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Bridge21: teamwork, technology and learning. A pragmatic model for effective twenty-first-century team-based learning

John Lawlor^a, Claire Conneely^a, Elizabeth Oldham^a, Kevin Marshall^b and Brendan Tangney^a

^aCentre for Research in IT in Education, School of Education and School of Computer Science & Statistics, University of Dublin, Trinity College Dublin, Dublin, Ireland; ^bEducation Division, Microsoft Ireland, Dublin, Ireland

ABSTRACT

There have been calls for decades by many educational writers and commentators for a new model of learning to facilitate what is generally described as twenty-first-century learning. Central to this challenge is the required shift in responsibility for who leads and owns the learning - from teacher to student. Such a shift requires a pragmatic pedagogical model to facilitate the transfer of control and ownership of learning. Vygotsky's 'more able other' identified the peer as a key figure in learning. Teamwork facilitates project-based learning and, when mediated with technology, proves an effective partner in creating an engaging and autonomous learning experience. This paper describes the rationale for the design of a teambased model of twenty-first-century learning, particularly drawing upon the team-based learning model of the World Scout Movement. Results from a year-long study of the implementation of the model in an out-of-school context with 288 second-level students are presented. The authors argue that Bridge21 is a candidate learning model for effective, implementable, twenty-first-century, team-based learning.

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Teamwork; technologymediated learning; non-formal learning

1. Introduction

Considerable current discourse in the area of education centres on the need to embrace what is referred to as twenty-first-century learning. The characteristics of such learning have been generally defined to include critical thinking and problem solving, communication skills, and the ability to learn from and work with others with the objective of fostering highly motivated and engaged students (Claxton, 2007; Collins & Dolan, 2011; Fullan & Langworthy, 2013; Wagner, 2010). Learning models that seek to encourage high levels of student-led learning typically embrace collaborative working and/or teamwork (Ryan & Deci, 2000). Johnson and Johnson described a cooperative learning group as a structure where students work together to accomplish common goals. They further described more developed cooperative learning groups as long-term, heterogeneous and stable, and introduce the idea of a team with three to four members that work together to maximise their learning as individuals and as a group (Johnson & Johnson, 1990a; Johnson, Johnson, & Stanne, 2000). Panitz defined collaboration as a personal philosophy for group interaction by group members and cooperation to drive group performance built on consensus (Panitz, 1999, 2001). Johnson regarded collaborative learning as the instructional use of small teams to support both mutual and collective learning (Johnson, 1994). Teamwork is the effective working of a group to deliver to a common objective and is in its essence a cooperative process driven by

the interaction and relationships of the team members (Scarnati, 2001). Team-based learning is proposed as a powerful alternative to traditional individualised teaching and learning based on the cohesiveness that can be encouraged in student learning groups, facilitating new drivers and motivation for learning within the team, based on joint effort, mutual dependence and shared objectives (Johnson & Johnson, 1990a; Michaelsen, Knight, & Fink, 2002).

Teamwork has shown itself to be a strong candidate as a vehicle of a transfer of responsibility from the teacher to the learner (Johnson & Johnson, 1990b; Michaelsen et al., 2002; Michaelsen & Sweet, 2011). There is an identified gap between theories of teamwork (or group work) and practice in formal education (Blatchford, Galton, Kutnick, & Baines, 2005) and it has further been argued that group work has shallow roots in how it is implemented in the classroom (Blatchford et al., 2005; Galton & Hargreaves, 2009; Kutnick & Blatchford, 2014).

Much of the literature dealing with how young people could learn with and from their peers uses the term 'group work'. This often refers to ad-hoc arrangements of participants for the purpose of a specific activity or task (Katzenbach & Smith, 2005). This paper presents a particular implementation of group work with a highly structured team-focused approach that facilitates and supports twenty-first-century learning. In contrast to the ad-hoc group, the acceptance of a sense of interdependency among members and shared responsibility in the team in realising an objective is a distinguishing characteristic of what may be described as teamwork (Donnellon, 1996; Katzenbach & Smith, 2005). Team-based learning offers a potential alternative to teacher-directed learning and changes the line of accountability from student-teacher to student-student (Sweet & Pelton Sweet, 2008).

The Bridge21 learning model presented in this article has a particular focus on how to develop and support the team. In essence, it is a pragmatic model for twenty-first-century learning which has teamwork at its core. The model has had extensive implementation in a range of learning contexts over a seven-year period with in excess of 8000 students from 80 second-level schools in a specially designed out-of-school learning environment on a university campus (Lawlor, Conneely, & Tangney, 2010). The article describes the rationale for the design of the model and outlines its use over a single academic year, before discussing the effect on the participants and the model's effectiveness in supporting collaborative learning and teamwork. The model, through its transfer of control of the learning from the teacher to the learner, has been shown to be effective in encouraging intrinsic student motivation and in promoting student responsibility for the learning (Lawlor, Marshall, & Tangney, 2016). Here we focus on examining how the model encourages student control of learning through the team; student engagement within the team approach; the learning process; and whether, in the assembly of the elements, as informed by literature, Bridge21 is an effective, implementable model for twenty-first-century team-based learning.

2. Literature that informed the Bridge21 model design

The development of the Bridge21 model was essentially evolutionary and moved from the intuitive to the informed guided by the literature and the emerging data. This path of development was directed by the data that surfaced through the experience and impact on the participants, as evidenced in their responses to questionnaires and in focus groups arising from the successive years of the programme implementation. The evidence from data was referenced through an abductive process against literature relevant to the elements comprising the model. There is significant previous work on employing structured teamwork in learning and notably in Slavin's Student Teams-Achievement Divisions (STAD), which are employed in team-based learning quiz exercises. This approach differs significantly with Bridge21 in its normative scoring of team performance, which contrasts with the Bridge21 goal-mastery orientation (Lawlor, 2016; Slavin, 1980). These different approaches and their relative efficacy would merit deeper comparison. The Bridge21 model for team-based learning relies on promoting intrinsic motivation and this is consistent with Deutsch's theory of social interdependence and the relationship between shared goals and individual motivation, as illustrated in Roseth et al.'s meta-analysis of the

relationship between motivation and achievement in interdependent situations (Roseth, Johnson, & Johnson, 2008).

