Developing twenty-first-century skills in out-of-school education: The Bridge21 Transition Year programme

Abstract

21st Century (21C) skills need to be taught intentionally and well, using pedagogical approaches that engage students and help them learn both skills and curriculum content. This paper describes an instrumental case study of an out-of-school education programme (Bridge21) designed to help students develop 21C skills. In order to determine the effectiveness of the programme, a mixed-methods approach was employed that included the collection of quantitative and qualitative data using student surveys (N = 329) and group interviews. A detailed skills framework was used to analyse which skills are inherent to the various activities that make up the programme. Findings suggest that the Bridge21 model can provide significant and sustained increases in student confidence across a range of skills, and that various elements of the programme design contribute directly to this.

Keywords

21C Skills; 21C Teaching and Learning; collaboration; project based learning.

1. Introduction

Young people today face a diverse set of challenges: factors such as globalisation, rapidly developing technology and instant access to information have changed the professional and societal landscape. It is argued that success in the modern workforce requires the ability to work well individually or as part of a team, to be able to make decisions and to take instruction, and to have the technical skills to access, analyse and create digital content.

The development of skills such as collaboration, communication and critical thinking is seen as increasingly important in modern society. These skills must be taught intentionally and are prioritised in some national education systems. Most national education systems remain content-focussed but pedagogical approaches designed to help students develop these skills within formal education are becoming increasingly popular. Identifying effective

models for 21C learning and understanding why they are effective is a vital step in introducing 21C learning into formal education.

This research examines an out-of-school 21C learning programme, the Bridge21 Transition Year (TY) programme (Section 2.3.1), based in the authors' university. Students' experience of the programme are first examined to determine if it has an impact on the participants' confidence across a range of 21C skills. The structure and features of the programme are then explored to determine which elements may be contributing to the reported effects.

2. Literature Review

2.1   21C Skills

There is no single, universally agreed upon definition of 21C skills. Binkley et al (2012) describe 10 skills, in four categories: Ways of Thinking, Ways of Working, Tools for Working and Living in the World. Ananiadou & Claro (2009) describe 21C skills in terms of two dimensions: Information and Communication, each with sub-dimensions and allowing for some skills to appear in both. Analyses of international frameworks for 21st Century competences by Dede (2007) and Voogt and Roblin (2012) identified a common recognition of the development of skills relating to communication, collaboration, problem-solving, creativity, and technological fluency as being fundamentally important. Ravitz, Hixson, English & Mergendoller (2012) created a detailed list and description of activities that map to various 21C skills including:

1. Collaboration

2. Communication

3. Creativity and Innovation

4. Critical Thinking

5. Learning with Technology

6. Self-Direction

There is not universal agreement that such heavy focus on these skills is necessary and a lack of reliable approaches to assessment of 21C skills is an ongoing concern (Care & Kim, 2018). This Ravitz framework used in this paper framework was chosen as the detailed breakdown under each category facilitates identification of the skills in the programme design of the Bridge21 programme, and a related, validated instrument provides a tool for the measurement of students' confidence in each skill.

2.2 21C Teaching and Learning

The phrase '21C teaching and learning' refers to pedagogical approaches that promote the development of 21C skills, such as those mentioned above, in students (Partnership for 21st Century Learning, 2018). There is an increasing body of literature highlighting the need to employ effective pedagogical approaches to help students develop them within formal education. This is well established in some countries (e.g. Finland and New Zealand) and is in its infancy in others (Rotherham & Willingham, 2010; Ananiadou & Claro, 2009; Dede, 2007; Kalantzis & Cope, 2008; Fullan & Langworthy, 2014). In Ireland, where this study took place, there has been a phased introduction of "Key Skills" across the secondary school system since 2014, mostly in the junior cycle (ages 12-16) (NCCA, 2014).

Claxton (2013) proposed that working on 'key competencies' should not come at the expense of working on challenging projects, but rather that the point of working on these projects is to develop the skills and confidence to take on these challenges. Indeed, literature on 21C teaching and learning tends to focus on ideas such as constructivism, active-learning, problem-solving and the creation of artefacts (Ananiadou & Claro, 2009; Dede, 2007; Kalantzis & Cope, 2008; Beetham & Sharpe, 2013; Conole, Dyke, Oliver & Seale, 2004).

Teamwork also features prominently in most 21C learning approaches and Galton et al. (2009) argue that young people require training in order to work effectively in teams (Blatchford, Galton, Kutnick & Baines, 2005; Johnson & Johnson, 1990; Katzenbach & Smith, 2005).

2.2.1   Drawbacks/Limitations

These 21C approaches are often more popular in literature than in practice (Rotherham & Willingham, 2010) and are not without their own inherent challenges. Fullan and Langworthy (2014) mention pitfalls to be avoided with new pedagogies, including giving the students too much choice or autonomy, providing ineffective feedback or using technology simply as a means of content delivery (Lei, 2010; Jenson, Taylor & Fisher, 2010). It is argued that approaches based on constructivism can be under-scaffolded and rely too heavily on discovery learning (De Corte, 2010; Mayer, 2004). Barron and Darling-Hammond (2010) found that project-based learning has significant benefits for learners when implemented by skilled, motivated "early adopter" teachers. These benefits were less prominent however, when these same techniques were rolled out across a wider teaching population. It is likely that this is due to the fact that such approaches can be more complex than a traditional "chalk and talk" lesson so training and support for teachers must be provided if they are to work this way.

