Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition

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Declaration

I declare that the work described in this document is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

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Abstract

Collaborative learning is viewed as being an integral aspect of education. Shifts in perception with regards to collaborative learning in the area of music composition have led to creative collaboration becoming more prominent within music education. In spite of this, a major problem with regards to collaborative learning, especially in music composition where a single artefact is produced, is that it can be difficult to assess the level of contribution that each group member has made within a specific project. This study sought to investigate the use of collaborative technologies in music composition.

In order to achieve this, a learning experience was developed that enabled groups of students to collaborate with one another, with the end goal being create a musical composition. A music composition lecturer was assigned to each student group, who provided formative feedback to the groups at key stages throughout the learning experience. While the instruction of the learning experience provided to the student participants was to create a musical composition, and the instruction of the learning experience provided to the lecturer participants was to provide formative feedback and guidance to the student participants regarding the composition, the main interest of this research was not of the composition itself, but of the process that led to the final composition.

A mixed methods exploratory case study was adopted for this research project. Data collected included lecturer interviews, student focus groups, observations within the collaborative platform, and the final artefact, namely the composition that was created. All data gathered throughout the learning experience was compiled into a case study database, and hosted within the qualitative analysis programme Nvivo 11. A grounded theory approach was adopted when analysing the data.

The study was populated by current music composition students and lecturers within the Sound Training College, Dublin, and took place in a blended format over a two week period. The study itself produced a number of significant findings, most notable of which implied that the collaborative experience provided music composition lecturers with insights that enabled them to assess individual learner performance within a collaborative composition. It was also found to have had an overall positive impact regarding the delivery of formative feedback to learners, as well as enhancing musical collaboration capabilities for learners.

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Chapter 1 : Introduction

1.1 Background and Context

At university and conservatoire level, Music Composition has usually been taught using the 'eminence' model (Barrett & Gromko, 2007; Barrett 2006), where there is a one-to-one relationship between the teacher (expert composer) and student (novice composer), with the goal being to develop a novice into an expert. However, over the last 20 years, as composition has become a more prominent component of a general school music education, higher education has responded by introducing general composition classes, which emphasise learning composition as a way of understanding music, rather than to necessarily train professional composers (Lupton & Bruce, 2010).

Much research in the field of eminence studies challenges the popular stereotype of the creative artist as 'lone seeker', and highlights the social nature of thinking and learning (Barrett, 2006). Becker (1990) asserts that the artist works in the centre of a network of cooperating people whose work is essential to the final outcome. With regards to composition, it has been recognised that group collaboration can be "an effective means of developing individual creativity and providing pupils with highly valued musical experience and not just as the unavoidable solution to the logistical problems of the classroom" (Faulkner, 2003). The challenge for education is joining the individual and the social dimensions to promote the connection of individual learning for creativity and social creativity and learning (Sawyer, 2006).

The two main challenges associated with assessment within a collaborative learning environment are individual marking within group assessment, and communication and feedback (Harrison, Lebler, Carey, Hitchcock, & O'Bryan, 2013). Collaborative work is traditionally assessed by means of a collaborative product. There are two assessable elements to this, the overall quality of the collaborative product and the contribution of the individual to the collaborative endeavour (MacDonald, 2003). In a study by Kear and Heap (1999), many students indicated that they would have preferred more marks for the individual contribution to collaborative work, and correspondingly fewer for the co-operative endeavour. Therefore, understanding group dynamics, and the collaborative processes of decision making and learning in groups, is important for both learners and instructors in collaborative learning programs (Collazos et al, 2002).

Computing technologies can be used to increase access to authentic musical experiences (Dillon & Brown, 2007), with technology contributing to music training mainly through software packages that facilitate Music Notation and Composition (Koutsoupidou, 2014). Computer-supported collaborative learning is particularly suited to the induction of students into dialogue as an end in itself and, through this, to promote the skills of creativity and of learning to learn (Wegerif, 2006).

MacDonald (2003) posits that the use of computer conferencing for online collaborative work means that the assessment has a conspicuous advantage over the assessment of face-to-face collaboration, as the medium provides a written record of the interactions between students as they use text messages to communicate. This makes the process of collaboration more transparent, as a transcript of these conference messages can be used to judge both the group collaborative process, and the contribution of the individual to that process, thereby overcoming one of the traditional difficulties in implementing collaborative work fairly. This research aims to explore the effectiveness of implementing collaborative technologies within the area of music composition.

1.2 The Research Questions

In order to assess the effectiveness of implementing collaborative technologies within in music composition, the following research questions were generated :

- How does the use of collaborative technology affect the delivery of feedback to learners?
- How does the use of collaborative technology affect insights into assessment for the lecturer?
- How does the use of collaborative technology impact musical collaboration capabilities for learners?

1.3 Roadmap

Literature Review - The study begins with a review of the available literature with regards to music composition pedagogy, collaborative learning, creative collaboration, and technologies within music composition. A review of the different forms of assessment within collaborative learning is then performed, with the main challenges associated with assessment in collaborative learning being presented.

Design - Taking the findings from the literature review into account, the design chapter then describes how elements from appropriate pedagogies, instructional design models, and other relevant design theories informed the design of the learning experience.

Research Methodology - The methodological approach of this study is discussed within the research methodology chapter. The implementation of the study, such as timing and selection of participants, is also outlined within this chapter. Data collection and analysis methods are also described, with the rationale behind each method provided, in addition to the data analysis strategy.

Findings - This chapter presents the findings from the data analysis. It examines the perceptions of the learning experience of both the lecturer participants and student participants, highlighting and examining important emergent themes and discussing each in depth.

Conclusion - The concluding chapter summarises the findings of the study, recognising its limitations, and makes recommendations for further research.

Chapter 2 : Literature Review

2.1 Introduction

This chapter will review the literature relevant to the design and implementation of this research. The literature review will begin by outlining recent developments in music composition pedagogy. Following this, the topics of collaborative learning and creative collaboration will be explored, with particular emphasis being placed on the importance of social interaction within collaborative endeavours. The emergence of the role of technology in music composition will also be reviewed. Finally, the different forms of assessment within collaborative learning will be examined, including the challenges associated with assessment.

2.1.1 Methodologies of the Literature Review

For the purpose of this literature review, journals were accessed through a number of online databases available to the researcher. Stella Search was used in order to access the Trinity College Dublin online library database, as well as other online databases such as ResearchGate, Science Direct and Google Scholar. A number of publications were also accessed through the Trinity College library.

2.2 Music Composition Pedagogy

Williams, Wells, Proctor, & Harris (2010) noted that by the turn of the twenty-first century, a divide between the pedagogy of creativity and technique had emerged. Each of the areas of technical expertise, such as counterpoint, harmony, orchestration, and technology, became a unique course under the purview of Music Theory. Creativity, the remaining area for potential expertise, essentially became the now-specialized domain of Composition (Williams et al., 2010). Furthermore, focusing on Composition, Lupton & Bruce (2010) identified four themes within a modern Music Composition pedagogical model. These themes are: 1) Learning from the Masters; 2) Mastery of Techniques; 3) Exploring Ideas; and 4) Developing Voice. The first two themes deal with content to be learned, while the third and fourth themes deal with the creative process.

In the third theme, Exploring Ideas, students are encouraged to work continually to refine their compositions (Brindle, 1997; Miller, 2005). The emphasis is on students 'revising and extending' their work (Webster, 2003; Wiggins, 2005), and engaging in action learning where self-reflection is an important part of the process (Burnard & Younker, 2002; Emmerson, 1989; Wiggins, 2003).

Further within this theme, teaching strategies allow freedom and space for compositional ideas to develop and opportunities are provided for students to receive formative feedback (Bolden, 2009;

Miller, 2005; J. Wiggins, 2003; J. H. Wiggins, 2007; Wilkins, 2006). The teacher's role is as consultant, guide and advisor (Barrett, 2006; Berkley, 2004; Burnard, 1995; Ruthmann, 2007). Learning activities include presenting work-in-progress, collaborative composition, peer feedback and reflective practice (Bolden, 2009; Burnard, 1995; Burnard & Younker, 2008; Byrne, MacDonald, & Carlton, 2003; Faulkner, 2003; Fautley, 2005; Kaschub, 1997; Kennedy, 2004; Wiggins, 2005; Wiggins, 2007; Wilkins, 2006). Assessment strategies also could include reflective journals and peer assessment (Kennedy, 2004), and would allow freedom for the student to choose their own path (P. Burnard, 1995; Pamela Burnard & Younker, 2002). As such, this theme could be regarded as a student-centred approach to Music Composition education.

As teachers of music tend to teach in the way they have been taught (Karlsson, Juslin, & Olsson, 2008) there is a danger that stagnation of learning, teaching and assessment practices can be generationally perpetuated. Lebler (2007) suggests that a way forward is to consider that teaching practices that have dominated in the past will need to be rethought, and alternatives considered that are likely to produce graduates with the abilities and attributes necessary to adapt readily to a rapidly changing environment.

When it comes to assessment within Music Composition, creativity is an aspect which should be encouraged (Williams et al., 2010). Further expanding on the Exploring Ideas theme, Lupton and Bruce (2010) noted that assessment items that would target Creativity within Music Composition would include:

- submission of work-in-progress for formative feedback;
- reflective portfolio where students document their personal learning journey through developing their compositions, including the meaning they make from the process; and the way they have expressed themselves through their compositions;

When designing composition activities, Wiggins (2007) concludes that teachers should: allow students freedom to develop musical ideas; value students' existing knowledge; consider the richness collaborative experiences afford; and create an environment that 'fosters ownership and agency'.

2.3 Collaborative Learning

Collaborative learning is characterized by members of a group working together to complete all aspects of a project, and all members of the group are jointly accountable for the finished product (Ingram & Hathorn, 2009). Collaborative learning combines Constructivism with social learning, sometimes referred to as Social Constructivism (Vygotsky, 1978). Social Constructivists posit that learning emerges as an individual interacts with other individuals (Alavi & Dufner, 2005). This gives

focus to their discussion, enables them to learn from and build on the outputs of their peers, and to share their reflections and interpretations of what happened within their practice (Laurillard, 2009).

When discussing Collaborative Learning, it is important to distinguish it from Cooperative Learning. Cooperation is defined as a "style of working, sometimes called 'divide-and-conquer,' in which students split an assignment into roughly equal pieces to be completed by the individuals, and then stitched together to finish the assignment" (Ingram & Hathorn, 2004). Similarly, Dillenbourg and Schneider (1995) described cooperative learning as "a protocol in which the task is in advance split into subtasks that the partners solve independently". The overall learning outcome of such tasks often results in learners having a deep contextual understanding of their own contribution, and a more surface level understanding of all components in the project (Lock & Johnson, 2015).

Collaboration, as defined by Dillenbourg (1999), is when two or more people learn together. Furthermore, Tseng, Wang, Ku, & Sun (2009) describe collaboration as involving the "interdependence of individuals as they share ideas and research a conclusion or produce a product". In a collaborative learning environment, people are actively engaged in knowledge construction that is co-created, not owned by one particular learner after obtaining it from the course materials or instructor (Brindley, Blaschke, & Walti, 2009).

Collaboration involves a different relationship between its members than what occurs with group and cooperative work and maintains a common goal or purpose. The learning tasks are designed in such a manner that all members need to contribute to the key components of the group's work (Graham & Misanchuk, 2004). In collaboration, individuals cannot compete against one another, because they are accountable for the product as a group (Ingram & Hathorn, 2004).

The strengths of collaborative learning include the ability to compare ideas, collaborate, learn from peers, share knowledge, and skills to support other participants, analyze and integrate different points of view, plan in a group, manage the workload, and use an effective platform (Biasutti, 2011). Moreover, crucial factors for building trust for teamwork include individual accountability, familiarity with team members, commitment toward quality work, and team cohesion (H. W. Tseng & Yeh, 2013). Conversely, factors that impede collaboration include insufficient ability in workload management, different levels of engagement, insufficient coordination and organization, and technical issues (Biasutti, 2011).

