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Enacting key skills-based curricula in secondary education: lessons from a technology-mediated, group-based learning initiative

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Bridge21 is an innovative approach to learning for secondary education that was originally conceptualised as part of a social outreach intervention in the authors’ third-level institution whereby participants attended workshops at a dedicated learning space on campus focusing on a particular model of technology-mediated group-based learning. This paper analyses the current expansion of the Bridge21 project to mainstream schools against a backdrop of government-led reforms for lower secondary education in Ireland. The key skills central to the proposed reforms aim to make education more relevant to the challenges of twenty-first-century living and, among other goals, to empower students to think critically, communicate effectively and work collaboratively. This paper investigates the viability of the Bridge21 model in facilitating the promotion of a selection of these key skills within the context of two case study schools.

Keywords: key skills; technology; group based; learning

1. Introduction

In recent years, dramatic changes have taken place in the global economy and society, largely due to advances in information and communications technology (ICT) (Claxton, 2008). People need very different skills ‘for work, citizenship and self-actualisation’ (Dede, 2010, p. 51) in the twenty-first century, compared to the previous one hundred years. Trends in ICT development are transforming the world of work and creating an increasingly competitive economy in which advanced levels of cognitive skills and learning capacities are required of the workforce (Partnership for 21st Century Skills, 2006, 2011; Scheuermann & Pedró, 2009).

The economic and social trends of the twenty-first century have significant implications for education practices and policies and, indeed, pose many challenges. According to Carr, the urgent task of education must be to assist young people in preparing for ‘the diversity of the 21st century wilderness that they will encounter’ (Carr, 2008, p. 36). It is becoming increasingly apparent that today’s students should be expected to move beyond learning subject-specific facts and figures, towards acquiring a broad range of competencies which include complex skills and deep content knowledge. There is a requirement to develop ‘learners’ with positive

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transferable learning dispositions rather than ‘knowers’ who can absorb and reproduce received information (Claxton, 2006).

A feature of the work on twenty-first-century learning has been an emphasis on the development of key skills, or competencies, and a myriad of conceptual frameworks and resources have been developed to ‘delineate content and processes that teachers should convey as part of students’ schooling’ (Dede, 2010, p. 51). Amongst the most widely adopted of these is the Partnership for 21st Century Skills (2006) in the USA and the Organisation for Economic Co-operation and Development’s (OECD) Definition and Selection of Competencies (DeSeCo) project (Rychen & Salganik, 2005). In addition the European Parliament and Council of Europe have recommended the acquisition of eight key competencies in the context of lifelong learning including communication, digital competence and learning to learn.

Related to the facilitation of twenty-first-century learning, Aviram (2000), Collins and Halverson (2009), and Davidson and Goldberg (2010) amongst others have pointed to the need for educational systems and institutions to catch up with the changes seen in economy and society by reconceptualising education in light of the opportunities and possibilities afforded by digital technology. This is seen as challenging some of the fundamentals of provision to date including how learning is organised, what is important to learn and the role of the teacher/learner. The significance of informal learning via mobile technological devices and considerations related to student assessment are acknowledged as key sub-strands of this emerging re-conceptualisation. Against this backdrop the Irish secondary school system is currently undergoing a systemic reform process aimed at making schooling more applicable to the twenty-first-century context. In line with international trends, a focus of the reform process is on the development of key skills and a set of such key skills has been defined (National Council for Curriculum and Assessment [NCCA], 2011) based upon a synthesis of the literature in this area (NCCA, 2010). This review of literature acknowledges varying approaches to a competencies-based education internationally in the context of affording greater flexibility and autonomy at the school level, a skills- rather than a subject-based curriculum, and personalisation of the student learning experience with an emphasis on Assessment for Learning by means of portfolio or artefact generation. As such there is considerable alignment between the key tenets of this underpinning literature and the learning initiative which provides the focus for this paper.

Bridge21 is an innovative approach to learning for secondary education that was originally conceptualised as part of a social outreach intervention in the authors’ third-level institution. Participants attended workshops in a dedicated learning space on campus, focusing on a particular model of technology-mediated group-based learning (Lawlor, Conneely, & Tangney, 2010). Evaluations of the effect on learners of participation in such workshops indicate that it is a potentially suitable pedagogical model for developing twenty-first-century skills. This paper explores the adaptation of the model for use in mainstream Irish schools as a vehicle for helping achieve the goals of the current reform process. The paper describes the model and how it is being adapted for use in schools. The evaluation highlights students’ and teachers’ perspectives on the intervention, the extent to which it promotes selected key skills and identifies factors that enable or hinder implementation. Data are based on a case study in the 2011–12 academic year, during which six schools piloted the adaptation of the model for use in mainstream teaching. Case studies from two of these schools are presented in this paper.
The paper begins by giving some background on the reform process in Irish education before going on to give an overview of the Bridge21 model and how the authors are working with schools to adapt it for the mainstream classroom. The research methodology used in the study is described before outlining the main findings and discussing their implications.

2. The Irish context

The Irish education system, particularly secondary school education, is characterised by rigid structures and traditional subject-based rote-learning. In recent times, it has come under increasing criticism from educationalists, industry leaders and international corporate organisations (Jeffers, 2011; NCCA, 2005, 2011). As a result of this research evidence, public and political consensus and growing professional concern, a complete reform of the Junior Cycle (years one to three at secondary school) has currently started (NCCA, 2011). Changes are to be brought in on a phased basis over the next few years, but a framework is in place for schools to begin that process immediately if they so wish. A number of key areas are to be addressed via the reform process, namely the inflexible, overcrowded, exam-focused nature of the curriculum, the poor transition between primary and secondary school education and a recent decline in literacy and numeracy standards (as measured by PISA) (OECD, 2010). A greater emphasis on key skills is proposed to deepen students’ learning and equip them ‘to take up the challenges of further study in senior cycle and beyond’ (NCCA, 2011, p. 19). This proposed set of skills is grounded in national and international research and practice (NCCA, 2011) similar to that described above.