2.3 The Bridge21 Learning model

Bridge21 is a model of collaborative, project-based and technology-mediated learning which facilitates the development of 21C skills through a social constructivist approach to teaching & learning. This involves students working through scaffolded cycles of collaborative project work during which they exercise 21C skills. The elements of the pedagogical model are shown in Figure 1 (a). Lawlor (2016) contends that each element of the Bridge21 learning

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model plays a part to promote and encourage learning and the combination makes the overall effect greater than the sum of its parts. A distinguishing feature of Bridge21 is that it uses the teamwork model from the World Scout Movement to structure collaboration (Lawlor, 2016).

The Bridge21 activity model is shown in figure 1 (b). It is the template structure for a Bridge21 learning activity and shows how the elements of the learning model are implemented. It is the framework upon which a typical Bridge21 activity is built (Byrne, O'Sullivan & Sullivan, 2017). It offers a flexible structure, allowing teachers to plan 21C learning activities that address both curriculum material and skills development. It also allows for the appropriate integration of technology into lesson plans that are collaborative, active and creative.

<FIGURE 1 HERE>

The Bridge21 model includes many of the features listed by Fullan and Langworthy (2014) on their continuum of effective pedagogies, e.g. increasing learner autonomy, collaboration, using technology to create new knowledge and a mastery goal-orientation. These features become more prominent as the students' Bridge21 experience increases and they spend their time working on challenging curriculum-based projects.

2.3.1   The Bridge21 Transition Year Programme

The Bridge21 TY programme is an out-of-school education programme for second level students (~16 years old). The students are in the Transition Year of the Irish Secondary School system. This is an optional in-school gap year between the Junior and Senior exam cycles (Department of Education and Science, 2004). Each week, approximately 25 students, from four or five schools, attend workshops in a customised learning space in the authors' university. The duration of each workshop is four days, during which time the students work in fixed teams of four/five to complete creative projects using technology. The groups feature

an even gender balance and a mix of socio-economic backgrounds. Participants often have had little or no experience of collaborative project work and frequently cite meeting new people, making presentations, and a lack of technical skills as fears prior to beginning the programme.

The TY programme is a relatively short but intense period of 21C learning that seeks to provide a boost in 21C skills for the participants (Lawlor, Conneely, Oldham, Marshall & Tangney, 2018). Workshops are led by one facilitator and a team of volunteer mentors. The facilitator plans and introduces the activities and conducts group discussions. The mentors support the teams by contributing ideas to discussions, helping them make decisions, providing technical help, or just as an extra pair of hands. There are typically three mentors on day one with fewer required later in the week as the level of scaffolding is reduced.

In terms of content, the programme can be divided into two phases: phase one, referred to as the 'Core' week, focuses on various multimedia projects but no curriculum material and is described in detail in section 4.1. Eight instances of the Core Week are run each year, introducing approximately 200 students to the Bridge21 learning approach. The structure of the four-day Core Week allows a focus on certain skills on each day, facilitating the students' development of their competence in teamwork, as well as communication, critical thinking, and technological skills. This is the "training" phase referred to by Galton et al (2009).

Phase two, or the 'Return' week, involves a second series of week-long workshops but, unlike the Core Weeks, each Return Week has a different curriculum focus. In 2015/16 and 2016/17, themes for 'Return' weeks included physics, English, history, language learning (Irish) and computer science. All students taking part in a Return Week will have already completed a Core Week. Students who take part in a Return Week use and build on their 21C skills as they work through challenging curriculum-aligned projects.

3.   Methodology

This research examines a programme that initially prioritises skills development over content delivery, rather than adjusting existing content delivery to try and include skills development. To adopt such an approach for use in formal education, we must be confident that it is effective and we should understand why it is effective. The overall structure of the programme, the design of the Core Week, the Bridge21 model and the skills focus are among the elements of the Bridge21 TY programme which may be replicable in other learning contexts.

3.1 Research Questions

Two related research questions are addressed in this paper:

1. RQ1: Is the Bridge21 TY programme effective in developing 21C skills in the participating students?

2. RQ2: Which features of the Bridge21 TY programme help promote the development of 21C skills?

These research questions are addressed by way of an instrumental case study using a mixed-methods approach (Yin, 2014), which allows for the development of an understanding of the phenomenon in question - in this case, students' development of 21C skills (Stake, 1995).

To answer RQ1, qualitative and quantitative data were collected over two years of the programme. Students completed surveys before, and immediately after, each week of the programme to determine changes in confidence levels and to allow them to reflect on their experience. Surveying the students who return to partake in additional workshops three months later allows the longer term impact of the programme to be gauged. This helps us to determine if any reported changes in confidence are merely are temporary effect or a novelty based on a new experience.

