ learning capacity? Do students enjoy a consistent experience in the way ICT is used and taught?</td>
<td>Does the curriculum provide opportunities for students to make links between ICT and real world situations? Is there sufficient support for teachers and students? Does the curriculum explore the mutual benefits of community links for learners? Are there metrics for the evaluation of ICT?</td>
</tr>
</tbody>
</table>

The BECTA framework, while stressing the broader context, focuses on the quality of provision for ICT as a subject, while the Newhouse framework puts the emphasis on ICT learning within and beyond the school. This aspect becomes relevant given the deployment of Web 2.0 applications and a learning platform, because these served to extend learning beyond the classroom. However both frameworks offer useful insights into curriculum design.

**Summary.** How well does the literature review justify the need to ask the questions proposed in this study?. Firstly it would appear that the concept of Digital Natives or New Millennials is too simplistic and may be an over generalisation and more data is needed about how young learners use and understand the capacity of Web 2.0 technologies to support their learning. Secondly the adoption of ICTs is unlikely to be sustained unless supported by changes in curriculum design, which in turn may be the
key which creates the context in which teachers can re-purpose new technologies.

Therefore an understanding of teacher behaviour and attitudes towards ICTs needs to be informed by and an understanding of the context in which they are designing learning activities – both before and during the school closure. Thirdly more data is needed to examine whether the affordances of Web 2.0 and the learning needs of students can be combined within existing learning environments. Lastly the review suggests that the methodology will need to address more than the relationship between the technology and the user – it will need to take account of the prevailing cultural norms that influence professional behaviours and which determine the validity of student learning outcomes.
Chapter Three

Methodology.

Lessons from the Literature

The question here is what can we learn from the research about the choice of methodology?. This was to be a longitudinal study interpretive study rather than a short term deterministic study looking for evidence of value added or whether technology works. Schrader (2008) in a critique about research practice in educational technology calls for studies which focus on learning in technology rather than through or about technology. He points out that these issues require careful research design if the right questions are to be asked.

The BECTA report on ICT and Pedagogy (2006) after a lengthy literature review, comments that researchers can no longer afford to ignore the context in which technology is being used

Many researchers have measured teachers pedagogical practices by observing and recording lessons in which ICT is used, in order to identify the actions of the teacher and the teaching strategies which they adopt in their lessons. However some studies have used this approach without capturing the pedagogical reasoning behind the teachers practices, or recording the preparation and planning prior to the lesson, so weakening the chain of evidence between pedagogy and attainment (p.36)

This theme is also picked up by Painter (2001) commenting on the complexity of observing behaviours associated with the technology integration.

These issues relate to the complexity of technology integration, the confounding of teaching quality and philosophy with integration, the difficulty of inferring important information about complex cognitive processes from direct observation, and the rate of technology development that challenges evaluators’ abilities to keep pace.
Schrader (2008) also observes that technology is not value free and that adoption and perceived affordances are a function of underlying beliefs and values about teaching and learning.

Pedagogical approaches using technology have varied widely, a fact that can be partially attributed to the disparate beliefs and understandings about the role of technology in education and partially attributed to the profound technological advancements in the last century. (p.458)

In other words the affordances of technology cannot be regarded as independent variable and any study must acknowledge the prevailing cultural climate about teaching and learning.

As Marc Poster (2005) observes in his book ‘History in the digital domain’, that as soon as technology is placed in a social context then ‘we then have a very messy situation confronting us (p. 56)’. It is messy because we cannot regard technology as a neutral blank canvas on which we observe the reactions of the key players. In reality the introduction of technology often changes the landscape which, in the real world of schools and classrooms, can become a place of intense social conflict.

This suggests that in order to acquire an authentic interpretation of how students and staff respond to the introduction of learning technologies requires an understanding of the influence of the prevailing values and cultural norms on the key players. This will involve looking at the influence of curriculum design, pedagogic practice along with the informal and formal interactions which create windows of opportunity. These ideas are explained in more detail in Figure 5 on page 49. The literature also suggest that a mixed method approach built around the principles of Research Design would be more likely to capture the relevant data.
The research problem led directly to the use of Research Design as the organising framework but this was supplemented by the use of Surveys to collect evidence on:

- e-leadership (BECTA e-leadership framework)
- staff perceptions about the affordances of technology (Newhouse framework)
- parents about their perceptions of work@home

**Research Design**

The key question in this study is about the impact on primary students learning behaviours and learning capacity after they have been exposed to Web 2.0 technologies and a learning platform over the period of one year. It was a complex enquiry conducted in a changing environment. As Mishra observed in a vodcast from his keynote at the SITE 2007 conference, technology is messy, learning is messy so it follows that the relationship between learning and technology is very messy. An understanding of context was essential. This required a more interpretative approach in which the affordances of ICT are seen as dependent on beliefs, values and understanding about relationship of technology and learning. Budget restrictions and demands on researchers can mean that studies about the impact of new technologies are often undertaken in isolation, within an aseptic environment ignoring the milieu of influences which determine the students learning. In this study we took the view that technology is inherently subversive because its adoption and use questions the status quo – it cannot be regarded as value free.

This requires a methodology with the capacity to address the complex relationship between technology, learning and education; one that encompass the dynamic changes in professional relationships, interpretations of policy and curriculum design.

The study involved a teacher/researcher supported by an external researcher. The research model had to be flexible enough to respond to changes in direction and new
opportunities exemplified by the sudden school closure caused by Swine Flu. The model also needed to acknowledge the impact of the teacher/researcher. This was not a situation for short term interventionism. As Robert Ebel declared:

....the value of basic research in education is severely limited, and here is the reason. The process of education is not a natural phenomenon of the kind that has sometimes rewarded scientific investigation. It is not one of the givens in our universe. It is manmade, designed to serve our needs. It is not governed by any natural laws. It is not in need of research to find out how it works. It is in need of creative invention to make it work better.

Tom Reeves makes a similar point in his Dean Lecture (1995) ‘Questioning the Questions of Instructional Technology Research’ arguing that much of the research on learning technologies is of a poor standard and lacks social responsibility. What else can the research tell us about the best way to study the changes in use of learning technology?

Schrader (2008) takes the view that if researchers are to understand how students can learn with and through technology, then context is everything and that researchers have to move away from focusing on just the interaction between user and computer. He observes that:

...Overall, this progression suggests that researchers should focus their analysis on interactions within a dynamic, immersive context rather than on the physical user-technology interaction..(p.471)

The BECTA Report on Web 2.0 (2008) makes the point that new technologies have always reconfigured human relationships and that technological innovations cannot be studied in isolation from the wider social context. They describe the complexities of studying the new digital landscape as follows:

...often they send their waves of disturbance through cultural traditions. The danger is to dwell only on the technology, thereby adopting a narrow deterministic view of its ‘effects’. (p.56)
A traditional deterministic approach to the research would reduce visibility of the important human interchanges which can have a significant influence on perceptions and use of technology.

Design Research was chosen as the theoretical framework for the study for the following reasons. Design Research:

- It offered a more socially responsible way of conducting the research by allowing for the school to exploit the findings and observations as they emerged and refine the learning environment;
- allowed the researchers to take a detailed look at the integration of learning design with the affordances of Web 2.0. (This echoes the point made by Schrader that context is everything and that our understanding of how Web 2.0 influences students learning has to embrace the context in which the activity was planned and delivered);
- allowed for intensive collaboration between researchers and school staff to clarify the problems and disentangle the data; and
- acknowledged that theory should inform practice. In other words the theories about change, pedagogy and learning would be expected to have an impact on practice and expectations of staff within the school. This was particularly necessary for the teacher/researcher who needed to work in a framework which recognised the practitioners desire to improve learning not just from a functional perspective but also from a theoretical perspective

Structured Interviews were also used to collect evidence from teachers about their reactions to the use of technology during the year and specifically during the school closure. Evidence was collected at different time throughout the school year and this is shown in Table 4. Appendix F shows a more detailed timeline about the development of the learning platform and Web 2.0 applications.

**Table 4. Timeline of Project Milestones**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>August, 2008</td>
<td>Arrival of new ICT teacher</td>
</tr>
<tr>
<td>October, 2008</td>
<td>BECTA Survey of e-leadership (n=5)</td>
</tr>
<tr>
<td>November, 2008</td>
<td>Staff survey ‘Teachers Professional ICT Attitudes’ (n=10)</td>
</tr>
<tr>
<td>December, 2008</td>
<td>On line survey of staff re connectivity and access (n=13)</td>
</tr>
<tr>
<td>May, 2009</td>
<td>Structured interviews with staff re perceptions of Web 2.0 (n=6)</td>
</tr>
<tr>
<td>June, 2009</td>
<td>1. Structured interviews with staff re perceptions about use of technology and impact on learning (n=5)</td>
</tr>
<tr>
<td></td>
<td>2. <strong>Swine Flu strikes!</strong></td>
</tr>
</tbody>
</table>
3. Collection of data from student Forums and Wikis

July, 2009

4. Analysis of student email transactions; Forums; Home Pages; Wikis;
5. Launch of on line survey to parent to measure their reactions to
   work@home (n=161 and a 61% return rate)

Data Sources

Design Research does not assume that the impact of technology on learning is governed by ‘natural laws’ as would be the case for the natural sciences. Instead it takes the view that students’ experience of technology is a result of a complex interplay between different elements that shape a students’ experience of learning with technology. It follows then that the data will emerge from the interaction of these different elements which were identified as:

- people;
- policies; and
- context and opportunities

Figure 4 illustrates the model used to justify the selection of data. There were two main periods when data was collected – pre Swine Flu closure and during the Swine Flu closure.