Topics pertinent to the design of a pragmatic model of twenty-first-century team-based learning include: team formation, accountability and effectiveness, the role of feedback, reflection and review, the importance of the design of learning space and tasks, and the potential of technology as an effective mediator of team and collaborative learning as defined by Johnson (Johnson, 1994). These topics are explored through the lens of a particular model of teamwork – that of the World Scout Movement.

2.1. Learning from the Scouts

The idea at the heart of the learning method of the World Scout Movement is that young people can learn from each other and that the role of the adult is to guide and mentor (Bénard, 2002; Kavanagh, 2003; Vallory, 2012; World Organization of the Scout Movement, 1998). Given the global impact of the Scout movement and the hundreds of millions of young people that have participated in its educational method over the last one hundred years, there is a remarkable paucity of academic literature and published research on its characteristics, impact or efficacy. Much of the literature that is available and referenced here is of a practical nature and intended to support practitioners and in the main lacks academic rigour.

The educational method of Scouting so impressed Montessori that she wrote of Scouting as 'freeing children from the narrow limits to which they have been confined' (Jeal, 2007, p. 413). Scouting's method is firmly rooted in a system of self-organised teams, which provides for a transfer of control and responsibility for learning to the young people, in what Scouting calls 'The Patrol System'. From its early years, as reflected in its historic documents, Scouting gave each Patrol a name, identity and its own space within the Scout meeting place, called a Patrol Corner (Reynolds, 1943; Wood, 1952). The Patrol has a Patrol Leader drawn from the Patrol members and he or she has the responsibility to ensure that the Patrol works together in a range of activities interweaving fun and learning. In summary, the ideal of the Scout Patrol can be described as a learning community where young people support each other's development (Bénard, 2002).

2.2. Team development

Placing students in an ad-hoc group and assuming that they will act as a team is a naive but not uncommon approach, particularly in formal education (Blatchford et al., 2005). Groups do not become teams just because they are labelled so (Katzenbach & Smith, 2005). The formation of teams is an important process to get right. Michaelsen and Sweet proposed three principles to guide team formation: (1) never use student-selected teams; (2) create diverse teams; and (3) make the selection process transparent (Michaelsen & Sweet, 2008a). Crucial to effective teamwork is the development of skills for working together (Blatchford et al., 2005). Developing and supporting the team and enhancing its integrity as a key unit in the learning provides a vehicle to promote autonomy in the sense that it is the team that takes the ownership of the learning as opposed to the teacher.

Teams accept and share common objectives, work together to achieve their objectives and can be measured for their performance against these objectives (Katzenbach & Smith, 2005). Requiring accountability for performance promotes interdependence and greater satisfaction within the team (Fandt, 1991). This process of transferring responsibility for the task from the teacher to the team gives control to the learners and has the important effect of making the team a 'vehicle' for student responsibility for the learning (Lawlor et al., 2016; Pyle, 1995). A crucial element in team accountability is the sense of sincerity and responsibility both to self and to fellow team members (Katzenbach & Smith, 2005; Peterson, 1997). This type of accountability can be encouraged and supported through a structured team-reflection process where team members are encouraged to be constructive and honest in discussing how they are working together.

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Team reflection provides an opportunity for the team to hold itself to account as a team and for individuals to consider their personal contribution (Hills, 2001). Providing feedback and encouraging team reflection on performance is an important element in creating cohesive learning teams (Michaelsen & Sweet, 2008a; Sweet, 2013). Providing the team(s) with structured tools and formal aids can be helpful in encouraging constructive team 'reflection on action' and individual reflection and metacognition on the learning experience (Apple, 2000; Schön, 1995). Additionally, allowing a time and creating suitable space are important prerequisites for effective reflection on learning (Nair & Gehling, 2008; Schön, 1995).

Creating effective team assignments is a key ingredient for team-based learning and the richness of the task given can moderate the performance and success or otherwise of the team and its members (Lou, Abrami, & d'Apollonia, 2001; Stewart & Barrick, 2000). There is a requirement that team assignments are designed so as to require group interaction if they are to promote both learning and team development (Michaelsen & Sweet, 2008a). Open and loosely structured tasks have been shown to encourage team productivity and exploratory learning to a deeper level than might occur with highly structured challenges (Lou et al., 2001). It has also been shown that team-based problem solving deepens both individual and team learning outcomes and provides a context for twenty-first-century learning (Freeman, McGrath-Champ, Clark, & Taylor, 2006; Trilling & Fadel, 2009).

It is essential that team members interact, for team-based learning to be successful (Hills, 2001). Students who believe that team interactions are adding value to their education both enjoy the experience and benefit from deeper learning (Gomez, Wu, & Passerini, 2010). Team-based learning requires a focus that has regard to how people interact within a social structure and situation so as to maintain its integrity and realise its goals. This is reflected in attention to interpersonal interaction and conversation and runs contrary to a focus on the individual (Koschmann, Stahl, & Zemel, 2004).

Students' experience of formal learning is presented in the context of a strict set of protocols, rules and principles that govern how learning is conducted. This impacts social interaction and what is understood as socially relevant (Sieber, 1979). Uniforms, calling teacher 'Sir' or 'Miss', general silence in the class and deferring to the teacher in the control of the learning are part and parcel of how formal learning conducts itself. This structured formality supports a pedagogy that favours a superior-to-subordinate relationship (Goodman, 2009; Skinner & Belmont, 1993). In contrast, a constructivist pedagogy centres on the role of the child in the learning and facilitates authentic and purposeful interactions with the child taking responsibility and opportunities for decision making in an environment of mutual respect and collaborative engagement (Dangel & Guyton, 2003).