Regarding social interaction, Wu, Hwang, and Kuo (2014) demonstrated that highly interactive students have higher learning achievements than less interactive students, indicating the importance of the social dimension of the learning process, and the importance of interaction among group members for knowledge construction. Furthermore, the discourse among the learners in a group is important during collaborative learning, which relates to the cognitive dimension of learning, and the participants' knowledge construction during collaborative activities (Wu et al., 2014).

The product of collaboration is a direct result of the interwoven contributions of the members. This knowledge collaboration results in deeper and richer learning experience than could occur by individuals working independently (Lock & Johnson, 2015). Whatever the subject matter being studied, collaborative learning develops in learners higher-level thinking skills, including the ability to reflect and think critically. If learning is defined as 'meaning-making' rather than 'acquiring information', reflection and critical thinking are important tools, especially in this era where information is easily accessed but less easily made sense of (Hargreaves, 2007).

2.4 Creative Collaboration for Composition

As previously highlighted, Composition is a subject which has long been taught using the 'eminence' model (Barrett & Gromko, 2007; Barrett 2006). Although composition can be effectively taught in both private and collective contexts, it may be worth considering the value of student-student interaction in education (Williams et al., 2010).

Moran & John-Steiner (1999) argue that creativity is not an individual phenomenon, but one that relies on the interaction and judgment of other people for its development. Furthermore, Fischer (2013) posits that "although creative individuals are often thought of as working in isolation, much human creativity arises from activities that take place in a social context in which interaction with other people and the artefacts that embody collective knowledge are important contributors to the process". John-Steiner (2000) further suggests that "sustained mutually beneficial collaboration provides a mirror to an individual, broadening his or her self-knowledge, which is crucial to creativity".

Glăveanu (2011) noted the distinction between a socio-cognitive and a socio-cultural approach of collective creativity. In a socio-cognitive context, the social dimension is external and creativity is embedded in the mind. However, in a socio-cultural context the social dimension is intrinsic to creativity, and creativity is embedded in interaction. The focus of the socio-cultural approach is collaborative creativity, creative learning, inter-subjectivity, and co-construction of knowledge, rather than group and team creativity and innovation. Glăveanu (2011) further argued that within the socio-cultural approach, creativity is considered social in nature and located in the space between self and others. The focus is a more interaction-oriented account of the collective work rather than merely outcomes and products (Rojas-Drummond, Albarran, & Littleton, 2008), and a multiplicity of processes and interactions are analyzed to interpret collaborative creativity.

Following a study by Faulkner (2003), it emerged that both teacher and learners found Collaborative Composition to be an effective and enjoyable method of learning Music Composition. It recognised that group collaboration can be "an effective means of developing individual creativity and providing pupils with highly valued musical experience and not just as the unavoidable solution to the logistical problems of the classroom".

The challenge for education is joining the individual and the social dimensions to promote the connection of individual learning for creativity and social creativity and learning (Sawyer, 2006). Teachers of composition must overcome not only the typical conception of human learning as a solo endeavour, but also the modernistic view of the artist as an individual in order to consider what may be gained by student-student interaction (Williams et al., 2010).

Through review of the literature, opinions within the area of Collaboration in Music Composition is the most polarising. Therefore, not all literature pertaining to collaborative composition was in favour of the concept. Odam (2000) claims that group composition arose purely due to practical and logistical priorities of the classroom. Glover (2000) also shares this view, and claims that the model of a class working in groups can lead to poor quality work, little sense of direction, and token outcomes. Furthermore, Odam (2000) maintains that composing is largely an individual activity. This view is ultimately inspired by the 'joy through suffering' image of Beethoven (Cook, 1998), where the composer has often been romantically viewed as a solitary, lonely figure at odds with his social setting. However, Gablik (2004) states that one of the challenges of teaching composition in a post-Romantic era is overcoming the conception of the composer as a 'genius' who functions as a solitary producer of art.

An additional hindrance to collaborative composition is that music teachers themselves are likely to have learnt composition through individual study of counterpoint and harmony (Faulkner, 2003), and may be hesitant to introduce such an alien concept as group composition. It is also worth noting that an emphasis on group composition could mitigate the development of individual voice (Stauffer, 2003). This argument poses merit as the emphasis in group composition lies within the making (Barrett, 2003) and empowerment (Hogg, 1994), rather than the development of a unique and individual voice.

While the arguments against collaborative composition pose merit and have been considered, the literature in favour of collaborative composition is too great to overlook in this instance. Furthermore, there have been significant technological developments since the publication of the theories against collaborative composition, allowing for much greater collaborative capabilities.

2.5 Technologies in Music Composition

In recent years, we have moved into an important evolutionary phase in the business of music and music production: the digital age (Huber & Runstein, 2010). Computing technologies can be used to increase access to authentic musical experiences (Dillon & Brown, 2007), with technology contributing to music training mainly through software packages that facilitate Music Notation and Composition (Koutsoupidou, 2014). Technological advancements have also supported the development of e-learning products by providing technological solutions for activities that were previously impossible,

such as interacting online in real-time to perform, and compose music (Biasutti, 2015a). As a result of these technological advantages, Music Technology has become a largely software-based, digital field.

There are several reasons why an educator should use the computer for music instruction (O'Hara & Brown, 2006). In addition to utilising music software, the advantages of online learning can also be harnessed. Such advantages include organizational and educational aspects such as flexibility in time management, flexibility in location (accessing the Internet in comfortable and quiet places in any country), reduced costs and travel time, personalized definition of the course contents, strengthened interactions among students, and the ability to encourage students to develop responsibility for their learning (Biasutti, 2011).

In Music Composition education, a common approach is to base learning on instruction and consider the computer as merely support for practice. This approach allows students to practice constantly and to improve their performing abilities. However, this approach does not stimulate the divergent thinking skills of participants (Biasutti, 2015b). With consideration to this, it is important to modify the instructional approach by introducing more interactive didactic methods based on socio-cultural theory (Biasutti & EL-Deghaidy, 2014). These methods value the learners' experience and stimulate students' understandings of their own constructs; participants play an active role and are engaged in questioning through cooperative learning activities (Donnelly & Boniface, 2013). The social dimension is an important factor for the effectiveness of asynchronous learning environments, and courses must be designed to support community building (Wegerif, 1998).

Wegerif (2006) also noted that "computer-supported collaborative learning is particularly suited to the induction of students into dialogue as an end in itself and, through this, to promote the skills of creativity and of learning to learn". This learner-centred method facilitates the expression of divergent thinking skills, and students are prompted to find their own solutions to the posed tasks. Music activities such as Composition and Improvisation are considered to be directly connected to the expression of creativity because they involve the generation of new music ideas (Biasutti & Frezza, 2009; Lewis & Lovatt, 2013; Locke & Locke, 2012). Music also provides the opportunity to work collaboratively to generate a shared creative product, engaging participants in cooperative tasks (Biasutti, 2015b).

2.6 Assessment in Collaborative Learning

Assessment refers to the tools, techniques, and procedures for collecting and interpreting information about what learners can and cannot do (Nunan, 1998). Assessment is more concerned with practical learning instances, whether learners are able to absorb and consume what they are directed and supposed to. It is a process to determine where you are "on the line" and compare your position to where you should or should not be (Kurt, 2014).

When discussing assessment, there are two main factors to consider; formative and summative. Scriven (1967) defines formative assessment activities as being used to provide feedback and evaluate learning progress in order to motivate students to higher levels, while summative assessment activities are used to judge final products for completion, competency and/or demonstrated improvement. Sadler (1998) further defines formative assessment as assessment that is specifically intended to generate feedback on performance to improve and accelerate learning. Formative evaluation is typically conducted for the purpose of improvement, where summative evaluation is implemented for the purpose of determining the merit, worth, or value of the evaluand in a way that leads to making a final evaluative judgment (Russ-Eft & Preskill, 2009). Strategically used together, both formative and summative assessment can advance and strengthen learner outcomes (Lock & Johnson, 2015).

Creating a climate that maximizes student accomplishment in any discipline focuses on student learning instead of on assigning grades (Fluckiger et al., 2010). This requires students to be involved as partners in the assessment of learning and to use assessment results to change their own learning tactics (Popham, 2008; Stiggins, 2008). Formative assessment best accomplishes this, as it seeks to inform instruction and help students use the results to enhance their own learning (Fluckiger et al., 2010).

Formative assessment is important as feedback given only at the end of a learning cycle is not effective in furthering student learning (Bollag, 2006). Formative assessment can be used to facilitate learning by providing students with the opportunities to judge their own work and learning progress based on feedback to various kinds of teacher-made tests and performance tasks, such as student portfolios (Song & Koh, 2010). Furthermore, Popham (2008) explains that consistent use of formative assessment "transforms a traditional, comparison-dominated classroom, where the main purpose of assessment is to assign grades, into an atypical, learning-dominated classroom, where the main purpose of assessment is to improve the quality of teaching and learning.

2.6.1 Formative Feedback

Feedback is a key aspect of formative assessment. Formative feedback furthers student learning as the student engages in a continuous loop of self-assessment based on particular criteria (Bollag, 2006; Leahy, Lyon, Thompson, & Wiliam, 2005). Shute (2008) notes that formative feedback represents information communicated to the learner that is intended to modify the learner's thinking or behaviour for the purpose of improving learning.

In order for formative feedback to be effective, it must be specific, simple, descriptive, and focused on the task. This allows learners to set clear expectations of themselves and to make decisions that influence their own successes (Butler, 1987; Shute, 2008; Stiggins, 2008). For maximum benefit, feedback must focus on more than one aspect of learning; thus formative feedback is given on the

product (assignment or performance), on the process (how it's done), and on the progress (improvement over time) of the learning (Guskey, 2001; Shute, 2008; Stiggins, 2008). Effective formative feedback comes from the instructor as well as from self and/or peer assessment and is based on clear criteria (Black, et al., 2004; Fontana & Fernandes, 1994; Sadler, 1989; Smith, 2007; Tunstall & Gipps, 1996; Vispoel & Austin, 1995).

Due to advances in technology, innovative modes of assessment have been developed, such as "alternative assessment". Alternative assessment is formative, process oriented, open-ended seeking creative answers, continuous and long-term, untimed with free-response format. Alternative assessment favours and values contextualized communicative tasks, individualized feedback and washback, criterion referenced scores, interactive performance and fosters intrinsic motivation (Brown, 2010). Additionally, using alternative assessment assists the creation of autonomous learners (Bayat, 2011) and stimulates reflective learning (Little, 2009). Through alternative assessment "students begin to identify strengths and weaknesses in their work" (O'Malley & Valdez-Pierce, 1996).

According to Jacobsen, Lock, and Friesen (2013), when students are given opportunity to co-create knowledge, the instructor's role changes. The role is no longer that of a transmitter or deliverer of information. Rather, the instructor becomes a "designer who is intentional about the work he or she asks students to do." Jacobsen et al. (2013) further argue that, with this change of role, the instructor needs to also be "mobile and responsive to individual and group learning needs, and to providing ongoing feedback to help all learners continually improve their work."

2.6.2 Summative Assessment

While it is established that formative assessment plays a major role in collaborative assessment, summative assessment is also a key factor. Each form of assessment has its specific purpose and place within the assessment design (Lock & Johnson, 2015). Traditionally in collaborative assessment, the instructor evaluates the group's final product, like an oral report or written document (Gueldenzoph & May, 2002). However, in order to help ensure both group interdependence and individual accountability, and so to support collaboration, both group and individual assessments are essential (Swan, Shen, & Hiltz, 2006). Without the input from the individual group members, the instructor can evaluate only the product, not the process that was used to create that product (Gueldenzoph & May, 2002). Therefore, it is important to assess both the processes and the products of collaboration (MacDonald, 2003).

Freeman and McKenzie (2002) assert that it is inadequate to evaluate a collaborative, project-based assignment by merely rating the quality of the final product of the group; rather, "If our courses have the objective of developing students' capacity to work as part of a team, then we need some means of assessing teamwork in a fair and meaningful way". One option of incorporating this is to make the group assessment the sum of individual participants' assessments on some measure of content

learning (Boud, Cohen, & Sampson, 1999). This sort of assessment makes group participants responsible for the learning of all members of their group, as suggested by Johnson, Johnson and Stanne (1989).