The strategy for the data analysis was to look for:

- confirming and disconfirming data which would reveal how well or how poorly the students used technology as a learning tool before and during the school closure;
- the data was then examined to determine if there was, on balance, credence to the notion of the learning behaviours associated with ‘Digital Natives’ and whether these behaviours supported their study habits and learning at home; and
- evidence of changes in teachers’ perceptions about the affordances offered by Web 2.0.
In Figure 4 the left hand side represents the formal processes – roles, relationships, timetables etc which define where, how and what a student should experience in ICT lessons. The right hand side represents the informal process emerging from the personal professional values, beliefs and experience which the teachers bring and which, in turn, determine what actually happens in the classroom. As a model it can be applied to any learning experience but for ICTs, it is especially relevant because the interpretation, adoption and application of technology by a teacher can be very subjective. Much of the data, both before and during Swine Flu, was taken from the activities which developed as a result of the informal processes. The opportunities and serendipity moments that emerged as a result of new professional relationships and a more open curriculum design for ICT, which supported use of technology beyond the timetabled lessons. These
are represented by the diamonds on the right hand side. For example the use of Forums and Wikis to support learning about Romans represents an opportunity arising from a chance conversation between class teachers and the ICT teacher. Similarly the proximity of library to the ICT room made possible the impromptu planning of a Information Literacy lessons and the use of multi-media applications to support book reviews. The school closure itself was the culmination of a lengthy period of informal interactions.

**Data Sources. Pre Swine Flu Closure**

The data collected to analyse the impact of the changes in curriculum and learning design on staff and students is summarised in Table 5

**Table 5. Summary of Data Sources Pre Swine Flu**

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self reviews by school leaders using BECTA e-leadership framework (Summary Appendix F on CD)</td>
<td>Quantitative data</td>
<td>Analysis of indicators for each of the eight themes</td>
</tr>
<tr>
<td>Structured interviews with primary teachers using Newhouse et al framework for ICT attributes (Summary in Appendix E)</td>
<td>Text responses</td>
<td>Analysis places teacher along the 5 point scale of ICT adoption. See Table 1</td>
</tr>
<tr>
<td>Creation of learning activities based on Web 2 applications and the learning platform</td>
<td>Student generated digital content</td>
<td>List of Web 2.0 applications used, justification and contextual examples can be found in Appendix A</td>
</tr>
</tbody>
</table>

**Teachers Attitudes and Perceptions of the Affordances of ICTs**

During the initial phase of the study class teachers (n=12) were surveyed to determine how confident they felt about using ICTs in their teaching and how much they felt it could support students learning. The Teacher Professional ICT Attributes Framework by Newhouse, Trinidad and Clarkson (2002) was used to assess the capacity of teachers to use ICT for teaching and learning. A survey based on this framework was given to all
class teachers and the results used to position teachers along the five stage continuum described in the Newhouse et al framework. The ICT Attributes Framework was chosen because it emphasised:

- the link between pedagogy, learning and technology and therefore ICT use was not a study in isolation;
- the interaction between teachers, school and system factors and how these influences adoption of ICTs therefore acknowledging the diverse factors that influence the use and adoption of ICTs; and
- the complexity of teaching.

(see Appendix E for a summary of the survey of teachers)

It also identifies three levels of outcome for each teacher in terms of their:

- vision and Contribution;
- integration and Use; and
- capabilities and Feelings towards the use of ICTs

In ‘Quality Pedagogy and effective learning with ICT; a Review of the Literature’, Newhouse, Trinidad & Clarkson (2002) proposed a theoretical framework to describe the forces which influence a teachers’ attitude to ICTs. Their force field model identifies the barriers, opportunities and energy requirements and pay offs which determine a teacher’s adoption of ICT. The model sees motivation to use ICTs by a teacher as a resultant force which emerges from the interaction between forces for and against using ICT. This will be different for each teacher.

Newhouse et al acknowledge that these forces may be as much about perceptions – both positive and negative – regarding the affordances of ICT, rather than as external obstacles (poor connectivity, infrequent access) to use of ICT. For example the survey results and semi-structured interviews, suggest that the reason for lack of use of ICTs was more reflection of professional values and beliefs than actual resistance to use of
ICTs. For example one teacher applauded their children’s’ use of ICT but did not see this as central to her teaching. She comments:

*I thought it was a great idea for the children to use a Forum and Google Earth for their Flat Stanley project, but my job was to make sure they all completed their Flat Stanley booklets by the end of term*

The point here is that lack of resources or lack of training was not need seen as an obstacle to integration. The results were used to map each teacher against the five Stages of Progression (Inaction; Investigation; Application; Integration; Transformation).

The results of this analysis are shown in Table 6.

**Table 6. Analysis of Teachers’ Professional ICT Attributes at the School.**

<table>
<thead>
<tr>
<th>Stages in the Newhouse et al Continuum</th>
<th>Number of class teachers at each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yr 1</td>
</tr>
<tr>
<td>Inaction</td>
<td>*</td>
</tr>
<tr>
<td>Investigation</td>
<td>*</td>
</tr>
<tr>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>Integration</td>
<td></td>
</tr>
<tr>
<td>Transformation</td>
<td></td>
</tr>
</tbody>
</table>

- The majority (9) fall into the middle zone suggesting that ICTs practice of classroom teachers was based on the following perceptions: that it was easier to use ICT for teaching than learning;
- the adoption of ICT was for largely personal reasons rather than due to school policy;
- there was a strong element of opportunism in the planning of ICT activities; and
- that ICT was best delivered by a specialist teacher.

This profile is probably typical of many schools in Hong Kong and around the world and explains the security staff felt from having an ICT specialist.

**School Leaders’ Attitudes and Perceptions of the Affordances of ICTs**

The BECTA Self-Review Framework was also used in this study by the senior leaders to reflect on the eight elements of e-leadership:
leadership and management,
curriculum,
learning and teaching,
assessment,
professional development,
extending opportunities for learning and
resources and impact on pupil outcomes.

Each domain has a number of indicators and leaders decide which one best describes e-leadership in their school. The results of this review suggest that GSIS is in the same position as many other schools, both locally and internationally and there are strong parallels between the views of the school leaders and the findings of international studies like SITESM2 in respect of their perceived disappointment in lack of progress with integration of ICTs into classroom practice. The school leadership team also acknowledged the influence of the Hong Kong Education Bureau’s 3rd ICT Strategy (2007) ‘Right technology for the right time for the right task’, as well as the UK government’s Harnessing Technology (2005), both of which both make unequivocal claims that the use of technology is essential for life-long learning and the restructuring of the learning environment. As a consequence the leadership understood well the need to switch the focus from investments to investigating the relationship between ICTs and pedagogy. This view was strengthened by the prevailing curriculum reforms. What they were less clear about was their vision and action plan to manage the shift from planning for technology to planning for learning. (A summary of the BECTA e-leadership survey is given on Appendix F on the CD)

Students’ use of Web 2.0 technologies before the school closure

The context and opportunities created during the year to develop students use of Web 2.0 is described in Appendix A; many of these Web 2.0 applications were deployed
through the learning platform. The summary is based on the framework used in the BECTA Report (2008) on *Web 2.0 technologies for learning: The current landscape – opportunities, challenges and tensions* (pp. 24-26).

To provide evidence of the impact of Web 2.0 on student learning, the ICT teacher collaborated with the class teachers to design learning activities which involved a mix of Web 2.0 applications that were often integrated into the learning platform but, in some cases, these were used on a standalone basis. Three activities were selected for analysis because they best represented the way the ICT teacher and class teachers worked together to exploit the functionality of the learning platform and web 2.0 applications within the context of existing schemes of work.

**Table 7. Learning Activities used to expand learning capacity using Web 2.0 within a learning platform**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forums in Year 4</td>
<td>Students used Forums on the learning platform to discuss what it was like to live under Roman law during the Roman Empire. Their Posts were then assessed using a rubric based on Bloom’s taxonomy</td>
</tr>
<tr>
<td>Wikis in Year 4</td>
<td>Students published their stories using a Wiki within the learning platform and then invited classmates to leave comments</td>
</tr>
<tr>
<td>Portfolios in Years 2 to 6</td>
<td>Students were shown how to create a Home Page for their Digital Portfolio on the learning platform. Older students were encouraged to enhance their pages by embedding Web 2.0 applications like Zoho (<a href="http://www.zoho.com">www.zoho.com</a>), YouTube, Slideshare(<a href="http://www.slideshare.net">www.slideshare.net</a>) etc. Portfolios in years 5 and 6 were assessed.</td>
</tr>
</tbody>
</table>

**Students’ use of technologies during the Swine Flu closure**

The school closure created an extra-ordinary set of circumstances and the opportunity was taken to create learning activities which would give students to use the Web 2.0 applications and the learning platform to support their work at home studies. The ICT teacher collaborated with class teachers to design these activities. Table 8 lists the activities used during the school closure.
### Table 8. Learning Activities used during the Swine Flu Closure

<table>
<thead>
<tr>
<th>Activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Diary</td>
<td>Forums were created on the learning platform for years 4 and 5 inviting students to record and reflect on the work they were doing at home. Extracts from these Forums were selected and presented in Table 14 along with comments. Forums had already been used with these students so they were familiar with the technology and the process. The evidence gives a unique insight into how they felt about and responded to the challenges of using technology at home.</td>
</tr>
<tr>
<td>Toy Story</td>
<td>The year 4 students were invited to design and build a toy that would float on water and write an explanation for another students about how to make the toy. The students were then invited to find ways of publishing their work using the technology available to them. The results give some indication about the capacity of students to use technology to publish their work.</td>
</tr>
<tr>
<td>Wikis on Life in Ancient Greece</td>
<td>Year 5 students were given the challenge of working in House Teams to submit a joint assignment describing life in Ancient Greece. They were expected to use a Wiki from the learning platform for collaboration and knowledge sharing. The results are used to evaluate their ability to use technology for knowledge building and collaboration.</td>
</tr>
<tr>
<td>Home Pages on student portfolios</td>
<td>Students used the opportunity to update and publish links to their work from the Home Page in their portfolios. The Portfolios were part of the learning platform and enabled students to create Home Pages and publish their work to teachers, classmates or year mates. To support the use of multi-media students were given access to school accounts for Slideshare and Motionbox(<a href="http://www.motionbox.com">http://www.motionbox.com</a>) and were also encouraged to select an appropriate Web 2.0 application. This gave students the opportunity to showcase what they learnt about how to what was in effect a mini blog into which they could embed Web 2.0 applications.</td>
</tr>
<tr>
<td>Technology Challenge</td>
<td>This activity was specially designed to give some students the opportunity to use technology to design, create and publish a multi-media show in which they describe what it was like to work at home. Of all the assignments this one would give an indication of the ability of students to generate and publish online content.</td>
</tr>
</tbody>
</table>