Central to the reform approach is that schools, teachers and students are integral to the change process and are allowed the flexibility to embrace innovation. Rather than placing an emphasis on traditional assessment of core subjects, it is proposed that students become more responsible for generating, gathering and presenting evidence of learning (NCCA, 2010, 2011). The list of skills to focus upon in years one to three of secondary school (ages 12–15) is shown in Figure 1. Other aspects of the reform process include a reduction in the number of subjects in which students are assessed and the devolvement of more autonomy to schools in the assessment process.

3. The Bridge21 model of twenty-first-century learning

Since late 2007 two of the authors have been involved in a social outreach project which has developed a particular model of technology-mediated learning (Lawlor et al., 2010). Initially targeted at students aged 15–16 years, the model has been used with more than 4000 participants ranging from primary school pupils to postgraduate students and students with intellectual disability.

The core components of the learning model are shown in Figure 2 and are detailed below:

- A structured **team-based** pedagogy influenced by the Patrol System learning method of the World Organization of the Scout Movement.
- A physical **learning space** designed and configured to support team-based learning.
Figure 1. The key skills defined (in NCCA 2011).

Figure 2. Components of the Bridge21 model.
Adult support that seeks to **guide** and **mentor**, with teachers orchestrating and scaffolding team activities.

- Engagement with content through student-led **projects**.
- **Technology** used as an integral tool in the process.
- Incorporation of team and individual **reflection** as a regular part of the learning.
- **Cross-curricular thematic** learning (Lawlor et al., 2010).

Central to the rationale of the model is the potential of ICT to support a structured, collaborative, project-oriented learning environment. Individually the elements which comprise the learning model are not novel, but we argue that their combination and systematic application in a variety of domains is innovative. Of particular interest is the approach to teamwork which is based on the model of small group working implemented via the Patrol System of the World Scout Movement. Central to this approach is an essentially Vygotskian framework, in which young people work together and learn from each other and the team takes responsibility for action by means of a contract based on mutual commitment, trust and identification with a shared task or objective (Bénard, 2002). The team is self-regulated and reaches decisions based on consensus. The team leader liaises with the adult mentor, who helps to bond the team and foster a team spirit. Team stability is maintained from task to task to allow for team development and to further foster the team dynamic.

From 2007–11 the main deployment of the learning model was as part of an out-of-school educational outreach programme with students from areas of social disadvantage in Dublin, Ireland. The typical workshop format was three and a half days (22 hours) in duration and included day-long projects, requiring students to work in teams of four to five students, research and explore various topics (some with a curricular focus) and create multimedia artefacts (videos, blogs, podcasts, games etc.). The emphasis was on collaborative, project-oriented, constructivist learning activities and a strict deadline was imposed on teams to deliver their work on time and make presentations to their peers and adult mentors. Students were encouraged to regularly reflect on and discuss their learning, knowledge and skill development. The learning model has also been used to deliver computer programming workshops to 16-year-olds (Tangney, Oldham, Conneely, Barrett, & Lawlor, 2010) and to explore peer teaching of advanced curriculum material, also by 16-year-olds, without the presence of a teacher (Lawlor et al., 2010).

Results from the evaluation of the various deployments of the model indicate that it has a positive impact on students’ intrinsic motivation and their attitudes towards taking personal responsibility for their learning. The results also highlight the potential to support the development of twenty-first-century skills such as collaboration, communication, problem-solving and critical thinking and there is evidence of skills transference to school and other learning contexts. Furthermore, there is evidence to suggest an improved attitude towards technology and its role in students’ formal learning (Lawlor et al., 2010).

### 3.1. Adapting the model for use in the classroom

The results outlined above suggest that adapting the Bridge21 approach for use in the formal classroom, so as to release the potential of ICT to leverage the power of collaborative learning, offers a model of pedagogical practice which aligns with the
needs of the twenty-first-century classroom and the Irish lower secondary reform agenda. The model facilitates a shift in focus from a narrow view of teaching individual subjects, to a wider goal of teaching key competencies and skills through engaging with curriculum material.

In the 2011–12 academic year a partnership programme was developed with six schools nationwide who wished to take the lead on implanting the national twenty-first-century reform agenda described in Section 2. The aims of the programme included: exploring ways in which the Bridge21 learning model could be adapted by teachers to deliver curriculum content in new and engaging ways, identifying how the model could support the development and acquisition of key skills and creating a pool of ‘early adopters’ (Rogers, 1995) – students, teachers, principals and learning communities – who, through their concrete experience, would act as role models and reference points for the ‘early majority’ (Rogers, 1995) as they fully embrace the reform agenda.

Schools could choose to adapt the model in a number of different ways:

1. **Single Subject Module**: Subject teachers adapt the Bridge21 model and use it within a single subject, within the confines of the regular timetable. The learning objectives are specific to a single subject area, but also focus on key skills.

2. **Integrated Curriculum Module**: The Bridge21 model is used to support cross-curricular project-based learning during two or more subjects as part of the weekly timetable. These learning units across subjects are entitled integrated curriculum modules. The learning objectives include multiple subject areas, and also key skills.