In a study by Kear and Heap (1999), many students indicated that they would have preferred more marks for the individual contribution to collaborative work, and correspondingly fewer for the co-operative endeavour. These sentiments are further reflected in observations on collaborative assessment in an online context (Ge, Yamashiro, & Lee, 2000), and in campus based environments (McDowell, 1995). Crews and North (2000) indicate that a combination of product evaluation by the instructor, peer evaluation by the group members, and self-evaluation by each student is necessary to obtain a comprehensive summative evaluation.

2.6.3 Assessment within Collaborative Music Composition

As previously indicated, collaborative learning can involve both summative and formative assessment to assess competence, where each form of assessment has its specific purpose and place within the assessment design (Lock & Johnson, 2015). However, a balance between formative and summative assessment is central to the formation and development of the music ensemble in higher education contexts (Harrison et al., 2013).

Pontious (2001) contends that teaching and assessment focus should be shifted to mastery of the standards so students can focus less on the completion of grades (summative) and more on intrinsic motivation and achievement of music (formative). This relates strongly to Eisner's (1991) notion that assessment tasks resemble the challenges of ordinary living, requiring an 'entirely different framework of reference' for their construction. Further to this point, Denson and Nulty (2008) claim that all the activities music students undertake need to be authentic to the profession of being a musician: 'The tasks students undertake do not simply mimic what a musician does, they are what a musician does'. The ability to collaborate with other musicians is an integral role of the musician.

Lebler (2010) has found that involving students as assessors in a peer assessment process has benefits including enhancement of students' abilities to conduct systematic assessment of music and also their ability to provide feedback in positive ways even when they might be drawing attention to flaws. The assessing of peers can enhance not only content-related learning and the ability of students to conduct assessments of other people, but can also produce improved self-reflection skills resulting in increased confidence and better awareness of the quality of the students' own work (Lebler, 2010).

2.6.4 Challenges of Assessment in Collaborative Learning

Collaborative work is traditionally assessed by means of a collaborative product. There are two assessable elements to this, the overall quality of the collaborative product and the contribution of the individual to the collaborative endeavour (MacDonald, 2003). However, the two of the main challenges associated with assessment within a collaborative learning environment are individual marking within group assessment, and communication and feedback (Harrison et al., 2013).

One of the greatest fears of both instructors and motivated students alike is the "social loafer", the student who looks forward to group work because it is a free ride (Levi & Cadiz, 1998). If the loafer becomes a considerable obstacle to the group, the other team members may share their concerns with the instructor. But often, students either do not wish to criticize each other on evaluation forms, or they give each other positive evaluations to ensure their own good grades (Lejk, Wyvill, & Farrow, 1996). This situation requires the instructor, as the "guide-on-the-side", to be aware of group dynamics and prompt lazy students to become active participants in the group experience (Gueldenzoph & May, 2002). Therefore, understanding group dynamics, and the collaborative processes of decision making and learning in groups, is important for both learners and instructors in collaborative learning programs (Collazos et al, 2002).

One way to collect both processes and products is through portfolio assessment. In the case of the assessment of collaborative group work, students might be asked to provide evidence of their contributions to group projects or reflections on the group process, as well as evidence of learning (Song & Koh, 2010). Portfolio assessments provide each student with the opportunity to demonstrate their understanding of course material as well as their participation in collaborative processes, and, when used longitudinally, how their understandings change over time in response to others contributions (Swan et al., 2006).

MacDonald (2003) posits that the use of computer conferencing for online collaborative work means that the assessment has a conspicuous advantage over the assessment of face-to-face collaboration, because the medium provides a written record of the interactions between students as they use text messages to communicate. This makes the process of collaboration more transparent, as a transcript of these conference messages can be used to judge both the group collaborative process, and the contribution of the individual to that process, thereby overcoming one of the traditional difficulties in implementing collaborative work fairly. This written record is essentially a description of the procedural aspects of collaboration, however, on a more sophisticated level the transcript can be used to judge the extent to which students were able to engage with each other in negotiating meaning in relation to the course material (MacDonald, 2003).

MacDonald (2003) continues by noting that potentially the most significant aspect of the assessment of online collaborative work is the transcript between collaborators, which opens up new avenues not feasible in a face to face situation:

> The transcript can be relevant and useful to assessment in a variety of ways. For example, it can be used by students as source material for written work. This reflects a move towards the greater use of non-conventional sources on these networked courses, and a greater dependence on constructivist approaches and peer-peer interactions, for negotiating an understanding of course issues. The transcript can also be used as evidence of participation, which means that it is no longer essential to assess a collaborative product, indeed it can be side-stepped in favour of rewarding the process of arriving at, and reflection on the success of collaboration, as well as the extent of the individual's contribution. In this way the process and product of collaborative assessment can effectively be uncoupled.

Assessing collaborative learning is difficult because it requires radically rethinking traditional evaluation techniques, however, such rethinking is also critical because collaboration among students has been repeatedly shown to enhance the effectiveness of learning (Swan et al., 2006).

2.7 Conclusion

A review of the relevant literature has indicated that there is a shift in perception towards the merits of incorporating collaborative learning experiences within music composition pedagogy. The potential for social learning within collaborative music composition experiences is being recognised and creativity is being encouraged. Advances in music technology have provided composition software that is capable of creating full musical compositions. Additionally, when using a computer for composition, the advantages of online learning can also be harnessed.

However, challenges remain when it comes to assessment within the area of collaborative learning. The literature indicated that the key aspects of assessment in both collaborative learning, and in music composition, are a combination of formative and summative assessment. The potential merits of using computer conferencing for online collaborative work have been highlighted. These merits stem from the detailed record of individual learner interaction and engagement being readily available and transparent. In addition, these technologies provide the teacher with asynchronous opportunities to provide formative feedback to learners.

The purpose of this study is to investigate the use of online collaborative technologies in music composition.

Chapter 3 : Design

3.1 Introduction

The literature review has indicated that collaborative learning can be an extremely beneficial method of learning, especially within creative tasks such as Music Composition. However, it is apparent that there is scope to improve methods of assessment with regards to collaborative composition, such as the provision of formative feedback throughout the compositional process, and the creation of a detailed timeline of collaborator contributions, both musical and social, which ultimately leads to more detailed information regarding individual performance when providing summative assessment.

This research proposes that there is scope to use technology to develop a learning experience within the area of collaborative composition that enables learners to collaborate seamlessly and efficiently, while also providing lecturers with deeper insights and understanding into the compositional process undertaken by learners. These previously unavailable insights could potentially allow the lecturer to assess the level of interaction between learners within a group, while also assessing the individual contribution provided by each of the learners towards the composition. The technology could also provide a convenient method of allowing the lecturer to provide formative feedback to the learner groups throughout the learning experience, and act as a "guide-on-the-side" (Gueldenzoph & May, 2002).

The aim of this learning experience is to use technology to allow for asynchronous collaborative composition between groups of learners, and ultimately make visible the process that leads to the final artefact, namely the composition. In doing so, the researcher aims to thoroughly investigate the research topic.

3.2 Instructional Design Model

Designing is "the process by which we define the decision to be made, the ends to be achieved, the means which may be chosen" (Schön, 1983). Instructional design, including the instructional design profession, has come under criticism periodically from educators who claim that the process by its nature tends to produce unimaginative training products, resulting in boredom for learners (Clinton & Hokanson, 2012). When "used as directed, it produces bad solutions" (Gordon & Zemke, 2000). Furthermore, others have contended that instructional design models ignore creativity (Caropreso & Couch, 1996; Rowland, 1995), and that creativity needs to be fostered among instructional designers apart from the instructional design models themselves (Caropreso & Couch, 1996).

As creativity is an integral aspect of this learning experience, implementing an instructional design model that fostered creative thinking was imperative. Upon investigating instructional design for creative tasks, the researcher discovered the Design / Creativity Loops (DCL) model (Clinton &

Hokanson, 2012). Central to the model is a representation of the iterative, looping problem-solving cycle that can include established stages of creative thinking.

The DCL model is in essence an elaboration of the widely adopted ADDIE model (Branson et al., 1975), with an added emphasis being placed on creativity. The model is not meant to be prescriptive in terms of application to instructional design practice, but descriptive, oriented to influence the overall paradigm of instructional design (Clinton & Hokanson, 2012). The point of the DCL model is that, to the extent that an instructional designer may be confronted with the next task or design problem in a project (Jonassen, 2000), these tasks or problems may be regarded as opportunities for creative work.

The first step in DCL model is to think of the designer's creative mindset as an "envelope" or contextual wrap that surrounds the entire process. Instructional designers should approach their work with an openness to novel but useful ideas, as is called for in the instructional design competencies outlined by Richey et al. (2001). Scholars in other disciplines have described designing as a looping, iterative process, which is a rapid, ongoing, and repeated sequence of analysis, synthesis, and evaluation (McNeill, Gero, & Warren, 1998) or examining, drawing, and thinking (Akin & Lin, 1995). However, the DCL model visualizes the cycle as a creative cycle, implying the possible emergence of ideas that are not only useful but also novel at some level. Since the creative process is made possible not only by personal creative ability but also by professional skills and expertise that have been built up over time, many of these excursions may occur in an automated fashion, such that the individual stages of the process may not be apparent. The looping process is nonetheless present. The image in figure 1 below illustrates this cycle.

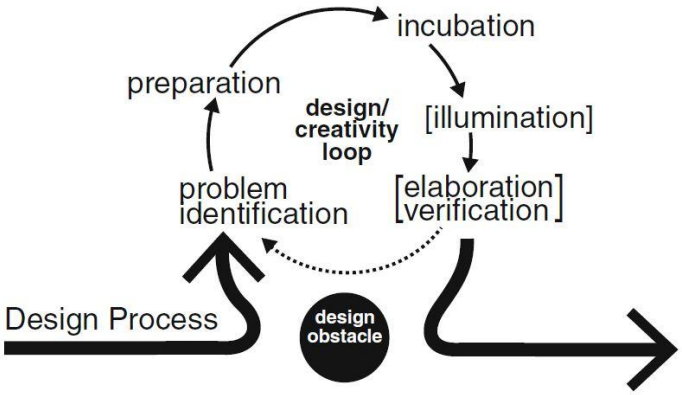

Figure 3.1 - The Design/Creativity Loop (Clinton & Hokanson, 2012, p.121)

Building on the ideas of both the creativity envelope and the design/creativity loop, the DCL model re-conceives the full ADDIE instructional design framework in an overlay model, while acknowledging

the importance of creativity. On the macro level, the creativity envelope ideally surrounds the entire process, where on the micro level, a 'magnifying glass view' into any of the overlapping phases presents a continuous fabric of various design/creativity loops (Clinton & Hokanson, 2012). Figure 2 shows the DCL model consisting of the ADDIE framework with the overlay of the creativity envelope and 'magnifying glass view.'

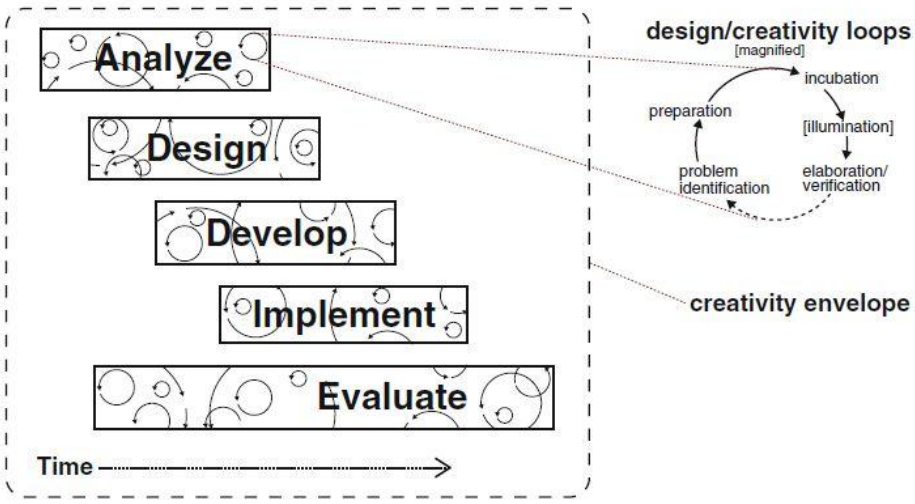

Figure 3.2 - Design/Creativity Loops model with ADDIE (Clinton & Hokanson, 2012, p.121)

Every instructional design model, no matter how complex, is an oversimplification of real-life instructional design work conducted by complex human participants in complex contexts (Clinton & Hokanson, 2012). The simple conceptual model offered here is no exception. However, the point of the model is that, to the extent that an instructional designer may be confronted with the next task or design problem in a project (Jonassen, 2000), these tasks or problems may be regarded as opportunities for creative work.