These activities and the associated correspondence from students, staff and parents generated another data set and these are summarised in Table 9.
Table 9. Summary of Data Sources used during the Swine Flu Closure

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student posts on the Daily Diary Forums in Years 2, 4 and 5</td>
<td>Text, Images and Videos</td>
<td>Presented as Charts of Posts and Views per year group. Fig. 8</td>
</tr>
<tr>
<td>Email correspondence with ICT teacher</td>
<td>Text responses</td>
<td>Nudist QR analysis identifies six strands. Fig. 7</td>
</tr>
<tr>
<td>Survey of all parents in Primary department</td>
<td>Text responses</td>
<td>Questions about use of technology and views on using technology to support learning at home. Appendix I (on CD)</td>
</tr>
<tr>
<td>Page Views of from the Learning Platform for years 2, 4 and 5</td>
<td>Quantitative data</td>
<td>Presented as graph of views against date. Fig. 6</td>
</tr>
<tr>
<td>Student generated digital content from Posts, Digital Portfolios and response to the Technology Challenge</td>
<td>Text, images, sound and video</td>
<td>Analysed using Nudist QR. Five distinct strands were identified (Table.10) supported by screen shots of examples. Appendix B to D</td>
</tr>
<tr>
<td>Semi-structured interviews with Primary teachers about their perceptions of technology before and after Swine Flu outbreak</td>
<td>Audio</td>
<td>See Appendix H. Analysed for themes</td>
</tr>
<tr>
<td>Student responses to learning activities designed by class teacher and ICT teacher</td>
<td>Digital content in text, audio and video</td>
<td>See Table.8</td>
</tr>
</tbody>
</table>

The data collected from student generated digital content – coming from Posts, their response to learning activities and work on their Digital Portfolios was used to evaluate the extent to which these young learners were exhibiting the behaviours associated with ‘Digital Natives’. This resulted in five central strands which are described in Table 10. The complete data set for each of these strands can be found in Appendices B to D with illustrated extracts from the email correspondence, posts on Forums and students’ Digital Portfolios.
Table 10. Themes identified from student-generated content during Swine Flu Closure (see also Appendices B to D)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What impact did the school closure have on the way students</td>
<td>Was everyone is a Digital Native?</td>
<td>How exceptional are the Digital Natives?</td>
</tr>
<tr>
<td>collaborated and communicated with each other?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What impact did the school closure have on the attitude of</td>
<td>What impact did the school closure have on the students’ use of</td>
<td></td>
</tr>
<tr>
<td>parents to technology?</td>
<td>technology?</td>
<td></td>
</tr>
</tbody>
</table>

What impact did the school closure have on the attitude of parents to technology?

What impact did the school closure have on the students’ use of technology?
Chapter Four

Data Analysis

Changes in Teachers’ perceptions of Learning Technology

This section will examine the data from teacher surveys and interviews to assess how they responded to the introduction of Web 2.0 technologies and, in particular, it will use the data from the school closure to assess the impact on teacher behaviour and attitudes when learning at home became mandatory.

The structured interviews reveal that, prior to the school closure, teachers were happy when ICT was an isolated subject because the boundaries and responsibilities were clear and ICT was regarded as one of four specialist subjects. The change in curriculum design and shift from planning for technology to planning for learning did not create any tensions. This is probably because teachers were not expected to make transformational changes in their practice in order to accommodate ICTs and neither were their skill levels regarded as an issue or impediment to student learning with ICTs. Neither were resources a key driver for change; while laptops were deployed in Years 5 and 6, these were not used as Trojan horses to infiltrate ICTs into classroom practice. The ICT room remained intact and continued to be the place where children used ICTs. The ICT timetabling did not change and each class continues to have 45 minutes a week of ICT time. However by the time Swine Flu strikes the use of Web 2.0 technologies was becoming normalised by the end of the year. The question then is what caused this change in attitude among class teachers?

Firstly there was a change in the professional relationship between the specialist ICT teacher which allowed for much greater alignment between ICT activities and mainstream activities and these were used to create timely opportunities to exploit
learning technologies in the context of what the students were already doing. Retrofit as opposed to transformation was the norm. The Alignment Model shown in Figure 5 represents these changes.

Figure 5: Alignment Model

The model represents alignment in terms of two continuum – the x axis shows the change from ICT as a subject to learning with and through ICTs, and the y axis represents the continuum from ICTs as isolated to ICTs being integrated into learning design. The introduction of a more open and flexible curriculum design and new professional relationships changes the context of professional conversations about the use of ICTs. Gradually isolated conversations about ICT were replaced by shared dialogues where both class teachers and ICT specialist both agreed and both understood how and why ICTs should be used.

For example, a Forum instead of being an isolated series of messages, becomes a way of supporting peer to peer learning or students’ prior learning about life in Ancient Rome, because both parties shared a common belief in collaborative student centred learning. Bubbl.us (http://bubbl.us/) instead if being used as another isolated PowerPoint
presentation becomes a visual thinking and planning tool to support enquiry into Roman life styles, because both parties believed in visual concept maps (see Table 11).

Table 11. Examples of how technology was used to enhance and extend the learning outcomes of existing activities

<table>
<thead>
<tr>
<th>The Context</th>
<th>Digital Tools deployed</th>
<th>Enhancement of learning outcomes</th>
<th>New Extended learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancient Civilisations Romans. Good or Bad?</td>
<td>Forums within a Learning Platform</td>
<td>Forums were used so that students could declare their prior learning and be aware of classmates prior learning. It supported the use of jigsaw groups – expert and home groups.</td>
<td>Information Literacy Skills. Ability to justify and reference a point of view about Romans and show awareness of other students contributions. The Forums were assessed using Blooms Taxonomy.</td>
</tr>
<tr>
<td></td>
<td>Wikis within a learning platform</td>
<td>Wikis enabled students to publish their work on Roman Gods and using a variety of media – sound, images - video.</td>
<td>Students were asked to blog as if they were a Roman God – they had to show a sense of audience and develop an understanding of blogging genre. They also developed their Digital Literacy skills by using different media to communicate their message.</td>
</tr>
</tbody>
</table>

The alignment model shows that teachers are more likely to see the affordances of ICTs if the application is introduced in a familiar context. The context helps reduce the gap between the affordances of technology and learning outcomes and creates the ‘spark’ of opportunism. The timing was often critical because the affordances of the ICTs and the return on investment by the teachers depended on the context or topic, if the timing was wrong then what could have been a solution quickly became a problem.

The new curriculum model played a key role in unlocking the doorway into existing schemes of work and turning what would have threats or hindrances into opportunities.

This model also supports the notion of connectedness described in the SITES 2006 study which defines 21st Century Learning skills in terms of two components – collaboration.
and connectedness. In this context connectedness describes how the perception of ICT depends on how far teachers accept the connection between ICTs and existing learning outcomes and pedagogy.

Finally the Alignment Model raised questions about the validity of the classic Rogers Model of change particularly when it came to addressing the impact of a sudden school closure on teachers’ attitudes to ICTs. These issues will now be discussed in some detail and will lead up to the introduction of the new Energy of Activation model to account for teachers change in attitude.

**The Rogers Model. Issues and Shortcomings**

The classic Rogers case would see the early adopters as key to the innovation with the laggards creating the drag. In this case there was no obvious evidence to link the early adopters with the innovations that occurred during the year. These staff had and continued to act within their own frames of reference and their use of ICT was a reflection of personal style, rather than determined by institutional values. The results of the structured interviews suggested that staff were happy with the status quo, indeed it did seem that the more innovative they were then the less likely was their approach to be adopted by colleagues. In other words both early adopters and laggards increased resistance to change and both were seen as outliers, separate from mainstream activity. In this case the few early adopters identified in the study did not appear to exert a significant influence on the adoption of new practices by the mainstream. The ‘chasm’ – or what is sometimes referred to as the ‘digital divide’ had moved to the other end of the bell shaped curve, and defined the gap between the conservative and highly sceptic users. See Figure 6.
The staff survey (Teachers Professional ICT Attitudes) and staff interviews was used to profile the staff against Rogers’ model of innovation.

Figure 6. Rogers’ Diffusion Model of Change. Amended

What did emerge was that the main innovation came from the staff in the middle of the bell shaped curve – pragmatic and conservative technology users initially, but once the spectre of swine flu emerged, they were joined by the conservative sceptical. It was these staff who then worked more closely with the ICT teacher to re-purpose and integrate their use of ICT. For some the motivation was pragmatic in that they saw integration as a way of increasing the amount of time they could allocate to a topic. Towards the end of the school closure even the deeply conservative users, represented by teachers not from the international section of the school, had begun to adopt ICTs to support on line language learning. To sum up, prior to the school closure it was becoming clear that the Rogers model did not fully represent how teachers were responding to the change in use of ICTs. The notion that the early adopters were the drivers for change was clearly not the case; instead the drive for change was coming
from the middle group. This issue becomes even more apparent when we look at the teacher data during the school closure.

**Teachers’ perceptions of Web 2.0 technologies during the School Closure**

Prior to the closure the conservative user community had become familiar with their students using Forums, the content of their Home Page and making use of Web applications. Their role had been one of supportive observers, happy to create opportunities for technology to be used to enhance their students’ learning. Even so they were still not driving the integration of ICTs.

This can be explained using the Endothermic version of the Energy of Activation Model (see Figure 3 page 21). While the changes in curriculum design and in professional relationships had reduced their resistance to the personal adoption of ICTs by sensitising them to how technology could enhance learning outcomes and processes (see Alignment Model described earlier), the perceived benefits of investing in ICTs did not outweigh the perceived cost of investing in new ways of working with ICTs.