2.3. Integration of technology in team-based learning

The advantages of a team-based experiential learning approach can be significantly enhanced through the creative integration of information and communications technology (ICT) in the learning (Pauleen, Marshall, & Egort, 2004). It has long been recognised that having students work and learn collaboratively in a technology-supported environment has advantages over individual learning (Crook, 1995; Johnson & Johnson, 1996). An effective and practical strategy in promoting teamwork and collaborative learning is to allow for sharing of computers within the team, rather than having a machine per student which could encourage individualisation (Lin, Chan, & Hsiao, 2011; Mitra, Leat, Dolan, & Crawley, 2010). Sharing computers has been shown to be more than a strategy to counter limited resources and presents advantages in productivity through peer learning and collaborative working (Best, Kollanyi, & Garg, 2012). Working in this collaborative way with technology meets the need identified by Conole et al. to facilitate activity-based learning with ICT and, in this way, shift the focus of learning from information transfer to collaboration and communication among learners in an environment where computers are a resource for the learning community (Conole, Dyke, Oliver, & Seale, 2004).

2.4. Learning space: creating team space

The rationale for presenting a team-based pedagogy is rooted in the idea of transferring ownership of the learning to a self-directed group. Thought must therefore be given as to how and where the team

would go about its business of being the driver of learning (Jolliffe, 2007; Taylor, 2007). Learning space is a key component in this learning environment. How the learning space looks and feels is important to those who will learn in it. The physical and spatial aspects of the learning environment communicate a symbolic message of what one expects to happen in a particular space and there needs to be an alignment between the intended learning approach and the learning space configuration (Proshansky & Wolfe, 1974). For team-based learning, this symbolic message is critical as it elevates the importance and pre-eminence of the team. The design of the learning environment requires that the needs of the team and teamwork are referenced with consideration of how they will work cooperatively, 'plan-doreview' together and how they will identify with each other as a team (Jolliffe, 2007; Taylor, 2007). A team-based approach would require a move away from the demands and strictures of the traditional classroom-style learning environment and system in that the teacher–student relationship, the learning space and the social learning environment would all be challenged.

Providing opportunities to integrate ICT in the learning is a further challenge to traditional formal learning environments with computer science labs emblematic of an approach that seeks to shoehorn technology into a 'cells and bells' classroom structure (Conole et al., 2004; Donnelly, McGarr, & O'Reilly, 2011). Sugata Mitra addresses this challenge with his Self-Organised Learning Environments (SOLEs) to facilitate children to work in groups with ready access to the Internet, with resource sharing of typically four children to each computer in the group (Mitra & Quiroga, 2012). Through this approach the building of the learning group is integrated into an ICT-enabled learning environment. Facilitating and growing creative twenty-first-century learners requires learning space that is a stage and forum for problem solving, creativity, teamwork and learner responsibility, and what can described as a 'jazz ensemble' of collaborative improvisation (Claxton, 2007; Frueauff, Wall, Essley, & Hall, 2011; Jilk, 2002; Nair & Gehling, 2008; Nevison, 2010; Wagner, 1997).

3. Building a model for teamwork

The particular learning model under discussion in this article was designed with teamwork at its core, with a commitment to enabling twenty-first-century learning and is built upon the ideas outlined in the literature in the previous section. Each element of the model is considered so as to facilitate teamwork and to exploit the affordances accruing from collaborative learning as part of a team.

The development of the model can be seen as example of design-based research (DBR). DBR is an approach to research focused on evolving design principles for a theory or model through testing a series of interventions. It has been identified as 'an important methodology for understanding how, when, and why educational innovations work in practice' (The Design-Based Research Collective, 2003, p. 5). DBR is in essence a method to build theory to improve practice (Anderson & Shattuck, 2012). This approach to building the Bridge21 model may be regarded as a piece of DBR in that the literature informs the design of the model which evolves through testing a series of interventions. DBR is an important methodology for 'understanding how, when, and why educational innovations work in practice' (The Design-Based Research Collective, 2003, p. 5).

The key elements of the learning model are: (1) building teamwork and team dynamic development; (2) technology-mediated collaboration and technology as a resource to the team; (3) team-friendly learning space; (4) project-based learning; (5) team and individual reflection; (6) mastery goal orientation; (7) social learning protocols; (8) adult facilitator/mentor support.

These elements are implemented in a systematic and structured mix (see Figure 1) and a detailed description of each is presented in the sections below. A summary is provided in Table 1.

3.1. Teamwork

Teams do not just happen, they must be established, developed and nurtured (Katzenbach & Smith, 1993). For Bridge21, Michaelsen and Sweet's injunction to avoid student selection of teams is adopted so as to avoid a potential for prior personal relationships to influence the make-up of the team, and so



Figure 1. Learning model.

to ensure diverse and heterogeneous teams (Michaelsen & Sweet, 2008b). Team stability is maintained throughout the Bridge21 intervention so as to allow the teams to 'form' and iron out any issues that arose so that the team could go on to perform as a unit.

The process of meeting a series of progressively challenging tasks is used in Bridge21 and has the effect of developing the team. When problems arise, the team is encouraged to have a meeting and sort the problem out by itself before resorting to external intervention. This interaction has the effect of building the team and strengthening the learning. Each team member is assigned a role and is expected to deliver in that role for the team. Examples of roles include: Researcher, Editor, Multimedia Artist, Audio Technician, Script Writer. This peer accountability contributes to team cohesion and effectiveness. Each team appoints a Team Leader. This takes place early in the formation of the team with the team and Team Leader allowed to make a change if they wished following reflection on the completion of their first task together on a 'no shame, no blame' basis, as described in Wagner's proposed approach to leadership in learning (Wagner, 2001). After this opportunity the Team Leader appointment holds for the life of the team in the learning intervention. The Team Leader role in Bridge21 requires the exercise of a range of leadership skills including coordination, delegation, motivation, coaching and representation of the team. The adult facilitator/mentor communicates to the teams via the Team Leader. In this way the Team Leader role is pivotal in transferring responsibility to the team.

3.2. Technology-mediated collaboration

Paradoxically, technology is both integral and ancillary to the Bridge21 model. The use of computers in Bridge21 is not in itself the object of the learning but their use is central to the model. The development of enhanced ICT skills is subordinate to and a by-product of more general learning in Bridge21.

Table 1. Elements of the Bridge21 learning model.