3. **Thematic Module**: Teachers develop and implement cross-curricular, team-based projects. During a thematic learning and teaching week, students engage in a project utilizing learning from the different subject areas. The learning objectives include multiple subject areas, and also key skills (Lawlor et al., 2010).

Teachers had the opportunity to experience the model first hand and to develop their teaching practice within the context of experiential continuous professional development workshops. A training programme was also provided by students based on the relational approach advocated by Blatchford, Kutnick, Baines, and Galton (2003).

4. **Methodology**

A multiple case study methodology was employed in keeping with Robson (2011). Two contrasting schools were selected from the population of schools involved in the programme and the study sought to explore issues of interest in both schools. Results from international surveys indicate that achievement amongst lower secondary students in Ireland is linked to certain school factors (Eivers, Shiel, & Cunningham, 2008; Perkins, Moran, Cosgrove, & Shiel, 2010). As such, the design of the present study sought to embed school context differences within a multiple case study involving contrasting schools. The study was conducted in two urban secondary schools in the Republic of Ireland during the 2011–12 school year. This approach enabled the researchers to access detailed quantitative and qualitative data throughout the school year and gauge the appropriateness of the Bridge21 model for promoting key skills.
amongst students and to identify factors enabling and impeding its implementation. Criteria for selection of the schools centred on two key factors: (i) contrasting student socioeconomic context and (ii) the overall enthusiasm of participating staff in relation to the initiative. Regarding (i), both schools were quite diverse while in relation to (ii) it appeared that there was considerable enthusiasm and fidelity of implementation in both schools.

School A enrols girls and serves an area of relative economic and social disadvantage. Six teachers and 35 First Year students (ages 12–13) participated, and project implementation reflected a mixture of single-subject and integrated curriculum approaches. In School B, also enrolling girls only, but serving a more economically advantaged population, 19 teachers participated along with 104 First Year students. This private fee-paying school is very well equipped in terms of ICT infrastructure, with a local virtual learning environment and a social networking site along with plentiful tablet devices. There was considerable flexibility about the extent to which teachers within schools engaged with the intervention programme. Typically, individual teachers within schools signed up for involvement with the programme and worked with intact class groupings, reflecting the somewhat notional state-wide average student–teacher ratio of 13.6 (Department of Education and Skills, n.d.). In reality, class sizes vary somewhat depending on the teacher and subject being taught.

Sample activities carried out in the two schools are shown in Table 1 and span a wide range of subjects. Some activities were carried out in a single class period and others were spread out over a number of individual classes. Activities requiring

<table>
<thead>
<tr>
<th>Task</th>
<th>Details</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research, create &amp; share a study document for your peers</td>
<td>Each team is allocated a different part of a topic to research, both in their textbooks and on the Internet. They are required to write up notes, find images &amp; collaborate together to create a document online (using GoogleDocs). This is then shared and presented to the other teams.</td>
<td>Geography, Science, History, Home, Economics, Religious Education</td>
</tr>
<tr>
<td>Write a character study/thematic blog post</td>
<td>Each team is allocated a different character or theme from a play/novel/short story and asked to write a blog post which captures the key points of that character/theme &amp; share with the rest of the class. The task ends with a presentation to the other teams.</td>
<td>English, Irish</td>
</tr>
<tr>
<td>5-minute movie</td>
<td>Teams are challenged with the task of scripting, acting, filming &amp; producing a 5-minute version of a play/novel/short story. The task ends with a final screening of the movies created.</td>
<td>Languages</td>
</tr>
<tr>
<td>Measuring and estimation</td>
<td>Teams are challenged to carry out estimations &amp; measurements such as working out the area and perimeter of irregular shapes laid out on a sports field and to estimate the number of tennis balls which could fit into the (fenced-in) sports pitch. Students use a mixture of traditional measuring devices (such as trundle wheels) as well as dedicated smartphone apps.</td>
<td>Maths</td>
</tr>
</tbody>
</table>
longer periods of sustained engagement were facilitated by blocking out periods in the timetable or teachers pooling their allocation of classes. Some interventions were mentored by the class teacher while others used a team teaching approach. A common strategy across both schools was to rearrange the classroom furniture to facilitate team work by clustering desks together for each team.

A range of methods were employed to support the study design. Data were gathered using a questionnaire administered to all participating students. This survey explored students’ experiences and views on their learning in school generally and also in relation to 11 specific sub-skills (see Table 2), under the headings of Being creative; Working with others and Managing information and thinking. Potential change in students’ experiences and views was measured through employing a pre–post questionnaire design, with the questionnaire administered in January and again in May. The later questionnaire also retrospectively probed students’ experiences with and views on the intervention itself. The questionnaire comprised a mixture of scaled Likert items and open-response probes, with a range of items focusing on each of the sub-skills to increase validity and reliability of responses.

Further numeric and qualitative data from the students were gathered through structured reflections completed by teams and by individuals at different stages during the course of the intervention. These student reflections captured real-time data on the functioning of teams and participants’ own awareness and understanding of their learning and were supplemented with a small number of similar teacher individual reflections. At the conclusion of the intervention, two focus groups were conducted, one with four teachers in School A (Art, Geography, Home Economics, Physical Education/Geography) and another with four Science, Technology, Engineering and Mathematics (STEM) teachers in School B. These methods sought teachers’ experiences and views as co-participants in the programme, with an emphasis on understanding the factors that facilitated and hindered quality implementation. An overview of the instrumentation and participants is presented in Table 3.