The school closure changed the status quo significantly reducing the Energy of Activation (see Figure 2, page 20 ), resulting in major integration of technology and learning by class teachers. The school requirement to upload resources via the school portal on a daily basis, and the time created to do this, acted as a catalyst and the benefits of using technology outweighed the energy required to adopt the technology. The problem had become the solution.
In Years 4 and 5 the work at home was managed from the learning platform because the teachers saw this as a better way of supporting their students’ learning. It allowed them to maintain a dialogue with their class using Forums and, most importantly, gave them a way of giving their students feedback. Literally overnight teachers who only previously have watched their students using these tools became active users themselves. This behaviour even extended to colleagues outside the International Department who, by week two, realised the need for multi-media resources if they were to keep their students engaged. This group quickly became active users of Audacity and streaming video through Motionbox, publishing their work through the learning platform. A PE teacher who enjoyed her reputation as a ‘technophobe’, when faced with the problem of how to celebrate the annual Sports Award evening (assemblies were forbidden) upgraded her PowerPoint skills and taught herself how to use Animoto (http://animoto.com), publishing her shows through the learning platform. The EAL teacher used the time to upgrade her starter page on the learning platform, adding Forums and links to learning activities. These and other examples can be seen in Table 12 below.

**Table 12. Examples of how teachers adopted Learning Technology during work at home**

<table>
<thead>
<tr>
<th>PE Teacher using the Learning Platform to broadcast an on line Sports Award</th>
<th>The EAL Teacher creates a learning community on the Learning Platform to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome to the Sports Award Evening (On Line!) (You must enter a username and password to see the presentations) Watch the Sports Award Slide Shows...click here (not live until 5.30 pm June 29th 2009) Nothing can replace the sense of being there, so we have created a Guest Book where you can give us your feedback. Click here to open the Guest Book</td>
<td>Children and parents: Welcome to our E2 website!...and welcome Back to School for 2009 - 2010 We are looking forward to a great year ahead. Check out the &quot;Learning Links&quot; section below for links to some excellent websites, if you are feeling bored, and don't forget to leave a message on our forums page. Our first forum &quot;What are you doing today?&quot;, just to get you started, but in the coming school year I am hoping to contribute to forums on a variety of topics.</td>
</tr>
</tbody>
</table>
Evening support work at home learning

The German teacher uses the Learning Platform to broadcast video and audio files during work at home

Summary. The data from teachers survey and interviews and the Energy of Activation model suggests that teachers attitude to ICTs depends on their perception of the balance between benefits and investment. Changes in circumstance such as provision of time and expectations from administrators can significantly alter this balance and precipitate a long term change in attitude and more sustainable use of ICTs.
The impact of the Swine Flu closure on students’ learning behaviours

This section will use the data taken from students’ use of Web 2.0 and the learning platform during the school closure to answer the research questions about the impact on their learning behaviour as they move from learning about ICTs to learning through and with ICTs.

Analysis of Students Page Views by year group.

![Figure 7: Page views on the Learning Platform by students during school closure from June 13th to End of Term (July 3rd) (Day 1 represents the first day of enforced school closure and day 21 is the last day of term)](image)

Page views in these Year groups were analysed because the activities and resources were published through the learning platform rather than the school portal. Page views give an indication of how frequently students logged onto their year page but some approximations had to be made to avoid double counting return visits in one session. The numbers represent a minimum as students may well have visited the Home Page of the learning platform where page views averaged 85 hits a day. The peaks and troughs reflect the energy points after key assignments or information were transmitted to students. The data shows that year pages were not viewed by every family every day but, judging from the contribution to Forums in Years 4 and 5, it is likely that a large
majority used the learning platform during weeks 1 and 2. The variation in activity is interesting and suggests that the children regarded the year pages as bulletin boards from which to get information. Their use of the Forums was more intense, especially among the Year 4’s who saw this as a way of keeping in touch with each other; in other words the social aspect of the learning platform exerted a bigger pull. In other words the Learning Platform was treated like a classroom on line – listen to the teacher when you have to, but having conversations was more fun! Not surprisingly activity dropped off in week 3 – the last week of term – but a small group of students continued to view and submit posts into the summer holidays.

The data shows that students from a young age were capable of using the learning platform to access information and to correspond with each other through Forums. However their behaviour suggest that, in contrast to the findings of Selwyn (2006), they were using the technology to compensate for the lack of classroom social interaction.

(research questions 3 and 5)
Figure 8: Analysis of email correspondence during Swine Flu closure

The email traffic was a good indication of the issues students and parents were experiencing. Interpretations have to be approximate but the significant numbers in Year 2s who lost accounts is indicative of their strong comfort level and motivation to use a learning platform but their capacity to understand personal accounts and security was less well developed. More significantly were the numbers of Year 5s who had problems publishing work through their portfolios and navigating through the learning platform. These students had enjoyed significant exposure to Web 2.0 prior to the closure and it is surprising that they had difficulty uploading files. In the discussion these findings will be used to argue that these Digital Natives are more comfortable surfing than being producers of content and are not always in such fine control of their online world as has been suggested.

Analysis of Forum Posts in Years 2, 4 and 5

Average Posts per student | Posts as a Percentage of visits
--- | ---
| Year 2 | Year 4 | Year 5 |

![Graph showing average posts per student and posts as a percentage of visits for Years 2, 4, and 5.]

Figure 9: Total Number of Posts and Views recorded by students in Years 2, 4 and 5
Forums were created in each of the year groups to support dialogue between students and between students and their class teachers. The students were invited to post a daily diary about their working activities as well as correspond with their teachers. The results reveal that while many students enjoyed looking at each other’s posts only a minority made a contribution. The Year 4 data shows that nearly all students were making regular posts on the Daily Diary but it was a hard core of four students who regularly took the lead. In year 5 the pattern is different with fewer posts on the Daily Diary and most posts appeared on the Ancient Greeks Wiki. Again there was a small hardcore of four active posters in Year 5. In other words there were significant numbers of students in Year 5 who did not take part and that it was the more able students who made the fewest contributions. In Year 2 a small group of four students made regular posts in response to the Book Review activity but, given their age and probably limited access to computers at home, the results might indicate that Year 2 students had the potential to be more active. This data suggests the behaviour of digital natives cannot be generalised and that not all are competent or enthusiastic about creating digital content. More data is needed about student posting behaviour in order to understand the behaviour of students when they participate in school based Forums and make use of other Web 2.0 applications. (research question 4)

Analysis of all Digital Content in Years 2, 4 and 5

The Nudist QR analysis of all the digital content generated by the students identified five key strands (see table 11) and these, along with the supporting evidence, are shown in Appendices B to E. The data analysis will focus on the key question regarding the impact of the school closure on the students learning behaviours and, in particular it will evaluate the queries raised in research questions 4, 5 and 6.
(A summary of all the email correspondence is in Appendix G on the CD)

All year groups were comfortable using Forums to exchange news about themselves (see Appendix B) and giving feedback to each other. Even Year 2 students were able to post feedback to their peer’s book reviews highly motivated by the multi-media context. Only a few posts reverted to SMS speak and many were well written and students were very aware audience aware. Many Year 4’s and 5’s clearly wrote in a way that encouraged a response, in other words they did not make statements but expressed opinions and feelings which were often picked up by peers. Some even added sound files and images to illustrate an event or outing. This confirms the prevailing views that this generation is very comfortable using this medium.

<table>
<thead>
<tr>
<th>Year 2 students posting in response to a peers book review, publish on the learning platform</th>
<th>Year 4</th>
</tr>
</thead>
</table>
| Hi all, | Having great fun at the year end party especially at the Riddle.

A student posting on the Year 4 Daily Diary

What is the prize for making the toy boat? |

Answer to the riddle:
You know what, I won 5th prize in the GSTS raffle thing people!!! :)

He He it’s real. |
Transcript from a Year 5 dialogue

For Phoenix

Hi. It’s me ******. If you are in phoenix can you tell me what you are doing for the webquest. I am doing gods and goddesses. Since we have six people in our house one person will have to think of another topic.

(reply)

Hi. For the Ancient Greek homework I am working on ‘Warfare’. I have completed the work. Let me know when we can all share

Thanks

Wequest for Lion group

Hi

Message for the Lion group (Webquest)

I would like to do Daily life of women and children

Can lion please post what they would like to share so we don’t all chose each others topics!

Have a great holiday

I am doing Slaves

Tks **** and now I want I want to make it known that I am doing slaves for lions (actually I’ve already finished it) By the way what is everyone else doing?

Reply

I have already finished daily life of women and children

They were less confident when it came to collaboration (see Appendix D) and this particularly evident in the Year 5 who had been asked to use a Wiki to submit a joint project on Ancient Greece. A few students attempted to take the lead and set up Bubbl.us accounts for shared concept mapping but none actually succeeded in connecting each other to a single account. Only two of the four House teams created a
wiki and these were only partial successful, with the students tending to use them as a shared website rather than for collaboration.

The evidence suggests that students of all age groups can access information from a website but only a small minority can use digital tools such as Slideshare, Motionbox or Wikis to publish and broadcast their work. This confirms the findings from the Demos Report on ‘Their Space’ that only 20% of young people are active and productive users of technology.

Students in years 4 and 5 had enjoyed significant exposure to Web 2.0 technologies and had been shown how to embed widgets into their Home Pages. School accounts had been created in Motionbox and Slideshare to support this prior to the school closure. These students had been shown how to use Wikis and other Web 2.0 applications (Podcasting, Animoto etc), but only a few were able to re-purpose for publication and collaboration. Further work needs to be done as recommended by the BECTA Reports on Web 2.0 if we are to understand how students’ learning can be supported by Web 2.0 applications.

On the other hand the small minority from Years 2, 4, 5 and 6 did exhibit exceptional digital dexterity (see Appendix C), perseverance and imagination in the way they took full advantage of Web 2.0 applications like Motionbox, Slideshare, Powerzoom (http://www.powerzoom.com/), Zoho to get their work published to their audience of classmates. Further examples of this can be seen in Table 14.
These students also made full use of the learning platform to ensure that they reached their audience. As one Year 6 girl asked in an email to her ICT teacher:

_I created a Zoho account and used the Zoho Show tool and embedded my PowerPoint, but then I tried to post the link on my Homepage and it didn’t seem to work. You said something about an embed code...how do you find it? Thanks! Can you also tell me if I want my father to read my portfolio from overseas, is there a link I can send him without giving him my password to log on? Thanks again..._

She understood about security, publishing rights and the capacity of her portfolio. The same student had also gone to great lengths to find a way of embedding her PowerPoint in her Home Page. Often as not their published work was not directly related to the assignments set by the teacher. Other examples include a year 2 who extended her home page embedding photo gallery of her family along with sound files of her playing the violin. Another Year 2 published her Book Review in Photostory3 onto her Home Page and two Year 4 students found out how to embed videos of their Toy Boat.