The second question required a detailed examination of the structure of the core programme and, in order to accomplish this, a process of matching the components of the programme to the 21C skills identified in the Ravitz framework (Ravitz et al., 2010) was undertaken (Section 4.2). This process permitted identification of the specific skills that are supported by the Bridge21 TY programme, as well as the frequency of their integration in the workshops. These data, along with the findings from the first research question, have allowed an examination of how the design of the programme contributes to the students' skill development. Group interviews allowed for further exploration on these topics.

3.1   *Quantitative data*

Ravitz et al (2012) provide of a breakdown of six skills (Section 2.1) into a representative set of activities. This helps clarify the terminology, thus permitting a structured examination of levels of confidence with, and frequency of employment of, each skill set. For example, under Collaboration Skills, activities such as *'Work in pairs/teams to complete a task'* or *'Work with others to set goals/create a plan for your team'* are included. In order to gather quantitative data, the Ravitz skills framework was adapted to allow students to rate their confidence with each of the activities listed within six skill categories. In the absence of a direct measurement of student skills, their confidence to undertake each task or activity is used a proxy.

The students were asked to rate their confidence with each of thirty-seven activities on a five point scale, with '1' representing 'Not Confident at All' up to '5' representing 'Very Confident'. This framework was originally designed as a teacher instrument to assess teachers' use of practices that encourage students' use of 21C skills. However, recent research has validated a version of this scale to measure students' confidence with key skills (Bray, Byrne & O'Kelly, in press).

The surveys were completed online by participating students before (Time 1) and immediately after (Time 2) each week of the core programme (Figure 2). Over two years, 16

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instances of this four day programme were run with ~400 students taking part. Some students (~200) completed additional surveys three months later when they returned to take part in further workshops (Time 3 and Time 4).

<FIGURE 2 HERE>

Following normality checks, paired sample *t*-tests and repeated measures ANOVAs were used to identify any significant changes in students' confidence with each of the 21C skills.

3.2   *Qualitative data*

One question on the Time 2 survey asked students to write down three things they had "learned about myself and how I learn" during the programme. Qualitative data were also gathered by way of group interviews carried out at the end of the second week (Time 4).

Qualitative data were analysed using open coding techniques (Strauss & Corbin, 2008). This process involves reading and re-reading the qualitative data, labelling emerging concepts, and defining and developing categories based on the properties and dimensions of those concepts. These categories were then used to guide a process of Directed Content Analysis (Elo & Kyngäs, 2008). This is a structured approach that allows for pre-existing constructs to guide the analysis. The process begins with a theory or, as in this case, relevant research leading to identification of key concepts and variables that are used as coding categories. These categories are then used to direct analysis of new qualitative data, with any sections that do not fit with the predetermined codes assigned a new one (Hsieh & Shannon, 2005).

4.   Findings

In order to address each of the research questions, the analysis has been broken into two parts: analysis of the student data, followed by analysis of the activity design.

4.1   Analysis of Student Data

The Time 1 survey (n = 286) included the set of thirty seven 21C skills questions from the Ravitz instrument. The Time 2 survey (n = 329) contained the same set of 21C skills questions as well as open questions about the students' experience on the programme. These open questions provide rich qualitative data which were analysed to allow for data triangulation.

A smaller group of students (n = 107) completed surveys at the start of their Return Week (Time 3) and again at the end (Time 4). These surveys also contained the 21C skills questions. At the end of one Return Week (Time 4), a random selection of students were invited to participate in a focus group to discuss their experiences.

4.1.1   Quantitative Results

A paired-sample t-test (n = 286) was conducted to compare the students' confidence in each of the six skill categories at Time 1 and Time 2. Repeated measures ANOVAs were carried out on the 21C skills questions from the smaller group of students (n = 107) who completed the survey at all of Times 1, 2, 3 and 4.

- Time 1 v Time 2

The t-test showed statistically significant increases in student confidence in each of the six skill categories from Time 1 to Time 2. Cohen's d was estimated, with a large effect found for each skill set, based on Cohen's (1992) guidelines. These data are presented in Table 1.

<TABLE 1 HERE>

The two skills areas which see the greatest gains in confidence are communication and collaboration. These changes are also reflected in the qualitative data, which highlighted that collaboration was central to the students' experience of the programme. Meeting and working with new people, working in a team and making a presentation to a group are things that

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students mentioned as being highlights of their experience, so these large increases in confidence make sense in this context. Also, communication has the lowest confidence rating at Time 1, allowing greater scope for improvement.

The remaining four skills areas also show large increases in confidence but by a slightly smaller amount than communication and collaboration. This may be due to a higher starting point (Learning with Technology) or being exercised less frequently during the programme (Critical Thinking).

- Time 1, Time 2, Time 3, and Time 4

In order to identify significant differences between the four time points, ANOVA with repeated measures (with a Greenhouse-Geisser correction as our data violated the assumption of sphericity) was used. Among the group of students that completed the survey all four times, a clear pattern emerged. Participants showed a significant increase in confidence from Time 1 to Time 2, similar to that shown by the overall group. By Time 3, confidence levels had decreased from Time 2 but remained higher than Time 1. At the end of their second week, their confidence increased to levels similar to those reported at Time 2. This pattern is present in all six skill areas (Figure 3).