Element	Implementation strategy
Building teamwork	 Structured teams Team stability Team development Team tasks Team roles Team leaders
Technology-mediated collaboration	 Technology as a tool Technology and resource sharing in the team
Learning space	 Learning space designed to support the team Team ownership of space Flexible space Presentation area Stimulating environment
Project-based learning	 Scaffolded Team oriented Problem-based learning SMARTER (Specific, Measurable, Attainable, Relevant, Time-bound, Engaging, Recordable)
Team and individual reflection	Team plan, do, reviewIndividual 'cave' time
Mastery goal orientation	 Breaking the performance–ability connection Valuing effort in the learning Encouraging team and peer affirmation
Social learning environment	Social informalityStudent-led approach
Mentor/facilitator	Adult as guide and supportAdult as co-learner

Wu argued that 'experiments in independence can best take place in the secure reassurance of a highly disciplined stable pedagogic environment' and described this colloquially as a 'sink or swim' approach to learning (Wu, 2002). This 'sink or swim' approach is taken in Bridge21 with new applications and techniques assimilated by the participants in the teams with minimal introductory instruction and 'light touch' guidance (Wu, 2002). The participants learn from, and teach, each other as they explore the potential and capabilities of applications with which they have no previous experience, in the spirit of the learning espoused by Mitra and Quiroga (Mitra & Quiroga, 2012). Resource sharing is a notable feature in the use of ICT in the Bridge21 model. A team of four or five members is equipped with two computers to encourage collaboration and to avoid individualisation and the 'lone learner' that can occur when every student has individual exclusive access to a machine. Resource sharing also tightens the internal team interaction in that the team has to work together, scheduling elements of the work, working in pairs within the team on sub-tasks and helping one another overcome problems and challenges.

In summary, technology is used as a tool in the Bridge21 model aligned to the way young people use technology in their social lives and when not under supervision of adults (Resnick & Rusk, 1996; Sutherland et al., 2004; Windschitl & Sahl, 2002).

3.3. Learning space

The Bridge21 model requires a team-oriented stimulating and flexible learning space that is reflected in furnishing and decor. The Bridge21 model features dedicated learning spaces for the team called 'team

pods' (example in Figure 2). The team pods are defined team spaces to afford a measure of privacy to the team in its work together. The team pods are equipped with PCs as a team resource and seating is office-style swivel chairs to provide comfort and flexibility and to reinforce the sense of the team having important business to achieve in its learning space. The Bridge21 learning environment provides for breakout areas to allow the team to conduct meetings as necessary. A presentation area (example in Figure 3) is a feature of the Bridge21 model so that teams can present their work to their peers in the other teams. In summary, the learning environment in the Bridge21 model is designed to support team learning, and is different in many ways to the previous learning environment experience of participants.

3.4. Project-based learning

In Bridge21 the challenges assigned to the teams are centred around projects. The approach meets the common understanding of project-based learning in that the projects are complex and challenging, are authentically situated, require autonomous effort, are time-bound, require cooperative working, feature reflection and require the production of an artefact or presentation (Savery & Duffy, 1995). Additionally, the approach provides for support but not direction from a mentor (Thomas, 2000). The use of ICT is common in project-based learning and is integrated in Bridge21. The projects in Bridge21 are designed and structured so as to engage the team and promote team interaction in meeting the project challenge (Michaelsen & Sweet, 2008a).

3.5. Team and individual reflection

Bridge21 provides for team and individual reflection as part of the learning model. The individual reflection, or reflective observation as described by Kolb, takes place at the end of the workshop so as to deepen the learning, promote higher-order thinking and encourage metacognition (Dewey, 1933; Kolb, 1985; Schraw, 2001). The personal reflection is facilitated by creating personal space and a time for reflection or 'cave space' (Thornburg, 2004) and so is both spatial and temporal. The individual reflection is supported by questionnaires with open questions that challenge the participants to reflect on their personal experience.





Figure 3. Presentation space.

The team reflection takes place after each challenge and at the end of the workshop and is designed to promote peer learning, to encourage team interaction and to foster a 'plan-do-review' discipline for the team (Trilling & Fadel, 2009; Vogel, 2001). The team reflection is supported by a structured question-naire that guides the team in reflecting on how it works together and deals with challenges given it.

3.6. Mastery goal orientation

Bridge21 seeks to help participants be their best rather than find out who is best. The model sets out to break the performance–ability connection and through this to raise the students' perception of their own ability and to foster intrinsic motivation (Lawlor et al., 2016). This approach represents a mastery goal orientation where the underpinning philosophy is to encourage personal mastery and to avoid normative assessment. Goal orientations have been defined as either 'mastery', focusing on gaining competence or 'performance', focusing on establishing superiority over others (Chiaburu, 2005). Participants do not compete with each other in Bridge21, they work together to learn and achieve. This strategy encourages self-regulatory activity and fosters intrinsic student motivation (Ames, 1990; Ryan & Deci, 2000; Schunk, Meece, & Pintrich, 2012). While there is a natural inclination for teams to compete, this is downplayed in favour of an ethos and atmosphere of inter-team cooperation. In presentation the teams encourage, critique and applaud each other. In this way, Bridge21 works to build a shared sense of personal and team achievement and learning.

3.7. Social learning environment

A social learning environment is established in the Bridge21 model to support what is a social and constructivist pedagogy (Blatchford, Galton, Kutnick, & Baines, 2003; Dangel & Guyton, 2003). A friendly open and relaxed atmosphere permeates the environment and the protocols at play are based on trust and responsibility rather than policing and control. There is a deliberate intent to liberate students from the usual constraints that they feel in a school context. Students do not wear uniforms in Bridge21 as is

typical of formal schooling in Ireland, which in itself is a strong signal to the students that this learning environment is not like school. They are encouraged to address adult mentors by their first names and to see them as co-learners and partners in the activity and not as an authority figure.

The noise level in the Bridge21 learning is higher than a typical classroom as students are encouraged to openly discuss the work at hand with both their peers and the mentor(s) or facilitator.

3.8. Mentor and/or facilitator

The role of the adult mentor in Bridge21 is as a facilitator, supporter, guide and co-learner. The learning takes place in the team and the adult mentor is not a member of the team. Vygotsky's social constructivism is a learner-centred philosophy that emphasises the social and cultural context within which learning takes place (Vygotsky, 1978). There is a reliance in Bridge21 on the Vygotskian idea of a Zone of Proximal Development (ZPD) and learning with and from peers in the team (Blatchford et al., 2005; Vygotsky, 1978). The concept of a ZPD is a Vygotskian idea that is pertinent to small-group learning (Hogan & Tudge, 1999). There is an inherent dependency in in-group learning on finding a competent peer, or at least more competent peer, willing to share their knowledge or skill. Hogan and Tudge pointed to the significance of social context and the competency of peers within the group in determining how effective a learning group will be.