Data were analysed using appropriate methods. Student responses to the pre- and post-intervention surveys were collated and analysed using the statistical software package SPSS 16.0 (http://www.spss.com) and descriptive and inferential statistical

<table>
<thead>
<tr>
<th>Skill</th>
<th>Being Creative</th>
<th>Working With Others</th>
<th>Managing Information &amp; Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-skill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imagining</td>
<td></td>
<td>Relating effectively</td>
<td>Being curious</td>
</tr>
<tr>
<td>Exploring options &amp; alternatives*</td>
<td>Co-operating*</td>
<td>Gathering, recording, organising &amp; evaluating information*</td>
<td></td>
</tr>
<tr>
<td>Implementing ideas &amp; taking action</td>
<td>Respecting difference</td>
<td>Using information to solve problems &amp; create new tasks*</td>
<td></td>
</tr>
<tr>
<td>Changing &amp; taking risks</td>
<td>Contributing*</td>
<td>Thinking creatively &amp; critically*</td>
<td></td>
</tr>
<tr>
<td>Learning creatively*</td>
<td>Learning with others*</td>
<td>Reflecting on &amp; evaluating my learning</td>
<td></td>
</tr>
<tr>
<td>Being creative through ICT</td>
<td>Using IT to work with others*</td>
<td>Using ICT to access, manage &amp; share knowledge</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Skills from the NCCA framework which were explored in the study are marked with an asterisk.
approaches were employed, including difference in means and $t$-tests. Following transcription of the focus groups and participant reflections, data were analysed using the software NVivo based on a process of ‘generation and reduction of codes, formation of tentative categories, internal coding comparison and relational analysis’ in keeping with Hatch (2002).

5. Findings

A number of findings emerged from the study and these are detailed under a number of headings below. Data are presented first in relation to the experiences and views of students who participated in the study, followed by the experiences and views of the teachers.

5.1. Students’ experiences and perspectives

The overall response of students to the initiative was enthusiastic. One hundred and thirty-four students from two schools completed the pre- and post-intervention questionnaires. Of these students, 96% described the Bridge21 approach as Good or Excellent, highlighting various positive aspects of the programme such as ‘working in groups with more independence than a normal class’, ‘using computers’ and learning with ‘great enthusiasm’.

Bridge21 was viewed by the students as an engaging way of learning. For example, a comment expressed by one student at the beginning of the year about school noted that ‘you have to take down lots of notes in class which is bad if you are a slow writer’. This contrasted with later views by students that ‘we were trusted with the equipment’, were ‘using ICT as a learning resource’ and ‘learned to work on [the] computer’. Similarly, a pre-intervention comment that ‘I don’t like sitting at a desk for the whole class’ contrasts with later observations that ‘we interacted with everyone’, ‘we got to run around’ and were ‘studying outside’. Another student’s beginning-of-year view that she disliked ‘sitting listening to [the] teacher go on and on and on’ contrasts with the views of students later in the year about ‘working in groups with more independence than a normal class’ and learning ‘about loads of new things in a fun way’. What contrasting views such as these illustrate is the

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Purpose</th>
<th>Participants</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire</td>
<td>Pre–post design. Capture prior and emerging experience of learning and school; working with peers; awareness of &amp; learning in relation to key skills; views on the Bridge21 approach.</td>
<td>Students</td>
<td>134</td>
</tr>
<tr>
<td>Team reflections</td>
<td>Yield continuing data on organisation &amp; functioning of teams; team achievements; skills learned; future needs.</td>
<td>Students</td>
<td>41</td>
</tr>
<tr>
<td>Individual reflections</td>
<td>Similar to team reflections. Focus on individual input to team and task; personal perspectives on team-based learning.</td>
<td>Students</td>
<td>53</td>
</tr>
<tr>
<td>Focus group interviews</td>
<td>Experiences and views on implementing the Bridge21 model; identify strengths and barriers.</td>
<td>Teachers</td>
<td>8</td>
</tr>
<tr>
<td>Teacher reflections</td>
<td>Perspectives on teaching within the Bridge21 project.</td>
<td>Teachers</td>
<td>5</td>
</tr>
</tbody>
</table>
extent to which engagement with Bridge21 transformed students’ perspectives to see school as ‘exciting’ and ‘educational’ and through ‘having fun learning’ increased their motivation to engage positively with school and their own development.

5.1.1. Students’ awareness and acquisition of key skills

A key focus of this study was an analysis of the extent to which statistically significant increases were evident in relation to students’ awareness, acquisition and enactment of key skills. The study focused on 11 out of 18 sub-skills under three headings (see Table 2) and measured these using a large number of scaled Likert items in the student survey. Data were combined across individual items to generate composite indices for each of the 11 key sub-skills and summary statistics were generated in relation to these aggregate skill variables.

Separate data in relation to the key sub-skills were gathered and aggregated at two time points, in the questionnaire pre-implementation and post-implementation. Differences in mean student responses were computed for each of the key skill composite variables and these data, along with inferential analyses, are presented in Table 4.

The data highlight average gains in most of the composite variables. For example, pre-implementation, the mean response across survey items measuring the variable ‘exploring options and alternatives’ was 1.76. Post-implementation, this had risen to 2.03, a mean difference of .27, as indicated in the third column of Table 4. A paired t-test of this difference resulted in a t of 3.4 at a significance level of .001,

Table 4. Pre–post intervention differences and effect sizes for consolidated key skill variables.