Studies of creativity have suggested that the manner in which creative tasks are framed influences individuals' view of their creative potential and, thereby, their creative output (Silvia & Phillips, 2004; Szymanski & Harkins, 1992). Even the simple instruction to "be creative" may have a facilitative effect toward creative responses (Chen et al., 2005).

The DCL Model was utilised extensively throughout the design and development of the learning experience. The initial concept for the project was to develop a learning experience that enhanced the collaborative composition process for musicians. During the Analysis phase, as the topic of collaborative composition was researched, it emerged that challenges within the area of assessment was a major issue within the field. This led to Illumination, and ultimately the overall problem was reconceived. Furthermore, as the proposed collaborative technology was further investigated, it also emerged that its features were highly complementary to best practices regarding assessment criteria

utilised by music composition teachers. With this in mind, a creative solution was developed, whereby the Analysis phase was revisited and the focus of the learning experience shifted more so towards music composition lecturers and students, as opposed to just musicians. The learning experience underwent numerous iterations and cycles through the Design / Creativity Loop until the design of the experience was finalised.

3.3 Overview of the Learning Experience

The learning experience was delivered in a blended format over a two week period. The first face-to-face class was delivered at the beginning of the learning experience and served as an introduction to the project. The second face-to-face class occurred two weeks later, at the conclusion of the project, and served as a debriefing session. All collaborative compositional work was undertaken remotely by the learners at a location of their own convenience.

In order to maintain learner engagement throughout the learning experience, Keller's (1987) ARCS Model of motivational design was utilised. The four elements of ARCS, being Attention, Relevance, Confidence and Satisfaction were all implemented in various stages throughout the experience. Within the first face-to-face class, the learners were placed into groups of two to three individuals, and were asked to collaborate in order to create a musical composition. Learner groups were created in accordance to their preferred musical genre, as indicated in the Pre-Lesson Student Participant Questionnaire (Appendix H). This was to ensure that the composition maintained Relevance to each individual learner throughout the learning experience. The composition brief was designed as an open-ended composition, therefore allowing the learner groups the freedom to take the composition in whatever direction they felt necessary. This decision was also taken in order to increase learner motivation, as the composition would maintain Relevance to them throughout the experience.

Each learner group was assigned an individual lecturer, who acted as a "guide-on-the-side" (Gueldenzoph & May, 2002) for the duration of the project. Having the lecturer assigned to the learner groups provided the learners with Confidence, as questions could be answered, and reassurance provided by the lecturer.

Within the first face-to-face class learners were also set up with access to Splice, an online collaborative file sharing platform. This provided both Attention and Relevance, as Splice is an exciting new technology which is directly relevant to the area of study of the learners. Splice allows for the seamless sharing of music files that have been created within the composition software Ableton Live, between a number of collaborators. Each compositional update made by a collaborator is stored incrementally within the system, allowing for each iteration of the compositional process to be reviewed at a later stage. The platform creates a timeline of the compositional process, detailing all contributions made by collaborators, in both a compositional and social context. Each collaborator

can add "Comments" and a "Description" to each version of the composition, indicating to his/her fellow collaborators what updates they have made to the composition at any given time. Finally, all learners had access to the music production software Ableton Live, which they used to create their compositions.

Learners were given a two week deadline in order to create their collaborative composition. At two key stages throughout this two week period, the learners submitted their work to their lecturer, who provided feedback in order guide them through the compositional process, and address any problems that the learners may have had. This provided the learners with both Confidence and Satisfaction as they progressed through their compositions. Learners also received Satisfaction through the creation of the final composition. At the end of the two week period, within the second face-to-face class, the lecturer provided the learners with a summative assessment of how they performed.

Attention	Introduction of Splice within first class. New exciting technology.
Relevance	Splice technology and Collaboration are both highly relevant to compositional studies. Learners groups based on preferred genre (Pre-Lesson Questionnaire). Open-ended Composition Task
Confidence	Provision of formative feedback by lecturer throughout.
Satisfaction	Provision of both formative feedback and summative assessment. Creation of composition / artefact.

Table 3.1 - ARCS Model of Motivation (Keller, 1987) applied to the learning experience

3.4 Design of the Learning Experience

3.4.1 Musical Composition

When designing composition activities teachers should: allow students freedom to develop musical ideas; value students' existing knowledge; consider the richness collaborative experiences afford; and create an environment that 'fosters ownership and agency' (J. H. Wiggins, 2007). This was central to the design of the learning experience.

The overall aim for the student participants within the experience was to create a musical composition. Two key themes emerged from the literature with regards to designing the composition

task; Collaboration and Creativity. With these themes in mind, the composition brief was to create a collaborative, open-ended composition within groups of two to three learners. Students were afforded the freedom to take the composition in whatever direction they desired, so long as it resulted in a coherent piece of music. The open-ended nature of the composition was employed in order to increase student motivation throughout the experience, as the composition would remain relevant to them, rather than dictate the genre of music to be created and risk the students losing interest.

Literature Review Theme	**Design Principle**	**Implementation**	**Desired Outcome**
Music Composition Pedagogy	Much research in the field of eminence studies challenges the popular stereotype of the creative artist as 'lone seeker', and highlights the social nature of thinking and learning (Barrett, 2006). The artist works in the centre of a network of cooperating people whose work is essential to the final outcome (Becker, 1990).	Collaborative Composition Task	Students interact with one another and collaborate in order to create a coherent piece of music.
Creative Collaboration	Group collaboration can be an effective means of developing individual creativity and providing pupils with highly valued musical experience and not just as the unavoidable solution to the logistical problems of the classroom (Faulkner, 2003). Collaborative composition affords rich learning experiences (J. H. Wiggins, 2007).	Collaborative Composition Task	Students learn from one another whilst interacting and creating a coherent piece of music.

Table 3.2 - Design Table - Collaborative Composition Task

Literature Review Theme	Design Principle	Implementation	Desired Outcome
Music Composition Pedagogy	When designing composition activities, teachers should: allow students freedom to develop musical ideas; value students' existing knowledge; consider the richness collaborative experiences afford; and create an environment that 'fosters ownership and agency' (J. H. Wiggins, 2007). Allow freedom and space for compositional ideas to develop (J. H. Wiggins, 2007). When it comes to assessment within Music Composition, creativity is an aspect which should be encouraged (Williams et al., 2010).	Open-ended Composition Task	High level of creativity, engagement & intrinsic motivation as task is relevant to the learner.

Table 3.3 - Design Table - Open-ended Composition Task

3.4.2 Collaborative Technologies

While the instruction of the learning experience provided to the student participants was to create a musical composition, and the instruction of the learning experience provided to the lecturer participants was to provide formative feedback and guidance to the student participants regarding the composition, the main interest of this research was not of the composition itself, but of the process that led to the final composition.

Splice was chosen as the collaborative technology as it enabled the full iterative tracking of the compositional process, and allowed for social interaction between the both individual students within a group, and the lecturer and the students. Screenshots of the Splice platform can be found in Appendices P, Q and R.

The composition itself was created using the music production software Ableton Live. While there are numerous pieces of software that have the ability to create full music compositions, Ableton Live was chosen because it can be used in conjunction with Splice, all participants have prior knowledge of composing with it, and all participants have access to it.

Literature Review Theme	Design Principle	Implementation	Desired Outcome
Collaborative Learning	The strengths of collaborative learning include the ability to compare ideas, collaborate, learn from peers, share knowledge and skills to support other participants, analyze and integrate different points of view, plan in a group, manage the workload, and use an effective platform (Biasutti, 2011).	Use of the Splice platform	Splice provides a platform for learner interaction and collaboration.
Assessment - Challenges	Two of the main challenges associated with assessment within a collaborative learning environment are individual marking within group assessment, and communication and feedback (Harrison et al., 2013).	Use of the Splice platform	Splice to overcome these challenges by allowing for convenient formative feedback opportunities throughout, and providing a reflective portfolio with insights into individual performance.
Assessment - Challenges	The use of computer conferencing for online collaborative work means that the assessment has a conspicuous advantage over the assessment of face-to-face collaboration, because the medium provides a written record of the interactions between students as they use text messages to communicate (MacDonald, 2003).	Use of the Splice platform	Splice platform to allow for formative feedback throughout, and act as a reflective portfolio, with all student interactions and contributions recorded. This will lead to greater insights with regards to summative assessment.

Table 3.4 - Design Table - Use of the Splice platform

3.4.3 Protocols

All creativity happens within constraints (Stokes, 2006), however it is important to get the balance right. Too much pressure or restriction can hinder the flow of creative ideas (Collins & Amabile, 1999). Alternatively, creativity is not necessarily promoted by a casting off of all constraints either, as complete freedom can in fact be a hindrance to creativity (Stokes, 2006). A reasonable amount of limitation and constraint can spur creative work forward (Clinton & Hokanson, 2012). With this in mind, some basic scaffolding was introduced to the learning experience through the use of protocols. As per Wood, Bruner and Ross (1976), scaffolding controls the elements of the task that are initially beyond the learners capability thus permitting him to concentrate upon and complete only those elements that are within his range of competence.

With regards to the student participants, three key dates were provided to them at the beginning of the learning experience. They were required to have two draft submissions available for review at indicated dates throughout the two week period. The first of these draft submission dates was five days after the project commencement. They were required to add a "Star" to the project within Splice, and also add a "Comment" signalling that it was a draft submission. The second of these draft submission dates was ten days after the project commencement. The students were also required to have their final submission available for review within Splice fourteen days after the commencement of the project. In addition to these key dates, student participants were informed that all communication between the students within a group, and all communication between the student groups and the lecturer must take place within the Splice online platform. This was to ensure that the entire social and compositional process could be tracked within the Splice platform.

With regards to the lecturer participants, three key dates were also provided to them at the beginning of the learning experience. They were required to provide formative feedback on two draft submissions at indicated dates throughout the two week period. The first of these formative feedback dates was to be no later than seven days after the project commencement. The second of these formative feedback dates was to be no later than twelve days after the project commencement. The lecturers were also required to provide an informal summative assessment on the final composition provided by their student group, fourteen days after the commencement of the project. In addition to these key dates, lecturer participants were informed that all communication between themselves and the student groups must take place within the Splice online platform. Again, this was to ensure that the entire social and compositional process could be tracked within the Splice platform.

Literature Review Theme	Design Principle	Implementation	Desired Outcome
Music Composition Pedagogy	Provide opportunities for students to receive formative feedback (Bolden, 2009; Miller, 2005; J. Wiggins, 2003; J. H. Wiggins, 2007; Wilkins, 2006).	Lecturer Protocols - Deliver formative feedback	Learners apply feedback and further develop their compositions
Assessment	A balance between formative and summative assessment is central to the formation and development of the music ensemble in higher education contexts (Harrison, Lebler, Carey, Hitchcock, & O'Bryan, 2013).	Lecturer Protocols - Deliver formative feedback & summative assessment	Learners benefit from combination of assessment types
Assessment - Challenges	Instructor acts the "guide-on-the-side", to be aware of group dynamics and prompt lazy students to become active participants in the group experience (Gueldenzoph & May, 2002).	Lecturer Protocols - Deliver formative feedback	Motivates and encourages inactive students to become active participants
Assessment - Formative	Formative feedback furthers student learning as the student engages in a continuous loop of self-assessment based on particular criteria (Bollag, 2006; Leahy, Lyon, Thompson, & Wiliam, 2005).	Lecturer Protocols - Deliver formative feedback	Provision of formative feedback helps learners develop their composition
Music Composition Pedagogy	Assessment items targeting Music Composition would include submission of work-in-progress for formative feedback, and a reflective portfolio (Lupton & Bruce, 2010).	Student Protocols - Submit for formative feedback, communicate within Splice	Provide lecturers with deeper insight into the composition process, and individual performance within learner groups

Table 3.5 - Design Table - Participant Protocols

3.5 Conclusion

The key themes and challenges associated within the areas of collaborative music composition and assessment emerged following a thorough review of the literature surrounding the topics. The design of the learning experience addressed and incorporated these themes in order to develop and implement an appropriate intervention. In order to comprehend and assess the results of the learning experience, it was imperative that an appropriate research methodology was adopted and implemented.