In the Bridge21 model, the adult provides backup and support and occasional troubleshooting in relation to either technical or team problems that arise, but does so while respecting the integrity of the team and the primacy of the team in resolving its own challenges. In this way, the team is the vehicle for the transfer of responsibility for the learning from the adult to the participant. The adult avoids taking responsibility for leading the learning and 'steps back' so that the team and its members will 'step up'.

4. Implementation

The Bridge21 model was initially developed as part of the authors' university's outreach programme to second-level schools in areas of lower socioeconomic status. The model has since been scaled and deployed in a series of large-scale interventions over an eight-year period to the present. Implementing the model required an engagement and partnership with schools to secure the release of students during school time. In excess of 8000 second-level students have engaged in the programme from 2007 to the present.

4.1. Participants

The participants were drawn from the Transition Year (TY), which is an optional one-year programme in Irish second-level schools taken following a state examination after a three-year Junior Cycle and before the two-year Leaving Certificate programme, and designed to act as a bridge between the Junior Certificate and Leaving Certificate programmes. The programme is optional for schools and optional or mandatory for students depending on the school's policy. The year is intended to facilitate a broader educational experience to allow increased maturity before moving to further study, and to help students make the transition from a teacher-directed learning environment to one where they will take greater responsibility for their own learning and decision making (Department of Education and Skills, 2015).

This study considers the experience of 288 participants aged 15–16 years who were mid-second-level/TY students drawn from 15 second-level schools across the country for the academic year 2009–10 and the reflections through focus groups of a selection of participants from three consecutive academic years (2007–08, 2008–09, 2009–10). Each participant attended the programme during school time for a minimum of 3.5 consecutive days (22 hours in total).

4.2. Workshops

The programme consisted of 19 discrete workshops spread over a single academic year and catering for 25 students at each workshop. The workshops took place during school time but in an out-of-school context. The students attending each workshop were drawn from three or four schools so as to realise a mix of participants and social backgrounds. The workshops were entirely team based and the strategies applied were consistent with the principles surfaced in the preceding literature review. Each workshop commenced with an allocation of the 25 students into five teams of five.

Team skills were introduced through ice-breaker activities and team-based games. Tasks and challenges presented required a distribution of roles among the team members. Team meetings and reflection were encouraged after the completion of each task. Teams were supported by mentors who adopted an encouraging but 'hands off' approach and respected the integrity of the team by not intruding or directly leading. Each team selected a team leader on the first day. The coordinator communicated with the teams through the team leader. The tasks were time-bound with a requirement to deliver to a deadline with a presentation to the other teams. The tasks given included:

- multimedia projects;
- · computer game making;
- computer programming;
- peer teaching of mainstream academic subjects.

5. Research methodology design and method

The research seeks to explore whether, in the assembly of the elements, as informed by literature, Bridge21 is an effective model for twenty-first-century team-based learning. In order to judge the effectiveness of the implemented model, the research seeks to explore the perceptions of the participants following their experience with Bridge21.

The research looks in particular at the effect on the stated reflections of the participants with particular reference to the effectiveness of teamwork and the indications of twenty-first-century learning, and to provide for an understanding of what is emergent in the intervention (Creswell & Plano Clark, 2007). The research questions in a broader study addressing (among other topics) the area discussed in this article include the following (Lawlor et al., 2016):

Q1: What are the credentials of Bridge21 as a candidate model for twenty-first-century learning? Q2: What is the effectiveness of the model in facilitating team-based, technology-mediated learning?

The research design features mixed methods with a strongly qualitative lead supported by quantitative data (QUAL+quan) (Morse, 1991). Additionally, a pragmatic approach is taken so that the context of that experience and interacting factors that bear on that experience are considered (Feilzer, 2010). Hence, for this article, research questions can be formulated as follows:

RQ1: Do the themes emerging from the qualitative data support the claim that Bridge21, as implemented, provides a twenty-first-century team-based learning experience?

RQ2: Do the themes support the claim that the model is effective in allowing students to develop twenty-first-century skills?

5.1. Data instruments

To provide qualitative data, questionnaires were completed by participants at the commencement and at the end of the workshop. The open questions in the questionnaire are broad, exploring attitudes to the overall experience of the intervention, participants' rating of their experience at the workshops, and reflections on personal development and learning styles. These include:

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- I. Overall, how would you rate your experience in Bridge21? Why do you feel this way?
- II. Three things I learned about myself and how I learn during the Bridge21 programme.
- III. Has the Bridge21 programme impacted on you in any of the following ways?
 - a. improved my attitude to working as part of a team;
 - b. improved my attitude to education;
 - c. increased my confidence using technology;
 - d. made me feel that I would learn better in school as part of a team;
 - e. allowed me to make new friends;
 - f. improved my communication skills;
 - g. increased my independence.

Qualitative data were also harvested from a set of focus-group interviews. The focus groups were undertaken with students participating in three successive academic years. This provided samples of different cohorts of students from each of three successive years of the programme and at a time interval of between six months and three years after their participation in the programme. The interviews were conducted with students in groups of eight, from five schools over a two-week period in year three. The application of focus groups at a significant time remove from the participant experience of the workshops lends insight to the effectiveness and lasting impact of the model.

The issues explored in the focus groups were prompted by responses to open questions in the pre- and post-activity questionnaires and the pursuit of interesting issues emerging. Similar to the questionnaires, the focus groups probed the general experience of the students and were not solely oriented to teamwork or twenty-first-century learning but sought to open a discussion on the general student experience. Prompting questions explored participants' views on their experience learning as part of a team during the workshop and drawing comparisons to learning at school. Questions also probed participants on the role of the team leader and peer relationships within the team. The approach was semi-structured, informal and 'chatty' to encourage a rich interaction between the participants, to be reactive to comments made by the students and in general it followed a social constructionist approach (Ryan, Gandha, Culbertson, & Carlson, 2014).