<table>
<thead>
<tr>
<th>Key skill</th>
<th>Sub-skill</th>
<th>Mean difference</th>
<th>SD</th>
<th>t-value</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being Creative</td>
<td>Exploring options and alternatives</td>
<td>.27</td>
<td>.87</td>
<td>3.4***</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>Implementing ideas &amp; taking action</td>
<td>.14</td>
<td>.56</td>
<td>2.9**</td>
<td>.26</td>
</tr>
<tr>
<td></td>
<td>Learning creatively</td>
<td>−.06</td>
<td>.48</td>
<td>−1.43</td>
<td>.13</td>
</tr>
<tr>
<td>Working With Others</td>
<td>Co-operating*</td>
<td>.22</td>
<td>1.10</td>
<td>2.16*</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>Contributing</td>
<td>.04</td>
<td>.58</td>
<td>.67</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td>Learning with others</td>
<td>.12</td>
<td>.93</td>
<td>1.4</td>
<td>.15</td>
</tr>
<tr>
<td></td>
<td>Using ICT to work with others*</td>
<td>.34</td>
<td>1.32</td>
<td>2.6**</td>
<td>.31</td>
</tr>
<tr>
<td>Managing Information and Thinking</td>
<td>Gathering, recording, organising and evaluating information</td>
<td>.12</td>
<td>.82</td>
<td>1.68</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>Using information to solve problems and create new ideas</td>
<td>.11</td>
<td>.61</td>
<td>2.02*</td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td>Thinking creatively and critically</td>
<td>.12</td>
<td>.51</td>
<td>2.63**</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>Reflecting on and evaluating my learning</td>
<td>.00</td>
<td>.57</td>
<td>.67</td>
<td>.02</td>
</tr>
</tbody>
</table>

*Difference is statistically significant at:

* p ≤ .05;

** p ≤ .01;

*** p ≤ .001.
suggesting that the difference is not likely to be an artefact of the particular sample and can be considered as statistically significant. Expressing the mean difference in terms of standard deviation units, an effect size of .32 was estimated. Within the framework suggested by Cohen (1988), this represents a modest effect size. Responses by students to open questions elsewhere on the survey consolidate this interpretation. Comments such as ‘I use the brainstorm activity when I don’t know what to do’, ‘I completed a task in different ways’ and being ‘open to other ideas’ are consistent with the more quantitative results. Within the framework of exploring options, there was an increased awareness during the course of the year that skills learned through solving a problem could be transferred to subsequent problems. This is particularly interesting given the emphasis on general cross-curricular and cross-task skills in the intervention.

Significant statistical differences were found for five other sub-skills: implementing ideas and taking action; co-operating; using ICTs to work with others; using information to solve problems and create new ideas; and thinking creatively and critically. All reflect modest effect size estimates based on Cohen’s $d$ and are further reflected in open comments from students. For example, the mean gain on the variable Co-operating is reflected also in student comments such as ‘everyone’s ideas are better than one’, ‘by team work’, ‘working with others’ and ‘it helped me learn to co-operate with others’. When asked what three skills they had learned, students most frequently reported on co-operating and working together. They also mentioned reflecting on and evaluating their learning. Students reported reflecting most about their learning in Maths, History, Religious Education and English.

Of the 11 sub-skills, five showed no statistically significant evidence of difference in means or gain as measured by the statistical tests. Observed results highlighted an unexpected negative difference in means in relation to learning creatively; however this was not found to be significant. No or minimal differences were observed in relation to four other variables (contributing; learning with others; gathering, recording, organising and evaluating information; reflecting on and evaluating my learning).

5.1.2 Value of teamwork and self-awareness of learning

Student responses highlighted the role and value of group work undertaken as part of Bridge21. Data from the pre–post questionnaires show that students reported engaging in teamwork more frequently later in the year than at an earlier point, with a statistical difference of .292 on a 5-point scale ($t = 2.315, df = 112, p < 0.05$). Student responses indicated also their belief that working collaboratively with other students helped them learn (average increase of .431, $t = 2.315, df = 112, p < 0.05$) and that they learned from working as part of a team (average increase of .414, $t = 3.067, df = 110, p < 0.05$). These data highlight positive changes in both the quantity and impact of collaborative/team-based learning promoted within Bridge21. These global averages from the pre–post questionnaires are corroborated in structured individual student reflections completed during the project in one school (School A, $N = 53$). These show that more than four out of every five students enjoyed working with their team, listened to others’ ideas and made a good contribution to teams.

A further desired impact of Bridge21 was greater awareness amongst participants of their learning and increased capacity to systematically plan and implement learning strategies. Results highlighted success in the strategy of encouraging students to
utilise action planning in advance of completing tasks. Initially, action planning was typically rarely practised (mean .96 on 5-point scale) but this had increased to 1.72 by the end of the programme ($t = 5.034$, $df = 92$, $p < 0.01$). In the pre-questionnaire, 43% of respondents reported that they ‘rarely or never’ drew up an action plan for a task but this had almost halved to 23% by the end of the year. Conversely, whereas only 8% planned one or more times per day initially, this had more than tripled to 27% at the end of the year.

5.1.3. Use of technology

Technology as a means to mediate learning plays a central part in the Bridge21 approach. Student responses to the two questionnaires provide corroborating evidence that ICT was, in fact, used more frequently in classes at the end of the year than earlier in the year. Pre-implementation, the mean response of 102 students to the question ‘I used ICT to help me work with others on a task’ was 1.78, indicating on average that ICT was used one to two times per month. By year’s end, responses suggested mean usage of 2.12 or one to two times per week ($t = 2.163$, $df = 101$, $p < 0.05$). Open responses by students to an item probing ways in which Bridge21 helped them learn during the year yielded many comments about the positive influence of ICT. These comments focused on becoming more knowledgeable and confident with computers (‘improving skills on computers’), learning through ICT (‘it made learning fun working with computers’, ‘helped me see that computers are a great way of learning’, ‘That you don’t always need books to learn’) the use of cameras (‘it helped me use cameras’, ‘learned how to make a movie’, ‘upload camera files’) and general technology (‘I’ve learned more about technology’, ‘use some apps on computers’, ‘use ICT responsibly in a school environment’, ‘internet’).