Chapter 4 : Research Methodology

4.1 Introduction

This section will outline the research methodology adopted, and discuss the implementation of the research study, which has been designed to investigate the use of collaborative technologies in music composition. In particular the study sought to answer the following research questions:

- How does the use of collaborative technology affect the delivery of feedback to learners?
- How does the use of collaborative technology affect insights into assessment for the lecturer?
- How does the use of collaborative technology impact musical collaboration capabilities for learners?

4.2 Exploratory Case Study

Initial research methodologies considered for this project were that of an Experiment, a Survey and a Case Study. Through the analysis of three conditions in relation to the questions posed by the research, these being (a) the type of research question posed, (b) the extent of researcher control required over actual behavioural events, and (c) the degree of focus on contemporary events (Yin, 2014), an exploratory case study was chosen as the most appropriate research methodology.

Method	**Form of Research Question**	**Requires Control of Behavioural Events**	**Focuses on Contemporary Events**
Experiment	How, Why?	Yes	Yes
Survey	Who, What, Where, How Many, How Much?	No	Yes
Archival Analysis	Who, What, Where, How Many, How Much?	No	Yes / No
History	How, Why?	No	No
Case Study	How, Why?	No	Yes

Source : COSMOS Corporation

Table 4.1 : Relevant Situations For Different Research Methods

As noted by Schramm (1971), the essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or a set of decisions: why they were taken, how they were implemented, and with what result. Furthermore, Yin (2003) states that a case study is a methodology of choice when the issue under scrutiny is contemporary, complex and inseparable from

the context in which it takes place. An exploratory case study therefore allowed for the gathering of in-depth information with regard to the question being investigated in a real life context of creating a collaborative musical composition.

While according to Yin (2014), a case study is a comprehensive methodology which incorporates appropriate data collection methods and data analysis techniques, there are known to be limitations and criticisms associated with single case studies. As stated by both Hodkinson and Hodkinson (2001), and Bell (2005), there is too much data for easy analysis, which can lead to being difficult to represent in a simple way. It is also argued that it is too time consuming to collect data, very expensive when done on a large scale, and impossible to generalise the results in the conventional sense. These limitations were noted when considering this project, however both due to both the nature of the data collected, and the relatively small sample size associated with this research, a case study was chosen as the most appropriate method of research.

4.3 Research Participants

Purposeful sampling is the most common strategy in qualitative research (Hoepfl, 1997). Therefore, invitations to participate in this investigation were extended to a cohort of both Music Composition students and lecturers within the Sound Training College. The invitation clearly highlighted the purpose of the investigation to both student and lecturer, and what was expected of both cohort throughout the duration of the study. Both cohorts were chosen due to an prior level of Music Composition knowledge. This was an important factor of the study, as the purpose of this investigation is not to teach Music Composition, but to examine the effects of implementing collaborative technologies within Music Composition. Therefore, a knowledge of Music Composition was an important prerequisite of participating in the study. Lecturer expertise with regards to formative feedback and summative assessment within the area of Music Composition was also integral to the research.

The minimum age of the student participants was 18 years old, with no restriction placed on an upper age limit. There was also no gender restrictions with regards to the research. Invitations were extended to 22 potential student participants, with a final sample size of 10, due to voluntary nature of the participation. Due to the predominantly qualitative nature of the data gathered, 10 student participants was decided upon as an appropriate sample size to gain an appropriate insight into the effectiveness of the project.

The minimum age of the lecturer participants was also 18 years old, with no restriction being placed on an upper age limit. There was also no gender restrictions with regards to the research. Invitations were extended to 4 potential lecturer participants, with all of them agreeing to participate in the research. This number was chosen in order to allocate one lecturer per student participant group. It

was also decided upon as an appropriate sample size to gain an appropriate insight from the lecturers perspective into the effectiveness of the project.

4.4 Research Data Collection

In order to comprehensively answer the research question, a mixed methods approach was adopted with regards to data collection. Mixed methods involves the combining or integration of qualitative and quantitative research and data in a research study (Cresswell, 2014). The specific mixed method design chosen for this research question was the convergent parallel mixed method. This is a form of mixed methods design in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem (Cresswell, 2014).

A case study does not require rigid adherence to either qualitative or quantitative design, but advocates pragmatic decisions over the best methods to address the issues arising from the study as it evolves (Denzin & Lincoln, 2005). The following sections provide further details on the data instruments used.

4.4.1 Semi-Structured Lecturer Interviews

One of the most important sources of case study evidence is the interview (Yin, 2014). While there are many forms of interview, the most common form used for case study research is the semi-structured format (B. Johnson & Christensen, 2008; Yin, 2003). The rationale for selecting this form is that they can allow the researcher to enter the world of the interviewee and to gain a greater understanding from their perspective (B. Johnson & Christensen, 2008).

At the conclusion of the learning experience, each lecturer participant was asked to participate in a short semi-structured interview with the researcher. An interview protocol was developed in order to assist with the structure of these interviews (Appendix J). These interviews were recorded using a digital audio recorder with the prior permission of the participants. In order to best understand the participants experience of the study, open-ended questions were employed. This approach allowed participants to voice their experiences unconstrained by the views of the researcher (Cresswell, 2014). The interview protocol also allowed space for additional questions and for questions to be adapted, which enabled new themes to be further investigated as they emerged (Rubin & Rubin, 1995).

The data collected from the lecturer participant interview was analysed in order to assess the effect that the use of the collaborative technology had on the provision of formative feedback to the student participants. The data from the lecturer participant interviews was also analysed in order to assess

the effect that the use of the collaborative technology had on the insights into gauging individual student assessment within the learner groups.

4.4.2 Student Focus Groups

Two semi-structured focus group interviews took place with the student participants at the conclusion of the learning experience. One of the focus groups comprised of 6 participants, where the other comprised of four participants.

The focus group was chosen as it is recommended that group interviews be used in situations where "interaction among the interviewees will likely yield the best information and when the interviewees are similar to and cooperative with each other" (Creswell, 2008). Focus groups are also useful in generating a rich understanding of participants' experiences and beliefs (Morgan, 1997). This was deemed appropriate for this situation, following on from the collaborative learning experience shared by the student participants.

Much in the same fashion as the Lecturer Interviews, an interview protocol was developed in order to assist with the structure of the focus groups (Appendix I). The focus group sessions were recorded using a digital audio recorder with the prior permission of each of the participants. In order to best understand the participants' experience of the study, open-ended questions were employed. This approach again allowed participants to voice their experiences unconstrained by the views of the researcher (Cresswell, 2014). The interview protocol also allowed space for additional questions and for questions to be adapted, which enabled new themes to be further investigated as they emerged (Rubin & Rubin, 1995).

The data collected from the student participant interviews was used to analyse the impact that the collaborative technology had regarding collaborative composition amongst the learners.

4.4.3 Observation

Observation allows for the gathering of open-ended, firsthand information by observing learners in their setting during the educational experience (Cresswell, 2014). Where the issues being investigated are focused on the use of new technology, observation is seem as an invaluable data collection method (B. Johnson & Christensen, 2008). The learning experience allowed for observation not in a traditional, live classroom setting, but within an online environment. The Splice collaborative platform collected and stored all data regarding both individual interactions and contributions towards the composition. This data was used to analyse the level of interaction between the learners, the level of interaction between the lecturer and the learners, and the level of engagement of each of the individual learners towards the composition.

4.4.4 Artefact

The final artefact (composition) created by each participant group was analysed in order to assess how feedback provided by lecturers impacted on the final composition provided by the student groups. This data was used to examine the impact that the collaborative technology had regarding collaborative composition amongst the learners. A close examination of the artefacts created also supported common themes provided by participants within the post-experience interviews.

4.4.5 Data Collection Table

The data collected throughout the learning experience took place in the following format :

Order	**Activity**	**Data Gathered**
1	Semi-structured Lecturer Interviews	Qualitative
2	Student Focus Groups	Qualitative
3	Observation (Splice Data)	Quantitative & Qualitative
4	Final Artefact	Qualitative

Table 4.2 : Learning Experience Data Collection

4.5 Research Data Analysis

4.5.1 Data Preparation

Data preparation began with the organisation of all collected data into folders and documents, which could later easily be searched and analysed. Prior to any analysis, all audio recordings of interviews were transcribed and anonymised, all observations of interactions within the collaborative platform were collected into a single document, and all finished artefacts were gathered.

4.5.2 Data Analysis Process

For the purposes of this research, a grounded theory approach was adopted. A grounded theory is one that is discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to a particular phenomenon (Strauss & Corbin, 2008). Grounded theory offers a way of attending in detail to qualitative material in order to systematically develop theories about the phenomena being studied (Lawrence & Tar, 2013). Additionally, Strauss (1987) emphasises the usefulness of grounded theory approach when used within a case study research methodology. Grounded theory is an inductive, theory discovery method that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical data (Glaser & Strauss, 1967; Martin & Turner, 1986).

In order to begin the data analysis process, all data gathered throughout the learning experience was compiled into a case study database, and hosted within the qualitative analysis programme Nvivo 11.

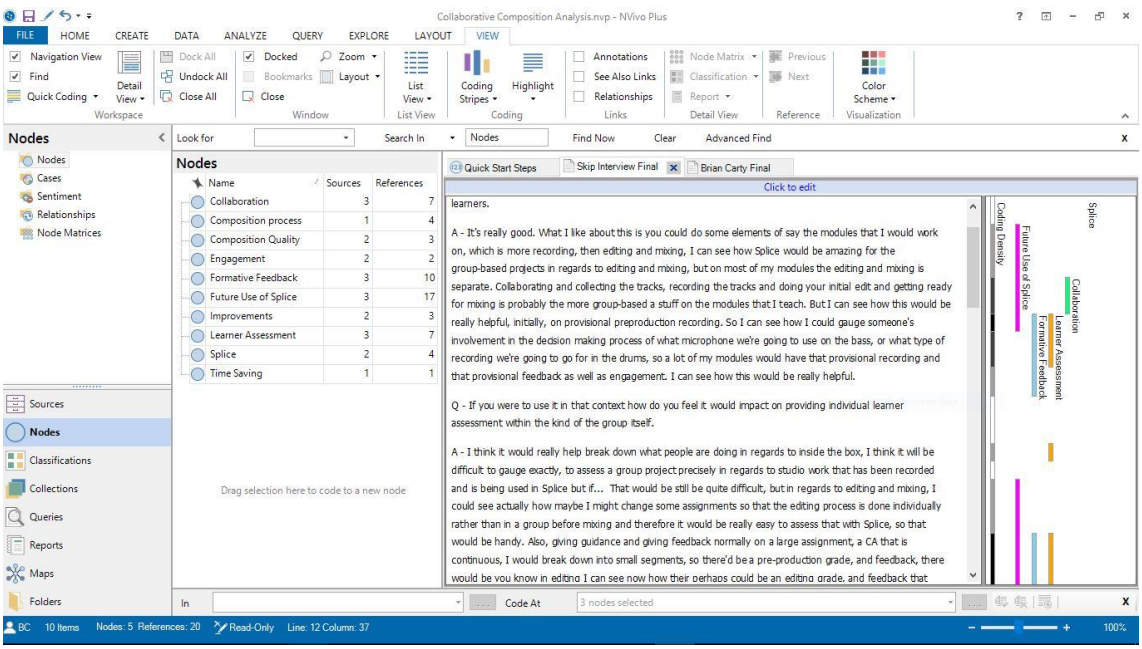

Figure 4.1 : Screenshot of Nvivo used for Qualitative Analysis

The grounded theory approach involves coding the assignment of themes and concepts to a selected unit such as sentences taken from an interview transcript. The concepts are combined into related categories; links between categories are identified and verified against the data, and selective coding attempts to integrate the categories into a theory, which accounts for the phenomenon being investigated (Lawrence & Tar, 2013).