The combination and triangulation of the qualitative data are summarised in Figure 4. A summary of the data collection instruments is presented in Table 2.

The post-activity questionnaire also contained a small number of quantitative items. One item asked the students to rate their overall experience of Bridge21 on a 5-point scale (from *Excellent* to *Poor*). The questionnaire also included a set of nine Likert-type items seeking to establish the extent to which the Bridge21 programme impacted on the students. Five of the items referred to issues relevant to teamwork: a. Improved my attitude to working as part of a team; b. Increased my confidence using technology; c. Improved my attitude to education; d. Made me feel that I would learn better in school as part of a team; e. Improved my communication skills. Responses offered ranged from *Strongly Agree* to *Strongly Disagree*.

5.2. Data analysis

The process of coding and analysis of qualitative data was supported by nVivo8 Computer Aided Qualitative Data Analysis Software. Data from two sets of (1) the questionnaires and (2) the focus groups were analysed in parallel so that the emerging themes could drawn from and be affirmed or challenged by both sets of data and to provide a measure of triangulation as illustrated in Figure 4. Firstly, conceptual code labels were applied to quotes arising from open questions in the post-activity questionnaires and from the focus-group transcripts. Secondly, these codes were grouped and categorised. This process yielded a set of themes particularly relevant to considering the impact of the team-based learning experience on the participants (Creswell, 2002; Lawlor et al., 2016; Strauss & Corbin, 1998). Finally, the



Figure 4. Combination and triangulation of QUAL data.

Student pre-activity questionnaire	n = 288	Year 09/10
Student post-activity questionnaire	n = 288	Year 09/10
Student focus-group interviews	<i>n</i> = 22	Years 07, 08, 09

20 emergent themes (T1 to T20 in Tables 4–8 below) were grouped into five topics and are discussed in detail in the following section.

For the post-activity questionnaire, the item on overall rating of the Bridge21 experience was scored 5 for *Excellent* through to 1 for *Poor*. The Likert-type items were scored 5 for *Strongly Agree* through to 1 for *Strongly Disagree*. The data were entered into the SPSS statistical package with a view to drawing up frequency distributions, calculating correlations, carrying out exploratory factor analysis and investigating whether the Likert-style items formed a scale or scales.

6. Findings and discussion

The focus of this article is to explore whether Bridge21 provides an effective, implementable model for twenty-first-century team-based learning.

The qualitative data provide the lead in the QUAL+quan methodology. Findings relating to students' overall experience are firstly presented. Following that, the emergent themes (T1 to T20 in Tables 4 to 8 below) are presented in five major topics: (1) team effectiveness and collaborative learning; (2) team and task; (3) team interactions and peer working; (4) comparisons with formal experience; and (5) team leadership. Descriptive statistical analysis of Likert-type items (quan) supported these emergent themes, as indicated below. The findings are then related to the research questions set out in section 5 above.

6.1. Overall experience and its relationship to teamwork

Analysis of quantitative data (n = 283) in the post-workshop survey indicates a strongly positive experience for the participants, with 80% rating their overall experience as excellent, 19% rating it as good, with only 1% stating it was average (0% fair and poor ratings). Qualitative analysis of the open-ended question ('Why do you feel this way?') suggests that the participants' positive experience was linked to

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how they felt about the team-based learning experience, directly referencing how their team worked and learned together (T1) and team performance (T2) in their answers.

The data distributions for the five Likert-style items were also skewed, with the medians corresponding to *Agree* or (for item (a)) *Strongly Agree*. Consequently, for the relationships among the overall experience and Likert-style items, Spearman rather than Pearson correlation coefficients were calculated, and techniques such as factor analysis that are predicated on normal distributions were deemed inappropriate. Rather, with the aim of providing some validation through triangulation, item-level data findings were examined to see if and where they provided support to the qualitative themes.

Table 3 presents coefficients for the Spearman correlations between participants' reported overall experience and their responses to the relevant Likert-type items: improved attitude to teamwork ($\rho = .366$, p < .001), increased confidence levels using technology ($\rho = .114$, p = .055), improved attitude to education ($\rho = .163$, p = .007), along with agreement with the assertion that they would learn better in school as part of a team ($\rho = .222$, p < .001) and their self-reported improved communication skills ($\rho = .162$, p = .007). Thus, all the correlations with the reported overall experience are positive and highly significant, except for the item on confidence with technology; in that case the coefficient just misses significance at the .05 level. The item is one of the most strongly skewed. The table also records that correlations between all the Likert-type items are positive and statistically highly significant.

6.2. Team effectiveness and collaborative learning

In exploring team effectiveness, we examined how the team worked and learned together from the perspective of the participants; objective considerations, such as the team outputs or products or opinions delivered from a viewpoint external to the team, were not factored into the analysis.

There is evidence from the data to show that participants had forthright opinions on how their team performed. They typically saw their own team as highly effective in achieving their objectives and in learning together and this was an emerging theme from both the questionnaires and focus groups. Team effectiveness and collaborative learning is referenced in four emerging themes: T1. Working and learning together; T2. How their team performed; T3. Their contribution to the team; and T4. Problems in their team. Table 4 summarises the themes and examples of student comments relating to team effectiveness and collaborative learning. Students generally reflected on their contribution to the team and its success, and their comments pointed to a strongly collaborative experience during the workshops.

Overall, it is evident from their declarations that students were not passive within their teams and generally they had formed strong views on the team effectiveness and the factors impacting that effectiveness.

6.3. Team and task

The relationship between team and task is touched upon in four emerging themes: T5. Need to deliver on their projects; T6. Promoting a sense of responsibility and control over the learning; T7. Team determination to meet their goals; T8. A sense of enjoyment in the work. Table 5 summarises the themes emerging and examples of student comments relevant to team and task. We suggest that the model

Table 5. Spearman	correlation matrix.	participants	overall experier	ice and reatures o	i teani based leann	ng.