<FIGURE 3 HERE>

It is clear from these data that students experience increased confidence in 21C skills during their time with Bridge21. In surveys (Time 1) and interviews (Time 4), students report very little use of 21C skills in their formal education. Confidence levels appear to fluctuate over time based on whether or not the students are using their skills regularly and Bonferroni post-hoc tests were conducted in order to determine where significant differences lay. At Time 3, students reported confidence levels lower than Time 2 but still higher than Time 1. The lower levels reported at Time 3 suggest there is a "use it or lose it" aspect to confidence with these skills. While there is a reduction from Time 2, the increases from Time 1 to Time 3

were statistically significant in three categories: Collaboration, Communication and Self-Direction.

<TABLE 2 HERE>

These data suggest that the increased confidence developed over a week in Bridge21 may endure over time. A novelty or feel-good factor at the end of each week must be acknowledged but sustained increases over a three month period suggest real gains in student confidence and skills. Analysis of the qualitative student data was used to further explore this idea.

4.1.2   Qualitative Results Time 2 - Open Response Survey Items

Qualitative data from the Time 2 survey related to students' experiences during the programme, with particular reference to what they learned about themselves and how they learn. Many students made statements such as 'I like working in a team' or 'I'm good with computers'. Others referred to developing new skills or confidence.

A process of open coding was carried out on 329 students' responses over two years (2015/16 and 2016/17). These answers were assigned one or more of 42 different codes, giving a total of 1241 coded data points. These codes were then arranged into nine broader logical groups. For example, the 'Technology' theme is made up of the following codes:

<TABLE 3 HERE>

Technology was mentioned by 184 individual students, which is 56% of the overall cohort. Figure 4 contains a breakdown of these themes and the percentage of the cohort that identified them.

<FIGURE 4 HERE>

It is clear that the experience of collaborating with their peers was significant for the students, with collaboration being referenced by 219 students, i.e. 67% of the cohort. The

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design of the programme ensures that collaboration is constant throughout the week and the student feedback reflects that experience. Technology is another prominent theme with 184 mentions, which reflects the integral nature of technology on the programme. Increased confidence, specifically around meeting new people or speaking in public, is also clear from the student responses. Communication (within the team, in addition to public speaking) is another noticeable theme. Students mentioned self-direction and creativity within the context of project-based learning.

Questions about collaboration and how well a team have been working together are part of each reflection activity during the week. Tech skills are also frequently highlighted after each project. This could be a factor in explaining the higher frequency with which these skills are identified by the students. Reflection activities that include a wider set of skills may help student better recognise their progress in those areas.

When asked to describe their experience with Bridge21, students often directly identified many of the skills areas included in the quantitative 21C skills survey. These data support the findings from the quantitative data. A further set of qualitative data was collected via student interviews at time 4.

4.1.3 Qualitative Results Time 4 – Group Interviews

A series of structured group interviews were carried out with students who had taken part in at least two Bridge21 weeks. 12 students participated in the interviews, in groups of four. This was a random/opportunistic selection of students participating in a Return Week towards the end of the school year. Interview questions included:

'Did participating in the Bridge21 programme have an impact on you?'
'Has anything you did/learned in Bridge21 been useful since, in or out of school?

These interviews were transcribed and analysed via a process of directed content

analysis (Elo & Kyngäs, 2008) guided by the categories that had emerged through analysis of the open items discussed in the previous section. The conversations referenced many of the skills the students had developed during their time in Bridge21 and how those skills have been used since they first participated in the programme.

Many students mentioned increased confidence, particularly around meeting new people and speaking in public:

'I feel like I'm more confident talking to new people. I'm not as shy. Before I was scared. Now I don't stop talking.'

Students described how the technical skills they learned were useful for them in their personal lives and in their studies:

'Lots of little tech things. It was good for projects and stuff in school.'

Participants pointed out that the experience of working closely with their peers improved their attitudes to teamwork and helped them develop their collaboration skills. They also mentioned that they don't get the same kinds of opportunities in school:

'In school, if you talk they're like "No!", but here it's like "Help each other" and that's good.'

Students mentioned self-direction, leadership and decision-making as skills they got to exercise and improve during their time with Bridge21.

'In school, you're told what to do. The mentors here, they just help you pick a path.'

These data provide strong qualitative support to the results of analysis of the quantitative data. Communication, Collaboration, Technology and Self-Direction skills have been very prominent in all of the data analysis.

In the next section, the structure of the programme is analysed to identify where these skills are exercised during the various activities.

4.2   Activity Design Analysis – Core Programme

The activity plan for the core programme remained largely unchanged during two academic years. A breakdown of each day of the 4-day programme is as follows:

- **Day 1 -** Students are encouraged to get to know one another and to become comfortable in an unfamiliar environment during a series of ice-breaker activities. Students are assigned their teams for the week and spend time getting to know their team-mates while undertaking team-building tasks and challenges. Communication and collaboration skills are central to the day and the students undertake their first technology-based activity. A typical project for the first day might be for teams to create a short film.