In order to do this, all interview transcripts were first analysed in order to become familiar with the data, with any initial codes being noted throughout the process. An open coding approach was adopted when analysing the data initially. Open coding is the analytic process through which concepts are identified and their properties and dimensions are discovered in data (Strauss & Corbin, 2008). Once the initial manual analysis had occurred, the Nvivo software was then used to perform an Auto Code process, in which the software automatically identifies codes within the data. The Auto Code process was used in order to strengthen confidence within the initial manually identified codes, and also to potentially identify any additional codes that had been overlooked by the researcher during the manual analysis.

Once the open coding process was completed, codes of a similar nature were grouped together, and a process of selective coding began. The aim of selective coding is to integrate and refine the categories into a theory, which accounts for the phenomenon being investigated (Darke, Shanks, & Broadbent, 1998). In selective coding the researcher reduces data from many cases into concepts and sets of relational statements that can be used to explain, in a general sense, what is going on (Strauss & Corbin, 2008). Selective coding was used to identify broad themes occurring within the data.

All transcripts were then analysed again in order to search for relationships between the themes that emerged from within the data, and between the themes and their related codes. These themes were further defined enabling findings to be produced.

4.5.3 Data Analysis Strategy

The challenge in a convergent mixed methods design is how to actually converge or merge the data (Cresswell, 2014). Of the three main types of data analysis within a convergent mixed methods design, these being side-by-side comparison, data transformation (changing qualitative themes into quantitative variables and then combining the two quantitative databases), and joint display of data (merging the two forms of data in a table or graph), a side-by-side comparison was deemed the most appropriate. This was decision was taken as due to the nature of both the qualitative and quantitative data collected throughout the research project. Due to the predominantly qualitative data collected throughout the project, the qualitative data will be analysed initially, with the quantitative data being compared in a side-by-side comparison in order to confirm or disconfirm the initial findings.

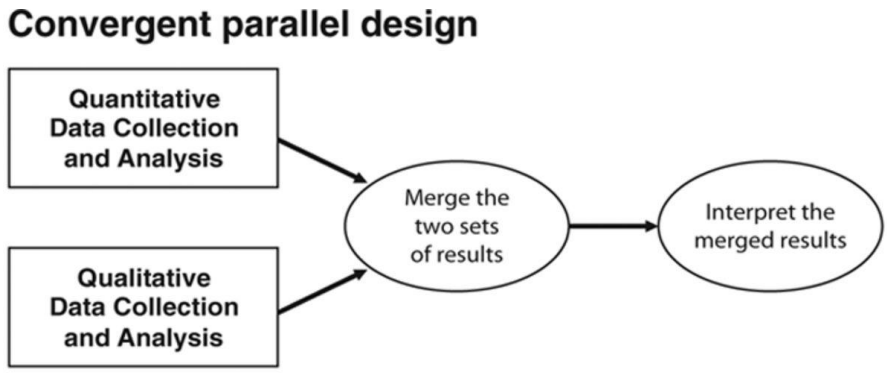

Figure 4.2 : Convergent Parallel Design

4.6 Implementation

The research project took place at the Sound Training College in Temple Bar, Dublin 2. It commenced on March 27th 2017, and ran for two weeks, finishing on April 10th 2017. Interviews with the lecturer participants, and focus groups with the student participants both took place on the final day of research project. The first and final day of the project were the only days containing face-to-face contact time with the participants, with the majority of the learning experience being undertaken remotely by both the student and lecturer participants.

4.7 Ethical Considerations

Prior to the commencement of the study, all lecturer participants were presented with a copy of the Lecturer Information Sheet and Informed Consent Form (Appendix D and E). They were asked to read all information and sign the Informed Consent Form if they were happy to proceed. The lecturer participants were informed that they may withdraw from the study at any time, and that their anonymity was protected.

While the researcher is not directly employed by employer of the participant lecturers, a potential conflict of interest arose as the participant lecturers involved with this research could be considered as being colleagues or associates of the researcher. In order to address this potential conflict of interest, a declaration was included in the participant lecturer Information Sheet requesting impartial observations with regards to the project.

Within the introductory face-to-face class, prior to the commencement of the study, the student participants were provided with the Student Information Sheet and Informed Consent Form

(Appendix B and C). They were asked to read all information and sign the Informed Consent Form if they were happy to proceed. The student participants were informed that they may withdraw from the study at any time, and that their anonymity was protected. The student participants were not known to the researcher prior to the study and were not obliged to take part.

Prior to the commencement of the study, permission was provided by the Sound Training College Board of Management (Appendix G and H) in order to undertake the research. Ethical approval was granted by the School of Computer Science and Statistics Ethics Committee (Appendix A).

4.8 Conclusion

This chapter has outlined the research methodology used to address the research questions posed in this study, and how the overall methodology was underpinned by a theoretical framework informed by the literature review. The data collection and analysis techniques were also presented, and also how the triangulation of quantitative and qualitative data would be approached.

Chapter 5 : Findings

5.1 Introduction

The previous chapter described the research methods, data collection instruments and analysis techniques used throughout this research project. In order to investigate the research topic, the use of collaborative technologies in music composition, the study sought to answer the following research questions:

- How does the use of collaborative technology affect the delivery of feedback to learners?
- How does the use of collaborative technology affect insights into assessment for the lecturer?
- How does the use of collaborative technology impact musical collaboration capabilities for learners?

Two of the above research questions relate directly to the experience of the lecturer, when providing both formative feedback and summative assessment to learners with regards to a collaborative composition task. The third question relates directly to the experience of the learners, and how the use of a collaborative technology would impact musical collaboration capabilities. With this in mind, the findings shall be separated into two distinct categories, the lecturers' perceptions of the learning experience, and the students' perceptions of the learning experience.

5.2 Lecturers' Perceptions of the Learning Experience

Based on a review of the qualitative data analysed directly from the post learning experience interviews with the participant lecturers, a number of key themes emerged from the lecturers' experience. Using Nvivo software, the wordcloud below was generated from the first iteration of the thematic coding, and provides a visual representation of the emergent codes. The frequency of codes does not necessarily indicate their importance, therefore they were subsequently grouped into broader themes as outlined previously in the data analysis strategy. The findings that will be discussed in this section emerged from these themes.

Figure 5.1 - Wordcloud of Emergent Themes

5.2.1 Delivery of Feedback to Learners

The available literature suggests that formative feedback furthers student learning as the student engages in a continuous loop of self-assessment based on particular criteria (Bollag, 2006; Leahy et al., 2005). Formative feedback is seen as being is central to the formation and development of the music ensemble in higher education contexts (Harrison, Lebler, Carey, Hitchcock, & O'Bryan, 2013). The first of the research questions posed related to the provision of formative feedback to student participants, and how the use of the collaborative technology effected its delivery.

From the analysis of the lecturer interview transcripts, it was found that all four of the lecturer participants had an overall positive experience with regards to providing formative feedback to the student groups within the collaborative platform. All lecturer participants found it extremely easy to provide feedback and offer guidance to their student groups.

"Interaction is very good in the platform, you can pop in and whenever there is an issue with the students.....offer solutions and point out any technical issues, or if there are any musical issues, it's very easy to jump in and point them out because you can see the whole process, the whole sketch of the composition from the beginning." - Lecturer 1

"I found that it made providing formative feedback really easy as I could just dip into the project and provide some pointers and ideas...". - Lecturer 4

It was also found that the lecturers enjoyed the convenience that the platform provided, in particular the additional opportunities to provide formative feedback, as opposed to solely within face-to-face class time.

"It's really good for formative feedback because you get to do it more frequently. The difficulty of meeting people makes formative feedback less often than you'd like it, mostly, so for sure if the student is going to engage, it gives them a huge benefit to get you for 5 minutes at the end of your day, as opposed to a weekly one hour slot.... It can really allow people to excel and get more formative feedback... so it's very positive from that point of view". - Lecturer 3

"It's as if you would have a live class in front of you... There's interaction, you can pop in and you can ask questions and offer solutions, and from that point of view it's very interactive, it's really, really good. You can assist and provide feedback as well even if you're not present. So it's really convenient in a dual aspect sort of way for both the student and the lecturer". - Lecturer 1

An additional finding was that the visual nature of the collaborative platform was of great benefit towards the provision of feedback to learners. Due to the aural, multi-faceted nature of music composition, it can sometimes be difficult to explain sonic terms such as frequency response and phase alignment. However the ability to add comments in the collaborative platform on specific instrument tracks, and at specific times where certain issues occur, was found to be very beneficial.

"It's very easy for the assessor to give feedback. It's really, really good. Excellent actually... It's very visual for the learner, which I really like, so when they're getting feedback it's quite obvious... what I'm referring to." - Lecturer 2

The strengths of collaborative learning include the ability to compare ideas, collaborate, learn from peers, share knowledge and skills to support other participants, analyze and integrate different points of view, plan in a group, and manage the workload (Biasutti, 2011). Having completed the learning experience, another finding was the potential of the collaborative platform with regards to peer-based feedback.

"I could see myself using this then where I've given the entire class a multi track to mix, and where they're perhaps sharing ideas,... I think half of the learning comes from that peer based feedback in particular... I think it's absolutely imperative to make that easier for the students." - Lecturer 2

Having performed an analysis of the interview responses, the data obtained from the collaborative platform regarding the feedback provided by lecturers, and how the students incorporated this feedback into their compositions was analysed and compared to the initial responses. It was found that Group 4 had very little engagement with the overall project, however the other three student groups significantly engaged with the learning experience. When Lecturer 4 provided Group 4 with direction as to how they could get started and begin their composition, they still did not apply the formative feedback and begin composing.

As the collaborative platform captured each iteration of the composition, it was possible to revisit each group composition at each stage both before and after lecturer feedback had been provided. It was found that each of the three groups who engaged had effectively incorporated the feedback that was provided by the lecturers into their compositions, and in doing so, they progressed their compositions to a more advanced level.

5.2.2 Insights into Assessment

The second research question to be addressed related to insights into learner assessment by the lecturer. The use of computer conferencing for online collaborative work means that the assessment has a conspicuous advantage over the assessment of face-to-face collaboration, because the medium provides a written record of the interactions between students as they use text messages to communicate (MacDonald, 2003). From analysis of the interview transcripts, it was found that the lecturers believed that the collaborative platform provided the ability to assess individual student engagement within each group. These insights were met with overall positivity from the lecturer participants, as they felt that engagement was a crucial aspect of collaborative work.

"You can actually see who has engaged more... and you can see who's not engaging as well, which again, is very good to know." - Lecturer 1

"With this (the collaborative platform) I can see exactly who is doing work and who isn't. I can see how I could gauge someone's involvement ... which is so important." - Lecturer 2

"I think because you could actually see who's doing what, and you can see the conversations that are taking place and who offered what, and you know, the participation basically, it's obvious who has engaged and who hasn't because it's right there in front of you." - Lecturer 1

A major factor of these enhanced engagement insights are the ability to provide an accurate summative assessment of individual learners, within a group context. This was found to be extremely beneficial to the lecturers, and was a key factor that was previously missing in group work.

"It's really great because you can see who has uploaded and who has made the comment, so that's brilliant... It was actually a gap before in where... 'how do you really tell who did what in a group project?', because you're never there. So this really does document that quite well and quite neatly." - Lecturer 3

Another interesting finding was that the ability to see which students are making key decisions within the group is of major importance to the lecturers. Even if a student is not contributing musically to a composition, if they are engaging socially in other aspects such as creative decision making or fault identification, that is seen as a significant strength, and one that was difficult to identify previously.

"If someone isn't actually doing anything but they're driving the creative process, by say asking the right questions in the comments, or pointing out where issues lie, there is a strength in that even if that person isn't necessarily like writing the beats, writing the music, using Ableton, so I think it's really good in that sense." - Lecturer 4

Having performed an analysis of the interview responses, the data obtained from the collaborative platform regarding the engagement of students was again analysed and compared to the responses. While Group 2 collaborated well together and produced a good quality final composition, when the data from the collaborative platform was analysed it was found that only two members of the group of three had actually engaged in the project and collaborated with one another. The third member did not interact with the other two group members, the lecturer, or with any iterations of the composition. The insights gained from the use of the collaborative platform allowed the lecturer for Group 2 to be able to deduce this, and should a formal grade have been awarded, provide each learner with an accurate summative assessment.