**Summary.** Once again the data suggests that not all digital natives are adept at either using or re-purposing Web 2.0 technologies to support their learning. They are
motivated when the technology allows them to communicate and enjoy browsing for information, but their understanding of how technology can support their learning was not as developed as some commentators have claimed.
Chapter Five

Discussion and Conclusion

How did teachers’ perception of ICTs change?

This section will discuss the key research questions concerning the impact on teachers’
behaviour when Web 2.0 technologies are introduced and circumstances require
learning to be managed on line.

The introduction of Web 2.0 technology into the classroom could have been interpreted
by class teachers as a something of a Trojan Mouse, with the students acting as the
harbingers of change by bringing their digital skills, behaviours and new learning styles
into the classroom. The potential for tension and dissonance from teachers who are not
ICT confident is obvious, and this could have increased the Energy of Activation.

MacFarlane (2007) speaking at the Building Learning Communities conference describes
the deeply subversive nature of technology. Similarly

Jeffries et al. (2007, p. 122) in a paper on Pedagogy Ethics and Technology also refers to
the underlying tensions associated with the introduction of technology into the
classroom. They conclude that the interaction goes to the heart of what education is
about commenting that learning technologies have the potential to undermine the
legitimacy of the educational process.

Potentially the introduction of Web 2.0 far from being seen as a solution could have
challenged teachers’ beliefs and values about what is considered useful learning,
resulting in the innovation bring rejected. The Rogers model suggests that could have
increased the gap between the early adopters and the ‘middle zone’, increasing the
digital divide between the ‘have’ s’ and ‘have nots’ and the gap between the formal
(teacher managed, hierarchical) versus the informal (student centred, social,
democratic) further isolating technology from learning. The question then, is why did the teachers adopt the solutions offered by the technology?.

Before the school closure there was evidence from the structured interviews that teachers had a positive attitude towards their students using Web 2.0 and the learning platform and they had legitimised these technologies into their learning culture. This is significant as Fullan (1991) observed when exploring the issue of educational reform, teachers do not always have a coherent sense of the rationale or the need for change. This is particularly applicable to the introduction of technology which is often caricatured as a solution looking for a problem. Teachers who do not use technology are not necessarily resisting the need for change, rather they may be responding to a lack of understanding about the affordances the technology has to offer as well as insufficient opportunity to make sense of the new technologies for themselves. So the situation before Swine Flu closed the school is represented by Figure 3 on page 21 where the Energy of Activation (Woodhead and Kennedy, in press) is maintained. So what caused this to be reduced and precipitate the activities that emerged during the closure?.

Three reasons are proposed.

Firstly Swine Flu created a situation where teachers had to redirect their energies from face to face teaching and, most importantly, generate the time and motivation to prepare on-line resources and activities, in order to meet the new priority of managing learning at home. This reduced the Energy of Activation and what had been a problem – adopting new technology – became the solution. In other words Swine Flu was the catalyst that reduced the Energy of Activation. Time was also a key factor – the short time in which teachers had to respond and the time available to engineer the new learning resources.
Secondly the evidence shows that concentrating on the early adopters would have increased dissonance and therefore the Energy of Activation. Focusing on the ‘middle zone’ reduced dissonance because a small shift from these teachers made a significant impact on the overall perceptions of Web 2.0 and the learning platform, so that by the time Swine Flu closed the school, these technologies were seen as solutions not problems. The ‘chasm’ between early adopters and the middle ground was not the issue as much as the chasm between the laggards and the rest of the staff.

Thirdly the study shows that changes in curriculum design also helped reduce the $E_a$ because it gave teachers a new paradigm with which to understand and interpret the affordances of new technologies. The new ICT curriculum allowed for greater alignment between the learning outcomes and the affordances of new technology. This is confirmed by other researchers such as Meers and Knight (2009) in their report for the Victorian Institute of Teaching, who found that:

...in estimating the importance of a range of factors that enable teachers to adopt new digital/ online technologies in their teaching, teachers place less emphasis on those related to ease of use and support for ICT than do school leaders and sector personnel. Teachers also view pressure from outside sources for them to use ICT to be less importance than do sector personnel. Policies and syllabuses for ICT are seen as a stronger influence by teachers than by principals and sector personnel.(p.3)

In other words the adoption of new technologies, at least their acceptance, is influenced more by changes in curriculum design than the pressure from school leaders or from outside sources to create 21st Century Schools of the future. Rogers’ Diffusion Model gave a snapshot of staff attitudes to ICTs, but fell short when it came to revealing the changes taking place before and especially during the school closure. The Energy of Activation model gave a far more accurate representation of the tipping point created when learning had to be managed on line.
In education the keystone that bridges this gap is the curriculum. In other words bringing in new technology will fail in the long term, unless the affordances offered by the technology become embedded in curriculum design.

However the question still remains as to whether this impact had a more permanent influence on their underlying attitudes and beliefs about the affordances of learning technologies?. Or did the perceived benefits of the new ways of working exceed the investment required to adopt the new technologies?. As a footnote it was interesting to observe that in the following term, when a new learning platform was being introduced, there was widespread acknowledgement that this solution was necessary.

**The Impact on Students’ their Learning Behaviours**

This section will use the evidence from this study to discuss how students learning behaviour changed once they began to learning with and through ICTs, as well as examine whether the claims made about the relationship between Digital Natives and learning technologies can be sustained.

Then there are those who maintain that today’s students are bored and indifferent to what happens in the conventional classroom and only come alive when they return to their digitally connected world. Selwyn (2006) surveys students about their perceptions of connectivity and access in school where he contrasts ‘technology-rich learners’ and ‘technology-poor schools’, suggesting (p. 8) that outside schools young people have a ‘richer, more extensive engagement’ with technology and experience a more collaborative environment out of school. Some school leaders have used these arguments to justify sweeping changes in curriculum design, pedagogy and learning environments. In his article ‘Listen to the Natives’ Mark Prensky (2001) warns that those who have the responsibility to guide our students in a 21st century education will need
to be aware of the important characteristics of the 21st century landscape. This means taking into account that today’s students have a high comfort level in the use of computers, video games, and the Internet and they easily work with the most cutting-edge technologies. Students will need to be engaged electronically, while they collaborate with others and educators. He also states that students need to be given a meaningful voice in school. Prensky warns us that if we fail in this, *We will be left in the 21st century with school buildings to administer – but with students who are physically or mentally somewhere else.*

**How well do Digital Natives use Technology for Learning?**

This study of above average ability students shows that they are quick to learn how to use Web 2.0 applications, that they enjoy the medium and like to add Web 2.0 to their Home Pages but they were not at the cutting edge of technology. Only a small minority provided evidence of skills that enabled them to re-purpose these applications to publish their work. While they were familiar with the process of publishing from their social networking sites, the affordances of applications like Google Docs or Bubbl.us for collaboration had to be explained to them. Teachers had a key role to play in scaffolding these applications so they could benefit their students learning. This runs counter to the views of Tapscott (1998) who argues that teachers lack of skills and schools restricted connectivity is holding back a whole generation of digital learners. The study also calls into questions the idea that students enjoy a richer and more collaborative environment out of school. From this case it would seem that for young learners the scaffolding provided when they are in school is a key factor in determining the way they use technology for communication and collaboration. Without their teachers students
would remain digital natives – natives in the sense that they are happy to surf and play but unaware of what could be possible.

The results also confirm the findings of a major survey by Kvavik, Caruso & Morgan (2004) of 4374 students across 13 schools in the USA, that only a minority (21%) were engaged in actively creating their own content and that many, as indicated by the Demos Report on ‘Their Space’, had low levels skills understanding of Web 2.0 technologies. Similarly their knowledge of the more educational examples of Web 2.0 was very limited and restricted to applications that were promoted as part of site like Xanga (http://hk.xanga.com/) or Bebo (http://www.bebo.com/).

Bennett, Maton & Kervin (2008) come to a similar conclusion in their critique of the ‘digital native’, stating:

*The picture beginning to emerge from research on young people’s relationships with technology is much more complex than the digital native characterisation suggests. While technology is embedded in their lives, young people’s use and skills are not uniform. There is no evidence of widespread and universal disaffection, or of a distinctly different learning style the like of which has never been seen before. We may live in a highly technologised world, but it is conceivable that it has become so through evolution, rather than revolution. Young people may do things differently, but there are no grounds to consider them alien to us. Education may be under challenge to change, but it is not clear that it is being rejected.* (p. 783)

**Do Digital Natives have new and distinctive learning styles and needs?**

If the advocates of the Digital Native ecology are to be believed than the mix of work at home and exposure to Web 2.0 technologies would have provided the ideal environment for nourishing the four C’s of 21st century learning. The evidence does not support this well. It is unlikely that students would have spontaneously collaborated through the Wiki or Forums in the learning platform, unless these behaviours had been required by their teacher. Furthermore it would seem that their behaviour was strongly influenced by their class teacher. For example in one year 5 class the response rate on the Daily Diary was directly related to the engagement and encouragement from their class teacher.
It is argued that this generation have fundamentally different ways of thinking and of processing information. Portrayed as a generation of multi-taskers (screenagers), learning at high speed and making serendipity connections through the internet. As Bennett, Maton & Kerwin argue in their paper on ‘The Digital Natives debate; a critical review of the evidence’, there is little empirical evidence to support these claims. The recent study by Ophir, Nass & Wagner at Stanford University (2009) reveals, multi-taskers are not much good at multi-tasking. The study did confirm that students’ exposure to multi-media from a young age does have an impact on their visual-spatial skills and non verbal forms of intelligence – for example the Year 2 students capacity to visualize the construction of their home pages was striking, but there was little evidence that they or their older peers, were able to re-purpose these digital tools to support higher order thinking and processing skills. What the study does confirm is the research from Biggs (2003) and Ramsden (1992) that students’ use of technology is very dependent on the task set by the teacher. A similar conclusion was reached in the BECTA report on ICT and Pedagogy (2003) stating that:

.. that these benefits are dependent on the way in which the teacher selects and organises the ICT resources .. the crucial component remains the teacher and their pedagogical approaches (p.33)

**Are they digitally disconnected from the schools and education?**

Tapscott (1998) argues that the ICT capabilities of Digital Natives are so extensive that it is simply no longer appropriate to even attempt to define their learning through an ICT curriculum; that teachers should let the students have direct and unfettered access to technology and they will teach themselves. Failure to do this will, it is claimed, lead to a digitally disconnected generation. MacFarlane take a different view describing this as a
form of ‘techno-romanticism’ which promulgates the notion that everything – in
education - has to change if our students are not to become bored and indifferent.
What was happening initially in this school was probably similar to many other primary
schools around the world and, if the advocacy of Prensky, Tapscott & Selwyn (2006) is to
be accepted, then this school would not seem to support the learning needs of the
digital native, and yet the evidence runs counter to these claims. Many students
repeatedly posted messages about how much they missed schools and their friends;
they repeatedly asked for help and support in use of ICT with some complaining that
connectivity and access at home was worse than school. These were students of above
average ability who had been exposed to Web 2.0 and were used to learning dialogues
on their Forums, many of whom had created quality Digital Portfolios, and yet they still
needed the scaffolding and support from school.
The evidence from this study confirms what MacFarlane (2007) argued in her address to
the Building Learning Communities Conference in Boston when she takes the techno-
romantics to task:

...one of the greatest myths around at the moment is that if we only left young people alone they
automatically reap those benefits...it is simply not true....

This study suggests that young learners need even more scaffolding if they are to make
sense of the digital landscape in which they find themselves. It confirms that a
significant number of young learners are digitally fluent but, if left to themselves, would
use technology in a trivial way. It also challenges the view that schools need to undergo
major transformations in the structure and management of their learning environment
to accommodate new technologies such as Web 2.0.
It does suggest that if we are to have a better understanding of the digital native, then we need to look more closely at the differences between them. For example the Green & Hannon (2007) survey of young technology points to the diversity of engagement among young users. They identified four levels of use: digital pioneer, creative producers, everyday communicators and information gatherers. The similarity between this profile and Rogers’ Diffusion Model is not surprising and would suggest that innovative use of technology among the digital natives is far from uniform and mirrors that of the wider population. The study suggests that more work needs to on the difference between digital natives in terms of their intellectual and digital capacity, and how access at home is influenced by the moral economies of the home - cultural factors, family dynamics and affluence. It maybe that that in some educational systems, technology is being used as an excuse for students’ disaffection with education (rather than the saviour); it may not actually be the reason.

Conclusions

The findings from the way these students used ICTs during the Swine Flu closure confirms their remarkable journey into the world of Web 2.0, their fluency with the language of technology and their delight in being able to use technology to express their ideas. The motivation to learn with and through technology was clear to see. However the data about their learning behaviours reveals a more complex relationship between students, their learning and ICTs. This can be summed up as follows:

- if left to themselves, only a few – and it would be the able few – would be able to re-purpose these technologies to support their learning. Their penchant for social networking sites like Xanga, Club Penquin (http://clubpenguin.com/), Bebo or Facebook, does not automatically translate into productive learning
behaviours with Web 2.0 or with learning platforms. Users of Facebook would confirm the high levels of scaffolding required to support sharing and social interactions;

- we should not underestimate the degree of scaffolding required if online learning is to be an inclusive learning environment; one in which all young learners can benefit from the affordances of learning technologies;

- the majority of digital natives in this study were just that - natives or digital novices. Only a small minority emerged as digital innovators or pioneers and not all digital natives share the same learning behaviours;

- ICTs can benefit and enhance learning when it is already integrated into programmes of study; and

- that young learners do not see ICTs as a substitute for the social interaction of the classroom. Far from being digitally disconnected, young learners enjoy technology when it connects them to their classroom activities.

The teachers also made a remarkable journey towards the adoption and integration of Web 2.0 technologies within the learning platform. The Energy of Activation model showed that it was not the advocacy of 21st century learning, or the techno-romanticism of the early adopters, or additional ICT equipment that energised them to change. Their willingness to adopt ICTs came about because the energy required to change had been drastically reduced and, in a very short period of time, the teachers were able to see the benefits of the new ways of working. In this instance it was the school closure that created the catharsis and, being pragmatist rather than idealist, teachers turned to the tools that were at hand to solve a problem. This study suggests that the ‘moral panic’ created by advocates of 21st century learning should not cloud our judgements or distract us from seeing teachers as having a key role in creating productive digital learning environments.

What are the messages for school administrators from this study?
Firstly investing in more technologies such as laptop schemes, interactive whiteboards etc may only inhibit a change in teacher attitudes and increase the digital divide. Neither are school closures to be recommended. The sustainable use of learning technologies requires schools to create a set of circumstances where the benefits of using technology are transparent and far outweigh the investment required from teachers in learning how to use technology. Secondly an inclusive learning environment should recognise the diverse learning needs of students when they use ICTs. Student led initiatives may not lead to 21st century learning.

From a research perspective, what are the next steps? It would seem that more data is required if we are to have a better and more accurate understanding of the digital native. Such as data about the differences between young people about how they use technology, as well research which can inform educators about the effectiveness of learning scaffolds can be developed to support the use of ICTs in general, and Web 2.0 applications in particular.

Finally, it is a concern whether the levels of interest, participation and engagement by students can be sustained in the long term once the use of Web 2.0 technologies becomes more systemised in schools. Having been there and done that, will the affordances, activities and current engagement offered by ICTs and Web 2.0 applications simply become another source of dreary activities to be accomplished by the student? Further work needs to be done to study how young people respond as more teachers use greater varieties of technologies, more of the time.
References


Animoto dynamic slide shows accessed from http://animoto.com/

Bebo accessed from http://www.bebo.com/


Bubbl.us. Concept mapping tool, accessed from http://bubbl.us/

Clubpenguin accessed from http://clubpenguin.com/


Education Bureau (2007). Right technology at the right time for the right task: Consultation document on the third strategy on information technology in education. HKSAR Government: Education Bureau.


Motionbox Video streaming solution access from http://www.motionbox.com/

Ophir Nass Wagner E C A. Multi-taskers pay mental price. (Video summary on YouTube)


Selwyn, N. (2006). 'Exploring the 'digital disconnect' between net-savvy students and their schools'. *Learning, Media and Technology*, 31 (1), 5-17. Available from http://www.informaworld.com/smpp/content~content=a743773671~db=all~jumptype=ref_internal~fromvnxs=v32n2s3~fromtitle=713606301~cons=772812186

Slideshare image gallery solution accessed from http://www.slideshare.net/


Specialist Education Services (2002). Quality Pedagogy and effective learning with ICT; a Review of the Literature. Published for the Western Australian Department of Education, Perth WA


Zoho suite of online applications to support resource sharing accessed from http://www.zoho.com/

Appendices

Appendix A The perceived and actual affordances offered by Web 2.0 and associated technologies

Appendix B What impact did the school closure have on the students’ use of technology?

Appendix C How exceptional were the Digital Natives?

Appendix D What impact did the school closure on how students collaborated and communicated with each other?

Appendix E Summary of Teacher Responses to Questionnaire based on the Trinidad and Clarkson Survey

Appendix F Summary of BECTA e-leadership responses (on CD)

Appendix G Summary of email correspondence between students, parents and teachers during school closure. (on CD)
Notes to accompany Appendices

Appendix A lists the Web 2.0 applications and other technologies used prior to and during Swine Flu. The style is based on the BECTA Report on Web 2.0 but has been amended to describe the potential learning outcomes and the context in which these outcomes were developed.

Appendix B to D. The content of the student posts, emails and text on their portfolios was analysed using Nudist QR. This identified three themes. Evidence to support and illustrate each theme is listed in the form of Screen shots from the Learning Platform of Posts, emails and content from student Portfolios or Wikis. The student identities are represented by a code which gives the Gender, Year and Class so, for example, FY5A would be read as Female, Year 5 in Class A.
### Appendix A