- **Day 2 -** Focus is maintained on communication, collaboration and technology skills, while also introducing elements of creativity and self-direction. The challenge for each team is to create a multimedia advertising campaign (video, audio and a poster) to sell a futuristic invention the team devised. This involves planning, decision making, assigning roles, scheduling and meeting deadlines.

- **Day 3 -** Critical thinking skills are central to the programme on day three. Each team designs a survey for their peers under the general heading of 'Being a teenager in Ireland', analyses the results and creates graphics to illustrate their findings. Presentations include discussions of results, limitations of the work and how the project might be improved.

- **Day 4 -** The final day of the programme emphasises communication skills along with creativity and critical thinking. The task is for each team to prepare a

presentation during which they propose changes to the second level education

system. During these final presentations, the facilitator provides less support than

earlier in the week and asks follow-up questions to challenge the speakers.

These workshops were analysed by matching the constituent activities to the Ravitz

key skills framework in order to identify the presence, and explore the frequency of

integration, of the 21C skills in the programme design. The activities for each day of the

programme were listed in separate columns of a spreadsheet. The skill elements from

Ravitz's framework were listed in separate rows and a '1' was added to the spreadsheet if that

activity required use of that particular skill. This allowed for a count of the frequency of use

for each skill element, broken down by day.

Table 4 shows a sample breakdown of the elements of the Collaboration skillset as

they are used on day one of the programme. The table shows 21 instances of students using

collaboration skills. It is clear that collaboration is a constant throughout the day and that all

six skills are exercised by the students during the various activities.

<TABLE 4 HERE>

A similar count was made of each skill set for each day of the programme, which

included 28 student activities over four days. The frequency with which each of the six skills

is exercised during the programme is shown in Table 5.

<TABLE 5 HERE>

The collaborative nature of the programme is reflected in the high numbers relating to

Collaboration. Communication and Creativity skills are consistently used throughout the

week. Self-direction is required to plan and organise each project the students undertake. This

is a change for many students, who describe their day to day experience in school as much

more teacher-led.

Students receive significant mentor support on day one, with the level of scaffolding reducing over the course of the week as students become more comfortable planning and making decisions for themselves. The use of critical thinking is more prominent in the tasks later in the week, reflecting the increasing challenge presented to the students during the programme. The specific skillsets required during each Return Week depends on the content for that week but the same project-based collaborative approach is used and the students receive lower levels of mentor support second time around.

Learning with Technology is the least frequent skillset represented in this table. The programme involves ample use of technology but usually for one or two tasks per day. The duration of each task is not captured in this analysis and, for this reason, it may under-represent the role of technology. This data is a measure of the intended use of each skill during the workshop. It cannot speak to the frequency with which each student exercised each skill. It is clear, however, that these six skills are central to the activities that make up this programme and that participation in it should represent an opportunity for students to practice and develop their confidence and ability in these areas.

These findings will be discussed in more detail in the next section.

5.   Discussion

Throughout the various data presented, there are some key ideas recurring. The 21C Skills questionnaire identifies clear increases in student confidence in all six skill areas, with communication and collaboration skills showing the most significant gains. A notable increase is still present three months after completing the first week of the programme and a return to the highest levels of student confidence in 21C skills is evident after a second Bridge21 week.

Analysis of the open questions indicates that the students felt that learning as part of a team was central to their experience and that using technology for learning was valuable and worthwhile. Students said they were more confident, often referring to meeting new people, working in a team or public speaking. The group interviews uncovered many of the same themes.

Teamwork skills, learning with technology, confidence around meeting and working with new people and communicating effectively within a team, or to an audience, are skills that are consistently included in descriptions of 21C skills (Partnership for 21st Century Learning, 2018; Fullan & Langworthy, 2014). This research establishes a link between these outcomes and the design of the Bridge21 programme, which encourages frequent use of these skills.

The structured nature of Bridge21 activities allows the facilitator to provide varying levels of scaffolding at different points in the process or to focus on different skills (Lawlor, 2016). A gradual change in scaffolding over the days or weeks of the programme allows the students to build their skills and confidence without being overwhelmed. Fullan and Langworthy (2014) state that too little structure can lead to problems for students. The very positive feedback on the experience suggests that the staged reduction in scaffolding over the various days of the programme is well-judged for this cohort. Those students that take part in a second week typically require less support with the collaborative or technological aspects of the programme. At that stage, more time is spent helping students work on the kind of 'challenging projects' advocated by Claxton (2013). This gradual shift in focus from skills to content is important for students who are relative novices to this approach.

Collaboration is a mainstay of the literature on 21C skills and 21C learning and it is suggested that students need to learn how to work effectively in a team (Galton et al, 2009; Johnson & Johnson, 1990). Many students mentioned that they enjoyed working with their

team or that they improved their teamwork skills. Others stated that this was in contrast with their previous experience of collaborative learning, which was less positive.

'It improved my teamwork skills. I never liked teamwork and now I actually do.'

This suggests that the Bridge21 model, and the initial focus on working through softer collaborative projects before taking on more challenging tasks, provides a framework in which these students can learn to collaborate effectively.