As noted previously, Group 4 had very limited engagement with the learning experience, however by using the collaborative platform it was possible to visit their composition and see which students had engaged in some fashion, and which students had not engaged at all. A full breakdown of group interactions can be found in the data tables in Appendix O.

5.3 Students' Perceptions of the Learning Experience

Based on a review of the qualitative data analysed directly from the post learning experience focus groups with the participant students, a number of key themes emerged from the experience of the students. The Nvivo software was again used to code these responses, with the codes then grouped into broader themes as outlined previously in the data analysis strategy. The findings that will be discussed in this section emerged from these themes.

5.3.1 Musical Collaboration Capabilities for Learners

When exploring the focus group responses, a number of themes emerged with regards to the capabilities that the collaborative platform afforded the learners. Similar to the findings within the experience of the lecturers, it was found that the student participants enjoyed the convenience that the platform provided. It enabled the learners to collaborate remotely, without the need to set up a time, date and venue to meet up face-to-face. It emerged that this was a current problem within the student participants.

"It's like a really good idea because I know there's situations right now that I'm in and we just can't arrange band practice, our times just kind of clash with one another. I was really excited at the start of the project because there is loads of potential in the idea... I really liked the concept and I definitely wanted to give it a try." - Participant 7

"Compared to collaborating face-to-face with someone, I found this much easier because I just had the freedom to work on ideas anywhere without having to set a time to meet up and then travel, like it was just time saving, but then I guess that is important." - Participant 3

"Even though my group partner was in Belfast at the time... it was just very easy to see what he was doing, where he was going with the track." - Participant 4

In addition to the convenience, it was also found that the student participants largely enjoyed the collaborative experience. A number of the participants indicated that they would be happy to collaborate using the online platform again, and indicated that they would be doing so in the near future. In addition, it emerged that the peer learning aspect of the platform was looked upon favourably as a method of learning by some of the participants.

"I definitely would use it again (Splice) and I'm thinking about... just asking a random person on Facebook "Do you want to collaborate?" because I'll try and find somebody who is a little bit better than me and try and learn from them at the same time. I think it's great yeah. It's a good way to peer learn." - Participant 4

"It was cool... it's definitely something that I'd use again because I just found it easy enough to collaborate, swap ideas and stuff." - Participant 1

"I've never really collaborated before except on a college project or something... I think this was great overall." - Participant 2

In addition to positive experiences, it was also found that the student participants encountered hindrances that impacted their collaborative capabilities throughout the project. Technical issues accounted for the primary boundary stopping students from fully participating in the learning experience. It emerged that not all of the student participants had the computer specifications required to simultaneously run both the composition software Ableton Live, and the online collaborative platform Splice side by side.

"My laptop is like 6 years old so it's pretty low spec and old so not really made for this sort of stuff but I still tried to download Ableton and Splice. It didn't go too well!" - Participant 5

"I was kind of limited with my own equipment and supplies, but I really like the idea and I definitely wanted to give it a try." - Participant 10

In addition to technical difficulties, it was also found that confusion amongst students played a part in the learning experience and accounted for a lack of engagement. The two areas of the collaborative platform that caused most confusion were how the online platform synced up with the composition software Ableton Live, and the commenting system.

"I was a bit confused like how it actually worked at the start... I didn't really know how this whole process worked and I was with Participant 10 trying to make the drum track that we put up, but we were both just kind of confused, we didn't really know how to use it." - Participant 9

"All three of us sort of experienced confusion, we didn't really know how it worked, how to really sync it all up together. We got there in the end though" - Participant 1

"I didn't really understand the commenting system initially, like how you can respond to someone's comments... if you're getting feedback. - Participant 4

Having performed an analysis of the student focus group responses, the data obtained from the collaborative platform was again analysed and compared to the responses.

As highlighted earlier, Group 2 collaborated well together and produced a good quality final composition, but when the data from the collaborative platform was analysed it was found that only two members of the group of three had actually engaged in the project and collaborated with one another. Upon analysis of the student responses, it was found that the third member of the group cited technical difficulties as the reason for not being able to engage. All three participants in this group also cited confusion with regards to commenting and interacting with one another. This is reflected in the level of interaction within the collaborative platform.

Also noted previously, Group 4 had very limited engagement with the learning experience. Similar to Group 2, the student participants cited both technical issues and confusion regarding the collaborative platform as the reason why they failed to engage.

While the project accounted for largely positive collaborative composition experiences and enhanced collaborative capabilities, there were clear indications that the online platform needs to be better introduced and explained to student participants before a similar project commences in the future.

5.6 Conclusion

This chapter highlighted the key findings that emerged from the data collected throughout this research project. There are clear indications that the use of an online collaborative composition platform within an educational context could be of benefit to both students and lecturers alike. Due to the small sample size and relatively short implementation time, it is believed that further research within this area will help confirm the findings with more accuracy and reliability.

Chapter 6 : Conclusion

6.1 Introduction

The previous chapter presented the findings from the analysis of the various forms of data compiled throughout the research project. This chapter discusses these findings in context with the central research question and its associated sub questions, and the conclusions that have been drawn from the analysis.

6.2 Addressing the Research Questions

This research study was designed to investigate the use of collaborative technologies in music composition. The study sought to answer the following research questions:

- How does the use of collaborative technology affect the delivery of feedback to learners?
- How does the use of collaborative technology affect insights into assessment for the lecturer?
- How does the use of collaborative technology impact musical collaboration capabilities for learners?

While this research project was centred around the topic of music composition, the goal of the research was not to assess music composition skills within learners, but to investigate how the use of collaborative technologies impacted upon the process of music composition. As highlighted in the findings, in order to do this it was necessary to analyse both the lecturers' experiences and the students' experiences throughout the research project.

6.2.1 How does the use of collaborative technology affect the delivery of feedback to learners?

The results of the research indicate that using the collaborative technology has an overall positive impact regarding the delivery of feedback to learners. All four of the lecturer participants found it extremely easy to provide feedback and offer guidance to their student groups. The platform provided a convenient method of delivering feedback to learners, as it could be undertaken remotely, and not solely within face-to-face class time. This aspect also provided additional opportunities for the provision of feedback, as it was not limited to an allocated time per week. In addition, the visual nature of the collaborative platform was of great benefit towards the provision of formative feedback to learners, as it made it very easy for lecturers to pinpoint exactly what they were referring to when providing their feedback.

Learners also benefited from the provision of the lecturer feedback through the collaborative technology, as they effectively incorporated the feedback in order to progress their compositions to a more advanced level.

6.2.2 How does the use of collaborative technology affect insights into assessment for the lecturer?

The results of the research indicate that the collaborative technology greatly enhances the insights into individual assessment within each student group for the lecturer. In this project, the platform provided a visual representation of the development of the composition over time, which made visible the process that led to the final product. This visual representation provided the lecturer participants with insights that enabled them to assess which group members had engaged with the project. This in turn led to the ability to produce an accurate summative assessment of individual learners within a group context.

6.2.3 How does the use of collaborative technology impact musical collaboration capabilities for learners?

The results of the research indicate that the use of the collaborative technology has an overall positive impact on musical collaboration capabilities for learners. Similar to the findings within the experience of the lecturers, the results from the project indicate that the platform provided convenience to the student participants, by enabling them to collaborate remotely. The peer learning aspect that the collaborative technology provided was also found to be of benefit to learners. In addition, student participants also largely enjoyed the collaborative experience, with a number of the participants indicating that they would be happy to collaborate using the platform again.

However, not all of the student experiences with the platform were found to be of a positive nature. Technical issues and confusion were found to be the two primary boundaries preventing students from fully engaging with the collaborative technology. Addressing these issues would be imperative for any future implementations of the collaborative platform.

6.3 Conclusions

Two of the main challenges associated with assessment within a collaborative learning environment are individual marking within group assessment, and communication and feedback (Harrison et al., 2013). While the primary intention of the collaborative technology implemented, Splice, is that of real-world collaborative composition, analysis of the findings show that there is scope to effectively implement the platform within an educational context. The findings show that the nature of how the platform enables users to collaborate lends itself effectively to both the provision of formative feedback to learners, as well as providing lecturers with the insights to form an accurate summative assessment based on learner engagement.

While the platform is of benefit within the context of feedback and assessment, it was also important to understand how the platform impacted on collaborative capabilities amongst learners. If the platform was not accessible and user-friendly from a composition perspective, it would prove difficult for the learners to fully engage with it. Some technical issues and confusion did arise amongst student participants, however the platform was met with overall positivity, and provided a convenient and effective method of collaboration.

6.4 Limitations of the Research

This research project took the form of a relatively small single-case study, which consisted of a small sample size of ten student participants and four lecturer participants. Due to time constraints, it took place over a short period of two weeks. It also occurred at a busy time of the year for both sets of participants, with both exams and assignment deadlines occurring throughout the project.

A further limitation was the access to the technical equipment required in order to use both the collaborative platform and the music composition software. While the student participants did have access to the required equipment within the Sound Training College, all of them participated in this study as an extracurricular activity and opted to undertake the project outside of college hours, using their own equipment.

6.5 Recommendations for further study and development

In order to further develop the study in this area, it is recommended that a larger scale research project, which consists of a larger number of participants, takes place over a longer period of time. All of the lecturer participants involved in the project indicated that they would be very interested in using the collaborative platform in the future, and would consider incorporating it into their respective curricula. The use of the collaborative platform within a graded curriculum consisting of set deliverables would greatly help to further develop the study in this area. It would also enable

lecturers to introduce Splice more thoroughly to students in order to minimise confusion and any potential technical difficulties that may arise.

Finally, as indicated by some of the lecturer participants, there is scope to incorporate the collaborative platform into other areas of music education, such as Pre-production, Editing and Mixing. It would be possible to undertake similar research projects in these additional areas in order to understand how the collaborative platform could be used within a broader music education context.

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Appendices

Appendix A - Research Project Proposal

Title:

Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition

Researcher : Brian Cahill

Supervisor : Dr. Nina Bresnihan

Purpose of project including academic rationale:

This project aims to assess the effectiveness of using collaborative technologies within the area of collaborative music composition. The learning experience will be delivered in a blended format. It will consist of two face-to-face classes, with the collaborative technologies and additional learning resources solely being made available online. The first face-to-face class will be delivered at the beginning of the learning experience and will serve as an introduction to the project, with the second face-to-face class occurring at the very end of the project, serving as a conclusion and debriefing session. All collaborative compositional work will be undertaken remotely by the learners at a location of their own convenience.

The learners will be placed into groups of two to three individuals and will be asked to collaborate in order to create a musical composition. Each learner group will be assigned an individual lecturer for the duration of the project. Learner groups will be created in accordance to their preferred musical genre, as indicated in the Pre-Lesson Student Participant Questionnaire (attached). All learners have access to the music production software Ableton Live, which they will use to create their compositions. Learners will also have access to the online collaborative file sharing platform Splice. Splice allows for the seamless sharing of music files that have been created within Ableton Live, between a number of collaborators. Each compositional update made by a collaborator is stored incrementally within the system, allowing for each iteration of the compositional process to be reviewed at a later stage. Each collaborator can also add "Comments" to the composition, signalling to his/her fellow collaborators what updates they have made to the composition at any given time. Additional compositional information, musical references, and resources will be made available to the learners within the Learning Management System Sound Training Online.

Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made to a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?

- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

This project is in part fulfilment of the M.Sc. in Technology and Learning in Trinity College Dublin. This project is not part of an existing course curriculum. No results are being awarded to learners upon completion of the learning experience.

Brief description of methods and measurements to be used:

The learning experience will take place over a two week period. The two face-to-face classes will be delivered by a Music Composition lecturer within the Sound Training College, with the researcher being present throughout. All participants are allowed to use any computer that they have access to throughout the project. They will also be provided with access to computers within the Sound Training College for the duration of the project.