5.1.4. Use of resources

Analysis of questionnaire data examined the frequency with which specific resources were used in Bridge21 classes. As shown in Table 5, student responses corroborated expected patterns with frequent use of laptops, PCs, software, digital cameras and

<table>
<thead>
<tr>
<th>Learning resources</th>
<th>Used in all Bridge21 classes</th>
<th>Used in most Bridge21 classes</th>
<th>Used in some Bridge21 classes</th>
<th>Used occasionally</th>
<th>Never used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laptop</td>
<td>58</td>
<td>27</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>PC</td>
<td>25</td>
<td>25</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Computer programs$^a$</td>
<td>52</td>
<td>30</td>
<td>8</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Digital camera</td>
<td>41</td>
<td>33</td>
<td>13</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Whiteboard</td>
<td>44</td>
<td>36</td>
<td>8</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Textbook</td>
<td>16</td>
<td>8</td>
<td>9</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td>Copybook</td>
<td>16</td>
<td>16</td>
<td>9</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>Worksheet</td>
<td>36</td>
<td>29</td>
<td>19</td>
<td>11</td>
<td>5</td>
</tr>
</tbody>
</table>

$^a$for example Moviemaker, PowerPoint.
whiteboards, all associated with the technology element of the Bridge21 model, as outlined in Section 3 of the paper. Expected also was the relatively less frequent use of textbooks and copybooks reported by students. Quite high usage of worksheets was, however, reported by students, with almost two-thirds of students reporting that worksheets were used in all or most Bridge21 classes. Clearly this is an issue of interest, perhaps focusing on the nature of the worksheets and how they were used to promote key skills.

5.2. Teachers’ experiences and perspectives

Teacher perspectives associated with the objectives of this study were gathered through focus group interviews. Their comments provided further interpretation of student experiences as well as highlighting, from a professional standpoint, philosophical, pedagogical and practical issues vis-à-vis the Bridge21 model and its implementation.

5.2.1. Teachers’ perspectives on the student experience

Teachers corroborated students’ self-reports of satisfaction and enjoyment in relation to their participation in Bridge21. Further, teachers reported enhanced student research and observational skills (both computer based and in the context of educational field trips) and presentation skills as a result of the programme. In many cases, students used PowerPoint or film to share their learning with peers, although in some cases teachers felt that the products such as PowerPoint or movies ‘didn’t portray all that they learnt that day’. In general, the teachers also corroborated students’ self-reported interest in technology-based learning. Use of PowerPoint, computers, mobile phones etc. caught students’ imagination, though not without some degree of frustration when the technology failed, a point raised by both teachers and students. Although some teachers raised concerns regarding the extent to which students’ learning on Bridge21 aligned with the formal curriculum, others expressed the view that significant development was evident ‘at a much deeper level than would normally happen’, especially when there was positive engagement with the associated task linked to an element of student choice and team-based learning. Peer assessment was experienced as a motivational factor for students to produce their best work in the context of presentations, with the levels of engagement and the standard of work found to improve from an initial to a subsequent round of presentations.

5.2.2. Implementing the Bridge21 model

Teachers described a variety of techniques, successes and challenges associated with enacting the Bridge21 model in classroom practice. Most teachers adopted the ‘Single Subject’ approach, where the Bridge21 methodology was used within a single subject within the parameters of the existing school timetable, via single or double class periods. In these cases, learning objectives were aligned with the relevant subject area, cross-referenced with integration of the key skills. For example, some English classes were tasked with writing a script for a five-minute movie related to a play, novel or short story, producing the movie and performing it for their peers. In Business Studies, a group analysed a local business, engaging in site visits, capturing digital footage and other relevant information to create a three-minute
promotional video presented to other teams within the class. Full implementation by teachers of both the Integrated Curriculum and Thematic approaches was less popular, though elements of these approaches were evident in the single-subject format. For example, teachers of Music and Irish Language in one school collaborated to devise a task where students produced music and lyrics for Irish-language songs and recorded their work in digital form using the software Garage Band and MovieMaker. This project was implemented within the parameters of the normal 40-minute class scheduling.

This emphasis on project work resonated throughout teacher responses. Through the course of the programme, teachers developed their capacity to design and promote learning utilising more tightly specified tasks rather than vague projects more prone to excessive interpretation by teams. For example, a cross-curricular project implemented in one school focused on Geography, Home Economics, Art and Physical Education. In relation to a relatively less successful theme on fashion, one teacher noted that:

They couldn’t make the connection between fashion and [the locality] … . We wanted them to be analytic about what people wear in [the locality] and maybe try to relate it to a wider community and maybe see the differences.

This view contrasts with the same teacher’s summation of a project theme of local buildings where:

When we brought them down to the regeneration project and down to the old primary school and there’s a lovely health centre inside it – they took pride in that and they were showing us around so that was kind of nice because we had never been down there but it wasn’t the same for the fashion, I felt that was really difficult for them.

Whereas the former, somewhat more vague theme may better align with some of the key skills addressed in this study (e.g. thinking creatively and critically), initial implementation of skills-based methodology may be more readily facilitated initially using tasks with clearly identifiable parameters.