Increased confidence in relation to meeting and working with new people was frequently mentioned by the students. Meeting new people is a feature of the programme: students from several schools are invited to participate each week and the teams are specifically picked to separate students from the same school. The ice-breaker games and team-building activities that make up the initial stages of the Bridge21 activity model are not just for fun; they help students overcome nerves and they model effective team behaviour (Katzenbach & Smith, 2005; Blatchford et al, 2005). The open brainstorming process is designed to encourage students to share ideas in a low-risk environment and become active members of the team. The nature of the project work encourages participation from all members of the team and the facilitator helps teams discuss ideas and make decisions in an inclusive way. These issues are less noticeable among students on their second visit to Bridge21. The increased confidence in collaboration and communication skills reported at Time 3 is visible as students require less help and encouragement as they get to know their new team-mates and take on new challenges together.

'I think I've gotten better at teamwork and listening to other people's opinion and incorporating them.'

Public speaking was mentioned by many students as an area in which they improved during the TY programme. Time 1 survey data showed communication skills had the lowest

confidence levels of the six skill areas covered, with the specific scale relating to 'presenting their work' ranked lowest of communication skills.

'Before I would have been, like shaking, and forgetting what I'd say.'

Analysis of the Core programme workshop design showed use of communication skills to be frequent across each day of the programme. The students make presentations in teams, from simple presentations in which they answer questions on the first day, through to proposing and discussing new ideas on day four. The gradual reduction in scaffolding for the student presentations is designed to reduce nerves and pressure while still encouraging each student to take a turn and speak out several times during the programme.

Learning with technology was another common theme in both the qualitative and quantitative data, with students reporting increased confidence here.

'I used to be really bad with computers but now I can do a lot of things.'

Students expressed enjoyment, a sense of improved skills and a desire to see technology more integrated into their education. For most students, the multimedia projects required learning to use at least one new piece of software e.g Windows Movie Maker. The Vygotskian idea of a 'more able other' was central to this process, with students working on shared devices and helping each other to master various technical skills. This approach allowed the students to create digital artefacts and engage with the technology in an active, productive way, rather than simply using technology as a means of consuming information (Conole et al, 2004).

In addressing the first research question, this study has shown this programme to be very effective in providing a boost to students' confidence across a range of 21C skills. The student feedback via both quantitative and qualitative survey questions, and in focus groups, provided clear and consistent evidence that participation in the programme helped increase their confidence using their 21C skills.

The second research question examined the design of the programme and found that many of its features encouraged the students to exercise the desired skills throughout the week. The use of the Bridge21 model, the initial focus on collaboration and communication skills and the gradual increase in focus on other skills areas before moving on to curriculum material provide a pathway from the medium to high range on the continuum of effective pedagogies described by Fullan and Langworthy (2014). The use of icebreaker and team building activities helps students learn to work together and communicate effectively, and provides an opportunity to model and discuss effective collaboration. The structured nature of the projects helps students find a role within their team and each new project builds on this experience throughout the week. The style of facilitation, the shared resources and the regular presentations are all features of the programme which promote the use of 21C skills. The consistent use of technology in a creative, productive way lets students develop their basic technical skills but also to use technology as a tool for learning, both in accessing and creating content. The initially higher level of scaffolding allows students to plan and collaborate effectively but a gradual decrease in scaffolding encourages students to think critically more often and to become more self-directed.

5.1 *Limitations and Future Work*

A limitation of this study is that the data is all self-reported by participating students. Although the quantitative data gathered using the key skills questionnaire adds rigour to the data collection, use of other measures of skills or confidence would further strengthen these findings. Some possibilities include peer assessment, skills tests or use of a facilitator observation protocol.

Student confidence with 21C skills was used as a proxy to track changes in their skill levels. Stewart et al. (2000) defined competence as being based on having previously completed a task successfully. The students report increased confidence with these skills having recently used them during the Bridge21 programme. Qualitative data show the students believe this increased confidence is based on increased competence, and is a direct result of participation in the Bridge21 programme.

This programme was designed and delivered by the lead author so a potential researcher bias must be acknowledged. To minimise this, the student interviews, and coding of qualitative student survey responses, were carried out by colleagues with no direct involvement in the programme. The 21C skills questions asked students to rate their confidence at a point in time. While the mean confidence levels increased significantly from Time 1 to Time 2, 42% of students reported a lower confidence level in at least one of the six skills at Time 2. This suggests that they were free to report how they felt at each time point without direct reference to the impact of the programme or comparison with their previous answers.

It is our intention to continue data collection from former Bridge21 TY students at various points. Measuring the students' confidence and capturing their opinions in the months and years after completing the programme should help to provide an understanding of whether the changes that have been identified are sustained over a longer period.

The period between Times 2 and 3 may be an opportunity for further work. Regular smaller interventions, in school or in Bridge21, after Time 2 could allow students to maintain their high levels of confidence with these skills. Student-led projects in school or after-school drop-in sessions may be options for this.