**The perceived and actual affordances offered by Web 2.0 and associated technologies**

<table>
<thead>
<tr>
<th>Application</th>
<th>Perceived Affordances</th>
<th>Broad Learning Outcomes</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audacity</td>
<td>This is not strictly a web 2.0 resource but supports the use of web 2.0 applications by allowing users to create sound recordings and editing multiple sound files, files are exported as either wav or mp3</td>
<td>Supports media manipulation and publication. Digital literacy is the most obvious learning outcomes as student learn how to edit and adapt difference sound to suit audience and purpose.</td>
<td>Bookbyte activity. Year 5 Time Travel Newscorp. Year 3</td>
</tr>
<tr>
<td>Motionbox</td>
<td>Supports video streaming and editing offers stronger security than You Tube. School account created for staff and students. Videos can be embedded into home pages</td>
<td>Supports publication and broadcasting of short videos. Develops digital literacy by giving students a choice about how they might represent their ideas and opinions. By using video students are learning the basic structure of video to represent their thoughts. The equivalent of learning how to write a story using video</td>
<td>Technology Challenge during work@home. All Years Body Systems. Year 3 Personal Digital Portfolios. Year 2, 3, 4 and 6 Book Reviews year 2</td>
</tr>
<tr>
<td>Animoto</td>
<td>Fast way to create slide shows to music. Can be embedded into home pages and published to a selected audience</td>
<td>Sequencing of photos to create a theme supported by addition of a sound track from animoto library. Learning how to manipulate images and sound to create a message that will engage an audience</td>
<td>PE for all years</td>
</tr>
<tr>
<td>Zoho</td>
<td>Offers multiple web 2.0 solutions for education. The school used Zoho Show to allow students to either embed existing PowerPoint slide shows into their home pages (or create their own). Later on replaced by Slideboom and Google Docs</td>
<td>Allows students to mix images and text and create a visual representation of an idea or opinion or enquiry. Can also offer opportunity for collaboration and peer to peer knowledge building. Creates a strong sense of audience for slide shows which previously had been limited.</td>
<td>Animal Study. Year 6 Ancient Romans. Year 4 Digital Portfolios</td>
</tr>
<tr>
<td>Slideshare</td>
<td>Creates editable slideshows from images which can be published on a webpage. Users can customise sequence and timings</td>
<td>Similar to Animoto but students have more control over production and can therefore gives them more opportunity to develop their digital literacies. Publication sharpens sense of audience and allows for feedback and then further improvements.</td>
<td>Book Reviews. Year 5 Field Trip to Cheung Chau. Year 5 Field Trip. Year 3</td>
</tr>
<tr>
<td>Photostory3</td>
<td>Not a web 2.0 application but a locally installed FOSS for creation of videos from images. Users can add text, voice over and sound tracks and can control sequence and timings. Used in conjunction with Audacity and Motionbox</td>
<td>Offers extensive opportunity for development of digital literacies in the use of images, text and sound. When used with Motionbox video can be embedded in a home page giving students access to an audience and feedback.</td>
<td>Book Reviews. Year 5 Field Trip to Cheung Chau. Year 5 Field Trip. Year 3</td>
</tr>
<tr>
<td>Bubbl.us</td>
<td>A concept mapping tool which creates visualisation of ideas. Individual elements can be easily linked and colour coded. Concept maps can be published on a</td>
<td>Supports enquiry skills by allowing students to externalise their thinking by giving them a visual</td>
<td>Continent Study. Year 6 Ancient Greece. Year 5</td>
</tr>
<tr>
<td>Tool</td>
<td>Description</td>
<td>Benefits</td>
<td>Examples</td>
</tr>
<tr>
<td>------</td>
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<tr>
<td>webpage and editor rights can be shared with other students and teachers.</td>
<td>Supports collaborative learning by allowing students to share ideas within a group.</td>
<td>Flat Stanley. Year 2 Continent study. Year 6 Mapping exercise. Year 5</td>
<td></td>
</tr>
<tr>
<td>Google Earth</td>
<td>A FOSS GIS solution for locating and interrogating geographical data. Students can add their own information in form of place marks, images and links.</td>
<td>Accessible to students of all ages; allows them to visualise locations and terrain. When used with portable GPS, students can add their own place marks along with images. Content can be published by creating kmz files. Supports enquiry skills and publication.</td>
<td>Ancient Romans class library. Year 4 Ancient Greeks class library. Year 5 Information Literacy. Year 6</td>
</tr>
<tr>
<td>Del.icio.us</td>
<td>A social book marking tool which allows users to publish and share websites. Can be used to create shared class libraries to support knowledge sharing and enquiry.</td>
<td>Provides high level support for development of information literacy when students are required to justify and categorise their web sites. Offers a digital version of library based information skills.</td>
<td>Book reviews. Year 4</td>
</tr>
<tr>
<td>Voicethreads</td>
<td>Equivalent to an audio visual Forum where subscribers can leave either a text, audio or video post. Focus of discussion can also be audio visual.</td>
<td>Primarily supports collaboration but the process of leaving a message indirectly supports digital literacies as students need to make a choice about appropriate medium for their post and when they use sound or video need to carefully structure and plan their use of the media.</td>
<td>Conflict and dilemmas. Year 4</td>
</tr>
<tr>
<td>Toondoos</td>
<td>Allows for the creating and sharing of comic strip to represent events, conflicts etc. Students have access to an extensive library of characters and backdrops as well as can add their own images and create their own comic.</td>
<td>Students can use toondoos to represent their interpretation of events or a story. Supports development of digital literacies as students have to sequence frames appropriately for their audience. Comic strips can be published on web pages.</td>
<td>Book reviews. Year 4</td>
</tr>
<tr>
<td>Jing</td>
<td>Captures images or videos of desktop. These can be annotated or edited and then published as videos or images onto webpages.</td>
<td>Supports enquiry and thinking skills (explanations) when used by students to visualise explanations for how to use software.</td>
<td>Screen captures from years 4 to 6</td>
</tr>
<tr>
<td>Forums</td>
<td>These were deployed through the Learning Platform and used to support learning conversations. Students were invited to share their prior learning and discuss different points of view.</td>
<td>Forums were used to develop communication skills and the ability to justify an opinion and reflect on others views. A Forum Rubric was developed from Bloom’s Taxonomy.</td>
<td>Examples: To support prior learning in Year 4 Romans Topic. Feedback and dialogues during work at home</td>
</tr>
<tr>
<td>Wikis</td>
<td>These were deployed through the Learning Platform and used to support collaborative learning and allow students to give feedback to each other.</td>
<td>Wikis supported the idea of sharing and the publishing developed digital literacies skills.</td>
<td>Year 4 used Wikis to publish stories and collaborate on their Roman Topic</td>
</tr>
</tbody>
</table>
### Appendix B

**What impact did the school closure have on the students’ use of technology (a)?**

| Evidence | It’s my Bubble.us account. I have my brainstorm saved on it. I am sorry for sending my brainstorm a bit late. My username is "*****" and my password is "********". I still can’t upload anything onto the ICT Webquest, so I will just E-Mail it to you. | Try the QUIZ. It’s cool but hard!!! I have created a hyperlink on my homepage ('click here to see my ICT challenge') and inserted the http address of the wiki (my Resources ICT stuff wiki ICT challenge) and saved it. But when I click on the hyperlink I get an error message. Switzerland is great - 1800 m altitude and the beginning of summer. I updated the Wiki. Hope it is working now. Will ask my mum to check. | My sister FY6A was so kind to try but failed too (same error message). Could you please have a look and tell me what is wrong? You can always see my ICT Challenge under the path Resources, ... so you can see my work. I am sorry I cannot publish it properly. Maybe I can work on it later (only after 3 pm, need to clear this computer...). |
| Interpretation | Students learning some digital literacy skills with bubbl.us. They needed help uploading and sharing. They had difficulties sharing and publishing this resource. | Example of creative uses of digital tools by a student in response to the Technology Challenge. FY6A published a video diary and a quiz for teachers all within a Wiki accessed from her digital portfolio. Student continues to work on her technology challenge while her family are on holiday abroad. The LP and associated digital tools have given her significant control over her learning and she is happy to continue to blend recreation with school work. | |
| Context | Y5’s were invited to use Bubbl.us to evidence their group planning for the Ancient Greek webquest. | Students were also invited to take part in a Technology Challenge where they had to think of creative ways in which to record their experiences of working@home during the school closure. | Students were also invited to take part in a Technology Challenge where they had to think of creative ways in which to record their experiences of working@home during the school closure. |
| Relationship | MY5A is creating a Bubbl.us to support her team mates work on the Ancient Greece project. | FY6A | MY4A |
What impact did the school closure have on the students’ use of technology (b)?

### Evidence

<table>
<thead>
<tr>
<th>Context</th>
<th>Year 4 students were asked to design and build a toy that worked on water. They also had to write an explanation of how to make the toy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>The Forum was important to Year 4 students who used it to substitute for their lack of social contact</td>
</tr>
</tbody>
</table>

### Interpretation

<table>
<thead>
<tr>
<th>Students were expected to submit a simple document via email. Here FY4B has elected to make it web-based and publish it through her portfolio.</th>
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<tbody>
<tr>
<td>Students were invited to use Bubbl.us to evidence their group planning for the Ancient Greek webquest. They were asked to embed the concept map into their group’s wiki</td>
</tr>
<tr>
<td>The Forum was important to Year 4 students who used it to substitute for their lack of social contact</td>
</tr>
<tr>
<td>Only a few students were able to use their digital portfolios to publish their work</td>
</tr>
</tbody>
</table>

### Relationship

<table>
<thead>
<tr>
<th>FY4B has used her home page to display an interactive description of how her Toy Boat works. Keywords are linked to other documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>MYSC creates a concept map and is trying to invite team mates to contribute</td>
</tr>
<tr>
<td>MY4A uses the class Forum to publish photos of his daily activities</td>
</tr>
<tr>
<td>FY4B has created a series of folder within her digital portfolio in order to publish her work for her teachers</td>
</tr>
</tbody>
</table>
What impact did the school closure have on the students’ use of technology (c)?

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Phoenix’s Wiki on Ancient Greece</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="http://example.com/image1.jpg" alt="Image" /></td>
<td><img src="http://example.com/image2.jpg" alt="Image" /></td>
</tr>
<tr>
<td>Year 4 students were asked to design and build a toy that worked on water. They also had to write an explanation of how to make the toy.</td>
<td>Year 5s working on their Ancient Greece project. They have to work in their house teams.</td>
</tr>
<tr>
<td>MY4C publishing his video of his toy boat on the year Forum</td>
<td>Students in Phoenix used the Wiki tool in the LP to create a home page for their Ancient Greece project.</td>
</tr>
</tbody>
</table>

---

**Evidence**

Anushka’s book review - Cameron Gallagher

Anushka, I liked your review, it was informative but you could have gone into more detail. However, you presented it really well over the speaker. Cameron

That book sounds very exciting Anushka! Wolfi sounds very smart and cute. Your voice was clear and you did not "ah" and "um". From Beth.

Anushka, I think your presentation was great! You spoke in a clear and loud voice. You did not hesitate while you were speaking! I think this book is interesting because I have read some books written by Jacqueline Wilson and they are also interesting. 

---

**Context**

Year 4 students were asked to design and build a toy that worked on water. They also had to write an explanation of how to make the toy. Year 5s working on their Ancient Greece project. They have to work in their house teams.