Technology was used throughout the project to facilitate team-based learning and encourage the sharing of resources amongst students engaged in tasks. Teachers observed students using technology in a mature way to facilitate and promote their learning. As a motivating factor with a positive effect on student engagement, cameras, laptops, software etc. enabled a connecting of students’ personal and educational uses of technology. As outlined by one participant in Focus Group A:

I suppose it was a motivation because mobile phones are banned and they’re supposed to leave them in the lockers when they come into school. Now what happens 99% of the time is that they have them sitting in their pockets and they are turned off and they might be buzzing or the volume is turned off so it’s a constant distraction anyway in their lives while they’re learning because they are in their pockets and they are buzzing and then you can see them checking and looking to see if there are messages so when the mobile phones were allowed it was great because they could take them out so that it was open – they could receive messages while they were learning and all of that but I suppose it’s ‘the forbidden’ so it was kind of breaking the rules by being able to take out the mobile phone so it’s really to teach them about being more mature about using it for educational purposes and making that connection because they felt ‘this is great’ but they didn’t necessarily connect it as …
Some challenges arose in relation to technology. In one case, digital photographs that students had carefully selected for inclusion in a project were lost. This, and other frustrating issues such as compatibility issues with certain technologies, caused understandable frustration, with teachers highlighting such events as an impediment to the implementation of the Bridge21 approach. Some teachers had reservations about their own familiarity and competence with technology, although in some cases this was alleviated somewhat by using students in Fourth Year (this is a type of gap or Transition Year in the Irish system) as peer mentors who assisted the younger students. This approach to cross-age peer-mentoring is an attractive prospect that has definite merit and might usefully be further promoted in schools. At the moment, however, such initiatives are unfortunately rare. Teachers also relayed how the technology employed was in certain instances a distraction for students, providing an avenue for pursuing interests not related to the task or project at hand. Overall, however, teachers viewed the Bridge21 approach as not entirely technology dependent, instead reverting to ‘pen and paper’ in the event of technical problems.

5.2.3. Adapting to the changing role for teachers and students

Some teachers experienced uncertainty regarding an appropriate level of input and structure to provide as part of the methodology. This issue links to a number of elements of the Bridge21 learning model, notably the facilitator/mentor role of the teacher, the team-based pedagogy, and recognising and promoting the social context of learning. Teachers acknowledged that the Bridge21 model demands a change in role for both teacher and student, yet they varied in how they reshaped their own role vis-à-vis students and provided students with the autonomy to learn independently. Over time, many teachers, although it ‘can be frustrating at times’, did manage to successfully reshape their role resulting in ‘improved engagement particularly for the younger students’.

Some teachers, in explaining an over-reliance on teacher input, highlighted the lack of student experience and familiarity with independent modes of learning and the need for reinforcement of students’ roles over the course of a team-based project. Students’ lack of familiarity with the Bridge21 approach was identified by teachers as an impediment to implementation, pointing to the need for students to be facilitated in learning how to work in groups as part of participating in this approach. As already noted above, a training programme was provided for students at the beginning of the school year so that they could develop the collaborative and other skills necessary for learning in the Bridge21 model. These comments from teachers suggest that some students struggled to transfer and apply initial skills learned in a ‘curriculum-free’ scenario to a curriculum-focused task in school. This was understandably less of an issue for students used to working in pairs or teams. Overall, however, it highlights the point that a significant amount of time and attention are required to train students how to work effectively as part of a team and develop the skills to learn collaboratively with their peers.

Teachers highlighted older students’ reluctance to ‘take that independent role which the students much younger than them had no problem doing’, while acknowledging teachers’ own limitations in sometimes not taking ‘the time to teach them how to do group work’ sometimes on the basis that ‘we have been discouraging it for years’, presumably in order to prepare students for the individual, competitive nature of the Junior Certificate Examination (a state examination taken at the end of
Year Three). Teachers offered other useful insights also, one participant reflecting the views of others that ‘I didn’t give them particular roles the last time and I’d certainly do that [now]’, thus highlighting how students need clearly defined roles and to be given a narrow focus to participate effectively within groups. This was particularly the case for weaker students within mixed-ability groups who, in some cases, were unable to understand the roles assigned to them. Generally teachers were of the view that in order to facilitate implementation the activity should take place within a timeframe compatible with students’ attention spans and ideally within a block of time rather than spread out over a number of weeks. Teachers were also of the view that a significant degree of input or structure is necessary to facilitate successful implementation with the task or activity broken down into short-term targets as well as the final goal.

5.2.4. Summary of results

Overall, the results of this study provide useful insights into the implementation of the Bridge21 approaches in the two schools studied. The data show that the most of the suggested approaches were tried out in class and that, in the main, students enjoyed the experience. The data suggest benefits to students in terms of enjoyment, motivation, engagement and learning, with encouraging preliminary evidence of some apparent student gain in relation to selected key skills over the course of the school year. It is not known why gains appeared in relation to some and not other key skills. At a minimum, the adequacy with which the survey instrument can, in fact, detect change in key skills is one area of further research in relation to the study. This may involve further refinement of the instrument and the employment of other approaches such as observational methods to help detect any such change.

Teachers were reflective and supportive of the programme, yet realistic about existing and future challenges associated with implementation of such approaches: greater alignment with curriculum goals; framing appropriate tasks; gauging optimum input and structure by teachers; group management; setting timeframes; and technical and pedagogical difficulties with ICT. Insights like this point to the need for continued refinement of the programme of continuous professional development for teachers associated with Bridge21, both in relation to pedagogy and ICT support.