6.   Conclusions

This study set out determine if the Bridge21 programme was effective is helping students develop confidence, and perceived proficiency, in 21C skills and to examine which features of the programme contributed to these outcomes. There is a growing recognition of the value of 21C skills for modern learners and many education systems are seeking to employ strategies to help their students develop those skills. Previous work by Lawlor et al. (2018) found that use of the Bridge21 model promoted increased student motivation and suggested that the model was effective in helping students develop 21C skills.

This study used the Ravitz 21C skills framework to quantify student confidence in each skill before and after an initial week-long engagement, after three months, and following a second week-long engagement. It is clear from the data presented that, when the Bridge21 model is employed in this context, it is very effective in meeting these aims.

Analysis of the data reflect increases in student confidence and ability across a range of 21C skills, each of which can be linked to elements of the workshop design. Key features of the programme include an initial focus on skills development with curriculum material introduced later and a shifting emphasis on certain 21C skills during repeated Bridge21 project cycles. From meeting new people and coming up with ideas at the start of the day through to creating artefacts and presenting their work, students are practicing their skills and becoming increasingly proficient as they do so. The results indicate that the Bridge21 model in general, and the Bridge21 Transition Year Programme in particular, are effective in increasing student confidence with, and proficiency in, 21C skills.

Bridge21 is an out-of-school programme that was developed in an informal learning environment. However, the problems that it addresses are prevalent in formal education at national and international levels, and the methods used can be easily modified for use in different contexts. It is a model that can be adapted for use in the formal school environment,

with this format particularly relevant for short-term use, e.g. project-based learning days. There is ongoing work to apply the model in curriculum areas including, maths, English, physics and history, and to adapt the model for use in traditional school contexts (Johnston, Conneely, Murchan & Tangney, 2015; Girvan, Conneely & Tangney, 2016).

The findings discussed in this paper highlight the potential benefits of short-term, skills-focused educational activities. It is clear that the Bridge21 model could be replicated, in or out of school, to help students build, or kick-start, their 21C skills and confidence. It can be adapted to any curriculum area and could be easily integrated into formal and informal learning environments.

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Tables

N = 286	Mean Time 1	Time 1 SD	Mean Time 2	Time 2 SD	Mean difference	Difference SD	t	p-Value	Cohen's d	Effect Size
Collaboration	3.66	0.67	4.28	0.56	0.62	0.65	16.18	<.001	0.96	Large
Communication	3.39	0.78	4.12	0.63	0.73	0.69	17.92	<.001	1.06	Large
Creativity & Innovation	3.58	0.70	4.10	0.66	0.52	0.65	13.53	<.001	0.80	Large
Critical Thinking	3.65	0.64	4.15	0.62	0.50	0.56	14.91	<.001	0.88	Large
Learning with Technology	3.73	0.65	4.27	0.58	0.54	0.61	14.95	<.001	0.89	Large
Self-Direction	3.64	0.62	4.16	0.60	0.52	0.56	15.63	<.001	0.93	Large

Table 1: 21C Skills Times 1 & 2

Time period	Significant differences
T1 – T2	All significant => positive
T1 – T3	Collaboration, Communication, Self-direction significant => positive
T1 – T4	All significant => positive
T2 – T3	All significant => negative
T2 – T4	No significant differences
T3 – T4	All significant => positive

Table 2: Significance of Changes in 21C Skills Times 1, 2, 3 & 4

'Can do technology skills'	82
'Improved technology skills'	46
'Like technology'	27
'Want improved technology skills'	9
Total:	**184**

Table 3: 'Technology' codes 2015-17

	Setup	**Warm-up**	**Investigate**	**Planning**	**Create**	**Present**	**Reflect**
Collaboration skills	Bridge Game, Pole Game, Fears activity	Team formation	What do we know about movies?	Storyboard	Filming, Editing	Prepare presentation, present video	Team reflection
Work in pairs/teams	1	1	1	1	1	1	1
Work with others - set goals and plan				1	1		
Create joint products				1	1		
Present your group work		1				1	
Use feedback on group tasks	1			1	1	1	
Give feedback to peers	1			1	1	1	

Table 4: Skills frequency - Day one, collaboration skills

	Day One	Day Two	Day Three	Day Four	Total
Collaboration Skills	21	22	20	4	67
Communication Skills	11	16	12	10	49
Creativity & Innovation	8	15	11	11	45
Critical Thinking	8	9	19	8	44
Learning with Technology	8	7	13	4	32
Self-direction	13	19	20	7	59