Table 3 Spearman correlation matrix: participants' overall experience and features of team-based learning

Variables	1	2	3	4	5	6
1. Overall experience	_					
2. Attitude to teamwork	.366**	-				
3. Increased confidence using technology	.114	.174**	-			
4. Improved attitude to education	.163**	.286**	.224**	-		
5. Learn better in school as part of a team	.222**	.336**	.230**	.197**	_	
6. Improved communication skills	.162**	.335**	.193**	.173**	.249**	-

***p* < 0.01.

Table 4	. Themes a	and samp	e auotes t	for team	effectiveness	and	collaborative	learning.
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Theme	Examples from focus groups and questionnaires
T1. Working and learning together	I think the team and I did a good job on the programme.
	• we learned the importance of teamwork and working in harmony on tasks on time.
T2. How their team performed	I think the team and I did a good job on the programme.
	• we learned the importance of teamwork and working in harmony on tasks on time.
	 we all just got into teams and settled down to work with every task that we were given.
T3. Their contribution to the team	I think I shared leadership during the week.
	I can work with others well. I can bring good ideas to the team.
T4. Problems in their team	• working individually is better for me. I tend to do my own thing in a group.
	• Learning in a team setting can be stressful at times but in the end it is very rewarding.

Table 5. Themes and sample quotes for team and task.

Theme	Examples from focus groups and questionnaires
T5. Need to deliver on their projects	 we learned the importance of teamwork and working in harmony on tasks on time.
T6. Promoting a sense of responsibility and control over the	• I helped my team to do all the tasks that were given to us.
learning	 I can work under a deadline and to a standard. and can adapt to other people working with me.
T7. Team determination to meet their goals	• I didn't expect my teammates to work so hard on our task.
T8. A sense of enjoyment in the work	 I can have a laugh while working. I can work hard with new friends and not get distracted.

was effective in promoting a sense of responsibility and control over learning, as evidenced by the high proportion of student responses that refer to individual contribution to collaborative tasks and their role in the team. Additionally, the participants viewed the need to deliver on their projects and the pressure on the team as being key to their experience and learning at Bridge21.

Some responses indicate students' surprise at their team's determination to meet their goal. The focused 'work ethic', referenced by the students, went hand in hand with a sense of enjoyment and fun in the learning activities.

6.4. Team interactions and peer working

Bridge21 is a noisy learning environment when compared with the teacher-directed second-level classroom, and excited conversation, discussion and sometimes argument are part and parcel of the experience. The data support a finding that personal interactions within the team were very significant in the learning and that substantial peer learning took place. The topic of team interactions and peer working is therefore considered. Analysis of an open question in the post-questionnaire, which examined students' perceptions of what they learned about themselves and their learning style (n = 287), revealed that 77% of participants made reference to their team or team issues in relation to their learning experience. Furthermore, there is a highly significant correlation between participants' reported improved attitudes to working as part of a team and perceived improved communication (r = .350, p < .001) – an essential skill in interacting with peers and team-mates in a collaborative learning environment.

Three themes spoke to the topic of team interactions and peer working: T9. Interactions within the team regarding task; T10. Working with others not their friends; T11. Personal growth in learning to work with others. Table 6 summarises the themes and provides examples of student comments coded under this theme. The richness of the interactions regarding their team-mates, as evidenced by the quotes in Table 6, gives testimony to high levels of team interaction and peer working during the workshops.

6.5. Comparisons with formal experience

Data analysis revealed that participants made frequent references to and comparisons of their learning experience in Bridge21 with their learning experiences in formal classrooms. Five themes are considered in relation to comparisons with formal experience: T12. Critical of group work in school; T13. Advocating Bridge21 method for school; T14. Bridge21 as liberating in their learning; T15. Students not optimistic for change; T16. Identification with the Bridge21 model. Table 7 summarises the themes emerging and examples of student comments relevant to comparisons with formal experience. It is noteworthy, as may be seen from the sample quotation for T16, that some students had embraced the Bridge21 model as 'our way of learning'. Participants were, perhaps unsurprisingly, universally critical of the methods employed in school and referred to teachers being very directive and controlling in their approach. They also spoke of a lack of peer interaction and a lack of properly applied team (or group) work at school. However, analysis of comments reveals that students were not optimistic that they could influence their teachers to adopt the Bridge21 approach in the formal classroom.

Finally, statistical analysis revealed a highly significant correlation between students' self-reported improvement in attitude to teamwork and their agreement with the statement that they would learn better in school as part of a team (r = .383, p < .001).

6.6. Team leadership

The element of team leadership in the model is addressed in four themes: T17. Revealed abilities as leader; T18. Leading to achieve objectives; T19. Experience of leadership was personally affirming; T20. A new-found confidence in leadership. Table 8 summarises the themes emerging and examples of student comments relevant to team leadership.

The idea of having a team leader from among their peers was novel to most of the participants but analysis of their responses indicates that this approach was generally accepted and approved by them. They made insightful comments on how they dealt with leadership issues or challenges that arose and how the team progressed through these challenges. Participants also identified their own skills and talents for leadership and showed evidence of identifying particular leadership styles. This perceived

Theme	Examples from focus groups and questionnaires
T9. Interactions within the team regarding task	 I've learned how to listen to other people's opinions and gained more experi- ence of working in a group.
	Iistening to each other and being given a chance to express their idea.
T10. Working with others who are not their friends	 I learned that I can work well in a team. I learned that I can get on easily with people.
	Working with new people wasn't as scary as I thought it would be.
T11. Personal growth in learning to work with others	I was able to work in a team with people I never met before

Table 6. Themes and sample quotes for team interactions and peer working.

Theme	Examples from focus groups and questionnaires
T12. Critical of group work employed in school	 in school now, our class is divided up into, is it 4 or 5 groups? we don't work as well as we do here There's basically no element of teamwork in it. Never.
T13. Advocating Bridge21 method for school	 if they'd [teachers] just realise that we'd learn more from being in teams, than being taught individually.
T14. Bridge21 as liberating in their learning	 I suppose it was a different type of learning. It wasn't your typical dayyou weren't so uniformed I suppose you can express yourself more. I shounds the for that we work in teams was creat here use the formalised way of education was left at the door.
T15. Students not optimistic for change	 we're probability for the method with the processing of learning like, as a team, 'cost in the teacher might say. we're probability comiants and the superstants and the processing like as a team, 'cost in the cost' mou'll do this by the book, 'cost in the processing the procesing the processing the procesing the processing the processing
T16. Identification with the Bridge21 model	your (Examination) is coming up soon and you nave to get it done; we need the course ministred of you're goma am. • our way of learming

Table 7. Themes and sample quotes for comparison with formal experience.