6. Discussion

The findings from the multiple case studies conducted with two schools implementing the Bridge21 model highlight the positivity of students towards this approach and its potential for the realisation of selected key skills. The findings also illustrated, however, the challenge experienced by teachers in transitioning to a key skills-based curriculum, in the absence of wider enactment of such approaches in the national context. Parental expectations around the need to ‘cover’ the entire syllabus and for students to succeed in relation to existing, important terminal examinations and certification continue to dominate. This illustrates the tension for teachers of implementing a locally developed curriculum innovation against a backdrop of an existing nationally developed and assessed curriculum. This tension may ultimately be resolved when and if a system-wide implementation of a key skills-based approach is realised. For now, the teachers participating in this study may be
considered as ‘early adopters’ in piloting the model associated with the present study. As such, responses from these teachers highlighted the challenges associated with implementing this reform and in particular the challenges they face in relation to assessing their own students for state certification, a role intended, but not yet achieved, at lower secondary level in Ireland.

The challenge of implementing a new approach within an existing system, and the impact of the various system characteristics, particularly subject boundaries and the physical organisation of the school, is illustrated by the fact that of the three variations of the Bridge21 model available, the one most amenable with and most closely aligned to existing structures was adopted to the greatest extent in the case study schools. The variations of the model as presented may be viewed as being on a continuum with regard to the degree of change and disruption to existing practices and structures necessary to facilitate implementation and it is entirely practical and expected that participant teachers would begin with the variation most compatible with their existing practices and structures. As teachers become comfortable with one variation they may progress to the other possibilities, as illustrated by the practices of some participant teachers captured here. Relative success and comfort with one variation may facilitate natural diffusion of the model and its variations within the school and the particular experiences with each variation and the factors effecting the transition phases can usefully be explored in future research regarding Bridge21 implementation.

The data from both student and teacher perspectives reflect a number of the elements of the Bridge21 model which may also be considered as elements of change in the context of transitioning to the Bridge21 approach. Whilst the data indicate increased use of technology in line with the Bridge21 model, it is evident that teachers considered it to be enabled and enhanced by technology rather than being technology dependent. This is evidenced by the fact that implementation was not entirely hampered when technical difficulties were experienced and was supplemented by means of more traditional classroom resources such as worksheets. Also in line with the model there were greater reported instances of teamwork and of students creating their own materials in the subject areas utilising the Bridge21 approach. Whilst both students and teachers acknowledged the enjoyment factor experienced by participating students, there were some divergent views across students and teachers with regard to the efficiency and effectiveness of how students worked in groups and their resultant output. Implementation of and support for the programme continued throughout the school year as a systemic realignment of pedagogical practices and experience. Whereas it is expected that students (and indeed teachers) might be initially ‘wowed’ by the innovation, its embedding in daily teaching and learning throughout the year supports the suggestion that participant engagement with the programme remained constant. Whilst students indicated having had a clear role and making a meaningful contribution coupled with the perception that working with others enhanced their learning, teachers on the other hand were generally of the view that students needed further development to enable them to participate meaningfully within groups, and that the group work and associated task be subject to a degree of structure for successful implementation to occur. Teachers were generally uneasy with the perceived unstructured nature of the Bridge21 approach, which may be linked to their expectations regarding the achievement of curriculum-based learning outcomes. This however was not a reference point of significance for students who reflected a more positive experience of working in teams.
Whilst teachers did concur that students developed research and presentation skills, it is evident that the curriculum-based outcomes were the reference point of most significance for teachers. Whilst further investigation of the divergence in views between students and teachers is warranted, there is also a need for clarity regarding the expected outcomes and for what may be described as a re-calibration of teachers’ frames of reference (via related continuous professional development) with regard to learning outcomes in the context of a key skills-based approach to curriculum and assessment. Related to this, the role of the teacher as mentor or facilitator is a further element of the Bridge21 model which emerged strongly over the course of the case studies. Best understood in the context of the change as effected via the Bridge21 model, teachers were uncertain of the appropriate level of input or structure to provide to students working in teams, suggesting the need for further research-based professional development in this regard. Teachers also suggested a number of possible tweaks to the nature of implementation as experienced by them which can be usefully explored in subsequent interventions. Specifically these relate to the composition of student groups, the nature of the project or task undertaken and issues related to timeframe and structure.

The analysis of learning outcomes relative to the 11 selected key sub-skills provided evidence of gain in respect of six skills, with no evidence of gain in respect of a further five selected skills. Overall, this reflects a positive impact with respect to the realisation of a selection of key skills via the Bridge21 approach over a relatively short period of intervention.

7. Conclusion

The Irish education system is making attempts to reform and to embrace elements of twenty-first-century learning and its associated emphasis on the development of key, or generic, skills. Educational reform is however a slow and complex process. This paper has described some of the insights gained in a year-long study in which two schools took their first steps on this path. The Bridge21 model was used as the basis for implementing a twenty-first-century pedagogy in the classroom and the experiences of students and teachers were reported upon. As a focus of the national reform agenda is the development of key skills, we devised an instrument for gauging student awareness, acquisition and enactment of these skills. Results from the study show that students enjoy the newer approach to learning and that there is some evidence of success in the area of skills development. Not surprisingly, teachers, while overall being positive towards the initiative, highlighted areas of concern going forward.

In the 2012–13 academic year the authors are continuing to work with schools in adapting the Bridge21 model as part of the reform process. The pool of schools has been expanded to 12 and covers a full spectrum of schools in terms of geographical location, social context and type of school. Our work has been refined based upon the analysis described in this paper and in Lawlor et al. (2010). A particular emphasis in the current year is being placed on professional development for teachers and the area of Assessment for Learning. It is hoped that the experience, and research evidence, emerging from this work will be of benefit to other schools in the system as they engage in change and to the wider research community.
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References