Table 5: 21C Skills Frequency

Figures

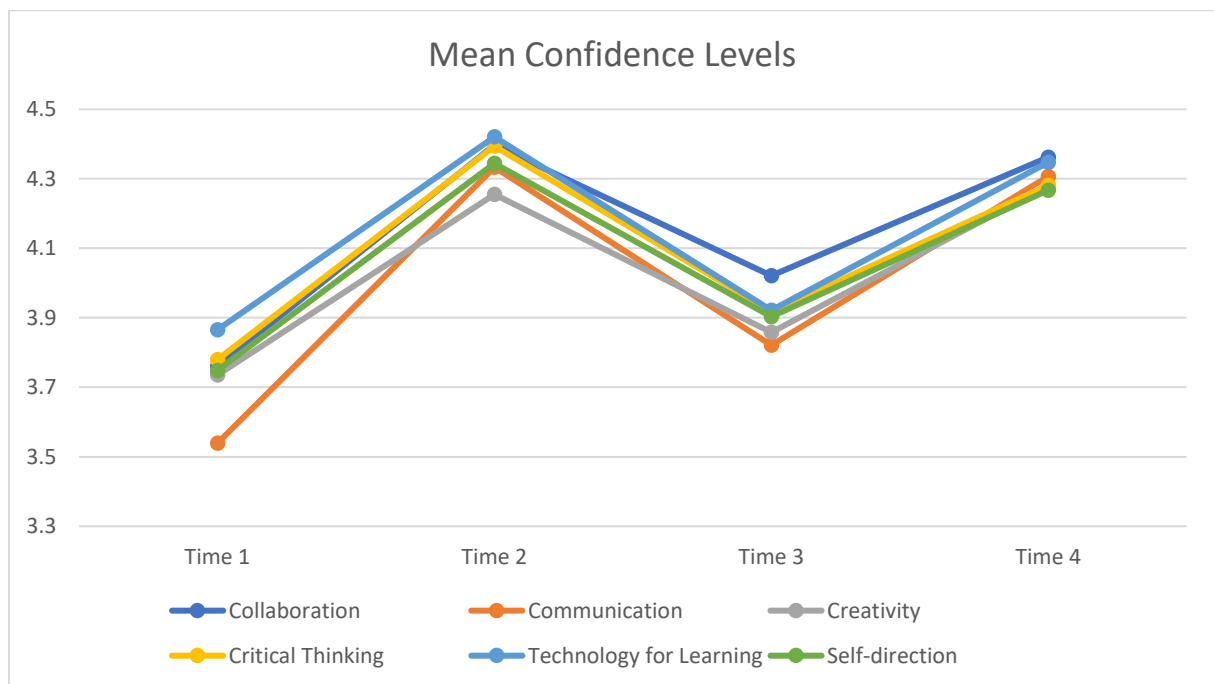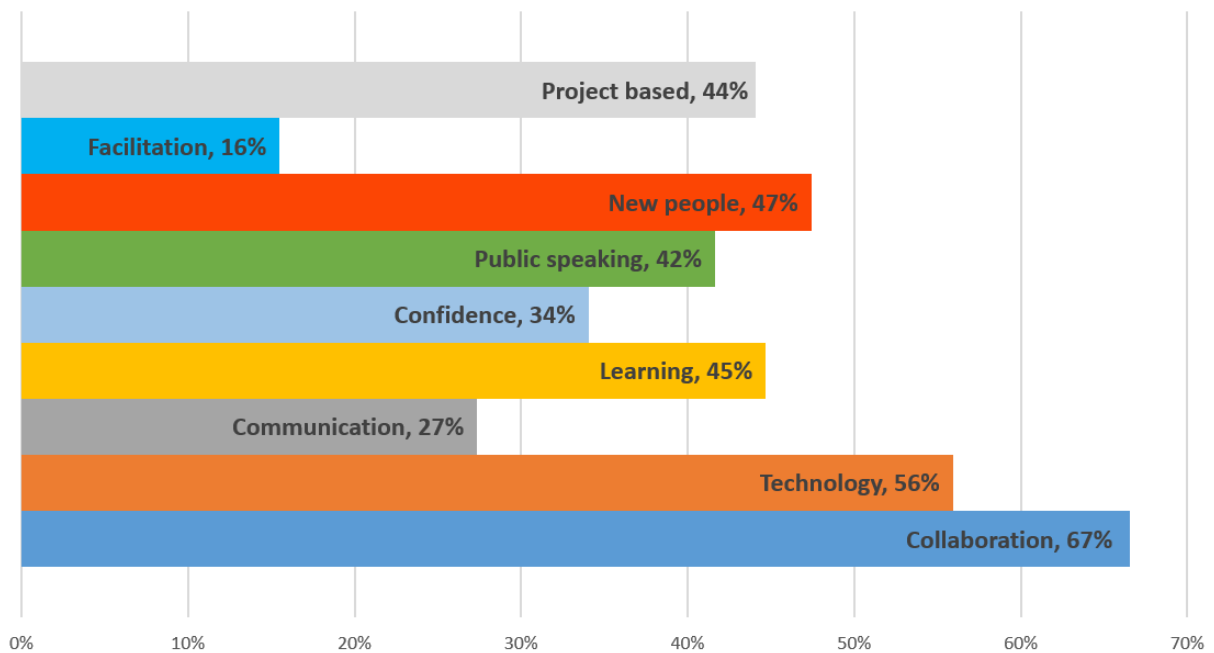Figure 1:

Figure 2:

Figure 3:

Figure 4:

Figure Captions

Figure 1: The Bridge21 Learning Model (Lawlor et al, 2018) & The Bridge21 Activity Model (Byrne et al, 2017)

Figure 2: Data collection timeline - Time 1 to Time 4

Figure 3: 21C Skills - Times 1, 2, 3, 4

Figure 4: Themes emerging from open survey items (2015/16 & 2016/17)

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