Table 8. Themes and sample	quotes for team	leadership
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Theme	Examples from focus groups and questionnaires
T17. Revealed abilities as leader	I learned that I am capable of managing and controlling a team.
T18. Leading to achieve objectives	 I learned that even a very daunting task is achievable if you put your mind to it and have a good team backing you up.
T19. Experience of leadership was personally affirming	 I can lead a team well. I was elected team leader and the rest of my team told me that I led them well.
T20. A new-found confidence in leadership	 I'm a good leader, I should have the confidence to put myself as official leader.

success in a leadership role established a new confidence that could be carried forward beyond the Bridge21 workshop.

6.7. Findings summary

To summarise our findings, the topics of team effectiveness, collaborative learning, team and task, team interactions and peer working, comparisons with formal experience and team leadership presented above collectively validate a learning model that is effective in scaffolding teamwork and team-based learning and moreover a learning model that facilitates twenty-first-century learning. Addressing Research Question 1, the findings indicate that Bridge21 was implemented in such a way that the students experienced many features of the twenty-first-century learning experience such as critical thinking and problem solving, communication skills, and the chance to learn from and work with others with the objective of fostering highly motivated and engaged students (Claxton, 2007; Collins & Dolan, 2011), as specified in the introduction. For Research Question 2, the students report the development of the relevant skills.

7. Conclusion

Bridge21 was explicitly designed to be reliant on a team-based approach to scaffold the learning experience. The design draws heavily on the learning method of the World Scout Movement (Vallory, 2012). The model has evolved following the pattern of design-based research (Anderson & Shattuck, 2012), and its many features were set out in Table 1 and Figure 1 above. The research reported here sought to explore whether, in the assembly of the elements as informed by literature, Bridge21 is an effective, implementable model for twenty-first-century team-based learning.

The findings here suggest that the model is robust and can be consistently implemented, based on well-understood and previously used principles as described in the literature. Moreover, results from both qualitative and quantitative data suggest that the team experience had a significant impact on the participants. While the data show that this level and intensity of team working were new to them, the findings point to the conclusion that the students found the experience to be energising, liberating in their learning, challenging and enjoyable. Overall, it is evident from their declarations that students were not passive within their teams and generally they had formed strong views on the effectiveness of working as part of a team and the factors impacting that effectiveness. Students accepted the arrangement of teams and the worry or perceived challenge of working with people with whom they were not previously acquainted was in general successfully addressed through the model and scaffolded collaborative learning activities. Students saw the experience of working in a team with people whom they did not know as personally developmental. The majority of students believe that their team was well applied to the task and that the relational approach central to the Bridge21 model fostered a strong

sense of belonging to the team by eliciting in the individual students a sense of responsibility to deliver to the task and increasing the degree of participation by all team members.

Additionally, there is significant residual evidence (from the focus groups) that the participants believe that they have grown and learned through the experience, that they will carry the learning to future work and that they have formed a positive view on the merits of working in teams.

The students took part in workshops during school time but in an out-of-school location, in a stimulating environment that was very different to that of their school classrooms. Placing them in teams not of their choosing with other students whom they did not know was a challenge to them and took them out of their comfort zone. They were asked to choose and work with a team leader from among their peers, which was generally a new experience. Being out of school was in itself a disruptive factor and would have affected motivation and attitude (Lawlor et al., 2016) and the strong team structure was bound to impact notably on their experience.

The integration of ICT in the learning was applied on a resource-sharing basis so as to support and maintain the integrity of the team model. The results suggest that this is an effective and practical strategy in promoting task-focused student interactions in order to promote a positive and active participation in the team (Blatchford, Baines, Rubie-Davies, Bassett, & Chowne, 2006; Mitra et al., 2010). We suggest that this approach to technology integration facilitates the development of core twen-ty-first-century skills of collaboration and communication among learners (Conole et al., 2004).

The results show that the model and its focused teamwork approach is a candidate vehicle for transference of ownership of the learning to the learners with evidence to suggest that, with this scaffolded approach, the teams and team members take responsibility for tasks and achievement for the team through combined personal contributions. The participants' comments are indicative of their strong convictions that the application of the Bridge21 model in school would provide improved opportunities to achieve twenty-first-century learning outcomes. The data also show that Bridge21 is a pragmatic model for effective twenty-first-century team-based learning with the potential to be of significant value in other learning contexts that seek to meet the challenge of promoting what is generally described as twenty-first-century learning.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

John Lawlor is Chief Executive Officer of Scouting Ireland. He is a visiting research fellow in the Trinity Centre for Research in IT and Education. He was founding director of the Bridge21 project. His research interests include team-based learning, the use of technology in learning, and the alignment of formal and non-formal learning.

Claire Conneely is Education Officer with Google Ireland. She is a visiting research associate in the Trinity Centre for Research in IT and Education. She directed the successful introduction and implementation of the Bridge21 model with schools and teachers in Ireland. Her research interests include the more effective use of technology in teaching and learning in formal and non-formal contexts.

Elizabeth Oldham lectured for many years in the School of Education at Trinity College Dublin and is now working in the School of Mathematics. She is a research associate in the Trinity Centre for Research in IT and Education. Her research interests include the use of technology in teaching and learning.

Kevin Marshall is the Head of Education, Microsoft Ireland. He is a visiting research fellow at the Trinity Centre of Research in Information Technology. Prior to working in Ireland, he worked in Boston Public Schools in the Office of Research, Assessment and Evaluation, where he ran a number research projects focusing on developing new performance assessment and statistical models to enhance student performance.

Brendan Tangney is a Professor in Computer Science in Trinity College Dublin. He co-directs the Trinity Centre for Research in IT and Education and is the academic director of the Bridge21 project. He has published extensively in the area of technology-enhanced learning with a particular focus on mobile technology, tools for maths education, and twenty-first-century teaching and learning.

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