**Relationship**

MY4C publishing his video of his toy boat on the year Forum. Students in Phoenix used the Wiki tool in the LP to create a home page for their Ancient Greece project.
<table>
<thead>
<tr>
<th>Interpretation</th>
<th>Some Y2 students chose to publish their scheduled book reviews as either sound or video files. Classmates were given opportunity to give feedback via a Forum</th>
<th>Students were also invited to take part in a Technology Challenge where they had to think of creative ways in which to record their experiences of working@home during the school closure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>A collection of posts from the Forum where year 2 students commented on the book reviews</td>
<td>MY4A uses his home page to publish his work for the technology challenge</td>
</tr>
<tr>
<td>Relationship</td>
<td>The class was already engaged in the book review and used the learning platform to continue with their work</td>
<td>This student was always keen to develop his skills and kept in regular contact with his teachers</td>
</tr>
</tbody>
</table>
## Appendix C

### How exceptional were the Digital Natives?

Screen shots taken from the Learning Platform of work by students in Years 2, 4 and 5

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Thanks for your appreciation of my Homepage/Website. About the PowerPoint, I created a Zoho account and used the Zoho Show tool and embedded my PowerPoint, but then I tried to post the link on my Homepage and it didn't seem to work. You said something about an embed code...how do you find it? Thanks! Can you also tell me if I want my father to read my portfolio from overseas, is there a link I can send him without giving him my password to log on? Thanks again...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>A few students became highly competent in using the LP and web 2.0 technologies. They maintained a regular dialogue with their ICT teacher about how they could achieve their aims. These students were particularly purposeful about their use of technology. The technical skills have been either self taught or supported by an adult. The student has a good sense of the media and had previously published images and sound files on VoiceThreads and her portfolio.</td>
</tr>
<tr>
<td>Context</td>
<td>A yr 6 student responding to the Technology Challenge. She has chosen to upgrade her Digital Portfolio Home Page using web 2.0 technologies shown during ICT lessons. This student videos herself testing her toy boat and then posts it onto her digital portfolio. The decision to video and publish was unsolicited and was probably a response to MY4C’s video of his toyboat.</td>
</tr>
<tr>
<td>Relationship</td>
<td>FY6A This student maintained a regular email dialogue as requests for phone support so she could better understand how to use the technology. FY4A This student maintained a regular dialogue on email and the class Forum with her classmates and teachers.</td>
</tr>
<tr>
<td>Evidence</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>Hi Year 4,</td>
<td></td>
</tr>
<tr>
<td>Good morning all.</td>
<td></td>
</tr>
<tr>
<td>I had a busy Father’s day. My dad helped me out over the weekend to do the best project. We had lots of fun and afterwards we went out to dinner to celebrate in the evening.</td>
<td></td>
</tr>
<tr>
<td>My dad taped me practicing my piano but I was unable to link it up to the homepage last Friday. Yesterday, I found out how to use Motionbox. It took me ages to hyperlink (embed).</td>
<td></td>
</tr>
<tr>
<td>Click here to listen to me playing. I hope you like it.</td>
<td></td>
</tr>
<tr>
<td>Jason</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>As with FY4A, this student also learns how to embed video but does not find it easy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extract from a Forum post typical of MY4C. This year group was particularly active on the Forum and used it extensively to keep in touch</td>
</tr>
<tr>
<td>FY2C had already created a sophisticated portfolio prior to the closure. She then used the time to add more multimedia content – in this case using a new app for embedding an image gallery.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY4C takes an active part on Forums and was the first to publish a video. His dominant audience are his classmates rather than teachers. He clearly enjoys the feedback from other pupils.</td>
</tr>
<tr>
<td>FY2C regularly uses her portfolio to celebrate the fun she has with family and her younger sister.</td>
</tr>
</tbody>
</table>
### Appendix D

What impact did the school closure on how students collaborated and communicated with each other?

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
</tbody>
</table>

#### Context

| Year 5s working on their Ancient Greece project. They have to work in their house teams. They use the Forum to try to work out a strategy |
| Year 5s working on their Ancient Greece project. They have to work in their house teams. This task was set during Swine Flu after collaboration between the ICT teacher and class teachers |

#### Relationship

| Y5 students have to discuss how they might use Bubbl.us and Del.icio.us to support their work on the Ancient Greece project |
| Y5 students discussing how to respond the WebQuest task. Students in the same House have to collaborate. |
An unsolicited response from the Year 5s about how they might share their experiences of working@home.

Y5 students discuss the idea of running a survey among themselves about work@home. They are aware that it is possible to do surveys online.

FY5H used the forum as an ‘open diary’ to share her thoughts with her classmates.

FY5H sharing her feelings about work@home and leaving the school at the end of the year.

MY4D sharing his work for that day as well as expressing his feelings “if I spend any more time on this wretched computer I will grow roots...I’m off to play outside because I am only 9 years old you know...now I’ve got a message asking to install a plugin...”

Year 5s working on their Ancient Greece project. They have to work in their house teams.

FY5G discussing how her classmates can create the Wiki for the Ancient Greece Project.
### Evidence

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hi Jason I listened to you on the piano u are amazing</td>
<td>Hi Year 4</td>
</tr>
<tr>
<td>I am up early again today. I selected my book for the Book Report.</td>
<td>I will be working on the second book in the series called The Ranger's Apprentice The Burning Bridge by John Flanagan which is a great medieval adventure. This is a picture of me with the book.</td>
</tr>
</tbody>
</table>

### Evidence

<table>
<thead>
<tr>
<th>Context</th>
<th>Unsolicited response by a Year 4 boy to his classmate’s video of him playing the piano.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship</td>
<td>MY4B giving feedback to a classmate about his video of him playing the piano at his home</td>
</tr>
<tr>
<td>This year 4 boy regularly published the first post for the day on the year Forum. He used text, images and sound.</td>
<td></td>
</tr>
<tr>
<td>MY4E announcing his plans for the day and responding to a classmates sound recording and his teacher’s comments.</td>
<td></td>
</tr>
</tbody>
</table>

### Evidence

<table>
<thead>
<tr>
<th>Evidence</th>
</tr>
</thead>
</table>
| -my German in which I had to hear track 12, 13 and 14.  
In German I also did the sheet that you had to connect the right little part of a sentence to the other right little part of the sentence and when you connected all of them you wright the full sentence you workbook.  
-my Mandarin  
-my Fiction 1, 2 and 3  
some of my math  
I haven't been able to find the explanation plan for the toy boat. |
| I'm really missing school I would rather go to school for the whole week (even over the weekend) than do all this hard homework!!!!!!!!! |

### Evidence

<table>
<thead>
<tr>
<th>Context</th>
<th>Students were asked to use the class Forum to record their daily work activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship</td>
<td>FY4C sharing her work diary with her classmates</td>
</tr>
</tbody>
</table>
Appendix E

Summary of Teacher Responses to Questionnaire based on the Trinidad and Clarkson Survey

<table>
<thead>
<tr>
<th>Vision and Contribution</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>What are the main purposes you want to use ICT for with your students?</td>
</tr>
<tr>
<td>Focus</td>
<td>What are you focusing on at the moment in the use of ICT?</td>
</tr>
<tr>
<td>Rationale</td>
<td>What is the value in having your students use a computer?</td>
</tr>
<tr>
<td>View of ICT</td>
<td>How does ICT fit into your teaching overall</td>
</tr>
<tr>
<td>Contribution to Communities</td>
<td>How do you contribute to school ICT planning? What would you like to contribute? What involvement do you have with learning communities that use ICT?</td>
</tr>
<tr>
<td>Integration and Use</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Frequency of use</strong> Is there any pattern to your ICT usage? How often do your students use ICT? Do they work independently or in groups?</td>
<td>Often there is not pattern or a ‘just in time’ strategy is used. Little evidence of student centered approach but this may be due to access problems. What is emerging is a contrast between the declared purpose of ICT – to support learning – with the practice which seems to be largely teacher centered.</td>
</tr>
<tr>
<td><strong>Implementation strategies</strong> What teaching strategies have you used, and do you use consistently where ICT is involved? How do you decide on the strategy you use?</td>
<td>Majority of responses were very teacher centred.</td>
</tr>
<tr>
<td><strong>Type of activities and pedagogy</strong> What activities have you used computers for in the last term?</td>
<td>Often subject based with students presenting or publishing their work using different media (this was frequently mentioned). Some reference to using ICT for extended learning.</td>
</tr>
<tr>
<td><strong>Tasks for applications</strong> To what tasks have you applied computers during the last term? How have you determined those tasks?</td>
<td>Reinforcement of learning and several references to planning of integrated activities with the ICT teacher.</td>
</tr>
<tr>
<td><strong>Assessing student learning outcomes</strong> Have you assessed work that students have done with ICT? How has this been included with your overall assessment processes?</td>
<td>Very little evidence that teachers assessed the quality of students work. This may reflect that there is an ICT specialist who is seen as taking responsibility for this.</td>
</tr>
<tr>
<td><strong>Relevance of ICT to content</strong> In what ways do you connect what the students do with ICT and the way ICT is used in our society?</td>
<td>There was a strong acknowledgement that students were heavy and confident users of ICT and often knew more than the teachers (not seen as a threat by any teacher). Also recognized that students lived in a multi media world and good use of ICT enabled teachers to replicate this in their classrooms.</td>
</tr>
<tr>
<td><strong>Achievement of CF overarching outcomes</strong> In what ways does the use of ICT by your students support the demonstration of the CF overarching outcomes?</td>
<td>Was not applicable to this target group.</td>
</tr>
</tbody>
</table>
Teacher ICT capabilities and feelings

<table>
<thead>
<tr>
<th>Understanding of potential uses</th>
<th>In different ways all teachers acknowledged the potential of ICT to support teaching and learning. There was a sense of frustration about the barriers that held them back. Some clearly see ICT as more than a tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roles of teacher and students</td>
<td>It was often to model good practice – no one actually mentioned that students had a role but anecdotal observation of some classes shows that students were taking an active role in managing the ICT – activities such as end of week videocasts; weekly class newspapers; Library Learner Leaders were all student led. Interesting to explore why this was identified by teachers themselves?</td>
</tr>
<tr>
<td>Source of direction for use</td>
<td>Overwhelming positive response to the idea that students can and should take a lead in suggesting how ICT can be used</td>
</tr>
<tr>
<td>ICT skills</td>
<td>These were often described as the traditional application programmes; few mention Web 2.0 or any new technology. Some refer to Wikis and YouTube and of course Google for searching.</td>
</tr>
<tr>
<td>Affective response</td>
<td>All feel ICT is necessary. Students need it more than they do!</td>
</tr>
<tr>
<td>Concerns</td>
<td>German teachers has major concerns about limited access to software and some reiterated their concerns about ICT and the tradition of group work in German classrooms. Other responses stressed the need for more integration and some guidance as well as worries that students experience of ICT in different classes is not consistent and therefore the experience was not progressive.</td>
</tr>
</tbody>
</table>