The initial face-to-face class will last for approximately two hours. In this class, the learners will be provided with the Information Sheet, Informed Consent Form, and the Pre-Lesson Student Participant Questionnaire. Participants must read the Information Sheet and sign the Informed Consent form provided by the researcher. Both the participant and the researcher will receive a signed copy of the Informed Consent form and a copy of the Information Sheet. The Pre-Lesson Student Participant Questionnaire will also be provided to the learners at the beginning of the class, asking for the Name, Music Genre of Preference, and Email Address (in order to access the additional learning material) of the participant. All questions will be optional.

The learners will be informed of the overall project brief, given a two week deadline, and assigned into groups based on musical preference indicated on the Pre-Lesson Student Participant Questionnaire. The specific genre of music selected by the student participants is not relevant to the results of the project. Each learner group will then be assigned an individual lecturer for the duration of the project. Learners will be provided with access to the Splice collaborative file sharing platform. Learners will also be provided with access to the Learning Management System, which contains additional compositional information, musical references, and resources in order to aid them with their compositions.

The second face-to-face class will take place in the Sound Training College two weeks after the initial class, and will last for approximately three hours. Here the learners will be debriefed regarding the learning experience, and provided with individual feedback from their previously assigned lecturer. Within this class, each participant will be asked to take part in a short interview with the researcher, each of which will last no longer than fifteen minutes. With the prior permission of the student participants, the interviews will be recorded using a digital audio recorder. Immediately following the interviews, the researcher will digitally transcribe the student participant interview responses and destroy the original audio recordings. The data from these interviews will be analysed to assess whether the use of an online collaborative file sharing platform is an effective method of compositional collaboration for learners. Before each interview begins, the participant will be

informed that each question is optional and that they are free to omit a response to any question. A copy of this interview questionnaire can be seen in the Post-Lesson Student Interview Questionnaire (attached).

Following the second face-to-face class, additional interviews will be conducted with the Sound Training College lecturers who provided feedback to the learner groups. These interviews will last no longer than fifteen minutes. With the prior permission of the lecturer participants, the interviews will be recorded using a digital audio recorder. Immediately following the interviews, the researcher will digitally transcribe lecturer participant interview responses and destroy the original audio recordings. The data from this interview will be analysed to assess whether the use of an online collaborative file sharing platform leads to a greater insight into the individual contributions of learners within a composition. The data from this interview will also be analysed to assess whether the use of an online collaborative file sharing platform is an effective method of providing feedback to learners within a collaborative composition project. Before each interview begins, the lecturer will be informed of the fact that each questions is optional and that they are free to omit a response to any question. A copy of this interview questionnaire can be seen in the Post-Lesson Lecturer Interview Questionnaire (attached).

The project will also analyse the data that is collected through the Splice collaboration platform. This data will be used by both the researcher and the lecturer in order to assess the level of interaction of each participant within the project. This data will be in the form of individual compositional updates made by a collaborator, as well as "Comments" made regarding the composition.

Participants - recruitment methods, number, age, gender, exclusion/inclusion criteria, including statistical justification for numbers of participants:

Participants will consist of both students and lecturers within the Sound Training College who are willing to participate in the research. General interest of student participants will be assessed by both the researcher and the lecturer of the Music Composition class, through both verbal and digital communication. Willing student participants will attend an introductory class where they will be briefed on the overall process of the lesson. After filling out the Pre-Lesson Student Participant Questionnaire, learners will then be enrolled on the Learning Management System via email invitation. The specific genre of music selected by the student participants is not relevant to the results of the project. The minimum age of the student participants will be 18 years old, with no restriction being placed on an upper age limit. There will be no gender restrictions with regards to the research. Invitations will be extended to approximately 20 potential student participants, with a likely final sample size at 15, due to voluntary nature of the participation. Due to the qualitative nature of the data gathered, 15 student participants was decided upon as an appropriate sample size to gain an appropriate insight into the effectiveness of the project.

General interest of lecturer participants will be assessed by the researcher through both verbal and digital communication. The minimum age of the lecturer participants will be 18 years old, with no restriction being placed on an upper age limit. There will be no gender restrictions with regards to the research. Invitations will be extended to 5 potential lecturer participants. This number was chosen with the intention to allocate one lecturer per student participant group. It was also decided

upon as an appropriate sample size to gain an appropriate insight from the lecturers perspective into the effectiveness of the project.

Debriefing arrangements:

Before the learning experience, all participants will be provided with a physical copy of the relevant Information Sheet and the Consent Form. Participants will also be asked to complete the brief Participant Profile form. Upon conclusion of the learning experience, each participant will be verbally debriefed about the research. Upon request, the participants will be informed about the findings of the research after it is completed.

A clear concise statement of the ethical considerations raised by the project and how you intend to deal with them:

Storage of Personal Data

As the data collected will contain personal information relating to the participants during the learning experience, considerable care will be taken to ensure it is stored safely. All collected data will be recorded to a secure storage platform for analysis. With prior permission of the participants, interviews will be recorded with a digital audio recorder. Immediately following the interviews, these interview responses will be transcribed, and the audio recordings destroyed immediately using the AVG File Shredder. All participants will be shown any direct quotations that might be used to ensure that they are not taken out of context. All of the data will be encrypted and stored in accordance with the Data Protection Act at Trinity College Dublin. After analysis, all data will be securely destroyed no later than the 31st of May 2017.

Conflict of Interest

The researcher is not employed by employer of the participant lecturers, however participant lecturers involved with this research could be considered as colleagues and associates of the researcher. A declaration will be included in the participant lecturer Information Sheet requesting impartial observations with regards to the project.

Appendix B - Information Sheet for Student Participants

Title : Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition

Researcher : Brian Cahill

Introduction : You are invited to participate in a research project which is part of the M.Sc. in Technology and Learning in Trinity College Dublin. This project will assess the effectiveness of implementing collaborative technologies in music composition.

Please read all of the information on this sheet carefully and contact Brian Cahill (cahillb2@tcd.ie) if you have any questions before, during or after the research. Your participation is entirely optional and you may withdraw from the study at any time without penalty. If you wish to take part in this project (two weeks in total), you will be asked to sign a consent form. Results of the project will be made available to you on request once the project has concluded.

Background to research : Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made within a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?
- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

What participation involves? : Participation in this project involves creating a collaborative composition within groups of two to three individuals. This project will last for a two week period. At the beginning of the project, you will be required to attend a face-to-face introductory class in the Sound Training College, which will last for approximately two hours. In this class, you will be asked to complete a short Pre-Lesson Student Participant Questionnaire. You will be provided with the overall project brief, assigned into groups based on musical preference indicated on the Pre-Lesson Student Participant Questionnaire, and assigned a group lecturer. You will also be provided with access to the online collaborative file sharing platform, Splice, and any other necessary resources. You will have a two week period in order to complete your collaborative composition using the Ableton Live composition software, and the Splice file sharing platform.

Upon completion of the two week project, you will be required to attend a face-to-face conclusion class in the Sound Training College, which will last for approximately three hours. Within this class, you will be provided with feedback regarding your composition from your assigned group lecturer. You will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding your thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. You will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all participants will be made anonymous.

You will be able to quit the project at any stage throughout the two weeks without penalty, and have your data immediately and securely deleted.

Conflict of interests : The researcher does not share an employer with the participant lecturers involved with this research, however they are considered as colleagues and associates of the researcher.

Duration : The project will last for a two week period. It will consist of two face-to-face classes, one at the beginning of the project (two hours duration), and one at the end of the project (three hours duration). The second face-to-face class will consist of a one-to-one interview that will last no longer than fifteen minutes.

Risks : There are no known risks to the participants other than the known risks associated with using a computer if you or a family member have a history of epilepsy.

Debriefing : Before the experience, you will be provided with an information sheet and the consent form. You will also be asked to complete a short participant profile survey, of which each question is optional. After the experience, you will be verbally debriefed about the research. Upon request, you will be informed about the findings of the research after it is completed. Any questions you have at any stage about the research or the project will be answered immediately.

How will my information be used? : The results obtained from your completion of the learning experience and your interview answers will be analysed and discussed in a written research project submitted to Trinity College Dublin. All information used shall be anonymous.

How will my identity/data be protected? : No personal information will be attached to your results obtained from your completion of the learning experience or to your interview answers. All information collected by the researcher will be made anonymous, treated with full confidentially,

and recorded to a secure storage platform for analysis. All of the information / data collected by the researcher will be encrypted and stored in accordance with the Data Protection Act at Trinity College Dublin. After analysis, all data will be securely destroyed no later than the 31st of May 2017. In the unlikely event that information about illegal activities should emerge during the study, the researcher will be obliged inform the relevant authorities.

Availability of audio recordings : No audio recordings will be made available to anyone other than the researcher, nor will any such recordings be replayed in any public forum or presentation of the research.

Appendix C - Informed Consent Form for Student Participants

Please read the Student Participant Information Sheet and address any questions about the research to Brian Cahill before signing this consent form.

Lead Researcher : Brian Cahill

Background of Research : Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made within a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?
- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

Procedures of this Study : Using both Ableton Live and Splice, you will be asked to create a collaborative composition within groups of two to three individuals. At the commencement of the project, you will be required to attend a face-to-face introductory class in the Sound Training College, which will last for approximately two hours. In this class, you will be asked to complete a short Pre-Lesson Student Participant Questionnaire. You will be provided with the overall project brief, assigned into groups based on musical preference indicated on the Pre-Lesson Student Participant Questionnaire, and assigned a group lecturer.

Upon completion of the two week project, you will be required to attend a face-to-face conclusion class in the Sound Training College, which will last for approximately three hours. Within this class, you will be provided with feedback regarding your composition from your assigned group lecturer. You will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding your thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. You will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all participants will be made anonymous.

There are no known risks to the participants other than the known risks associated with using a computer if the participant or a family member have a history of epilepsy.

Publication : The results will be published as part of my Dissertation for Year 2 in MSc. Technology and Learning.

Individual results will be aggregated anonymously and research reported on aggregate results.

Any questions should be directed towards Brian Cahill at cahillb2@tcd.ie.

Declaration:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Participant's Name: _____

Signature of participant: _____

Date: _____

Statement of investigator's responsibility:

I have explained the nature and purpose of this research, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

Researcher Contact Details :

Name : Brian Cahill

Email Address : cahillb2@tcd.ie

Investigator's signature : _____

Date : _____

Appendix D - Information Sheet for Lecturer Participants

Title : Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition

Researcher : Brian Cahill

Introduction : You are invited to participate in a research project which is part of the M.Sc. in Technology and Learning in Trinity College Dublin. This project will assess the effectiveness of implementing collaborative technologies in music composition.

Please read all of the information on this sheet carefully and contact Brian Cahill (cahillb2@tcd.ie) if you have any questions before, during or after the research. Your participation is entirely optional and you may withdraw from the study at any time without penalty. If you wish to take part in this project (two weeks in total), you will be asked to sign a consent form. Results of the project will be made available to you on request once the project has concluded.

Background to research : Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made within a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?
- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

What participation involves? : Participation in this project involves providing feedback regarding a collaborative composition that has been created by groups of two to three individuals. This project will last for a two week period. You will also be provided with access to the online collaborative file sharing platform, Splice, where you can monitor the progress of your group. You, as both a participant and a lecturer, will be asked to provide unbiased feedback and guidance to the students participating in this project.

Upon completion of the two week project, you will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding your thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. You will

be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all participants will be made anonymous.

You will be able to quit the project at any stage throughout the two weeks without penalty, and have your data immediately and securely deleted.

Conflict of interests : The researcher does not share an employer with the participant lecturers involved with this research, however they are considered as colleagues and associates of the researcher.

Voluntary Participation : Participation in this project is entirely of a voluntary nature. Participants have the right to withdraw from the project and to omit individual responses without penalty. Participants may also ask that any or all submitted responses are omitted following completion of the lesson.

Duration : The project will last for a two week period. At the end of the two weeks, you will be asked to participate in a one-to-one interview that will last no longer than fifteen minutes.

Risks : There are no known risks to the participants other than the known risks associated with using a computer if you or a family member have a history of epilepsy.

Debriefing : Before the experience, you will be provided with an information sheet and the consent form. After the experience, you will be verbally debriefed about the research. Upon request, you will be informed about the findings of the research after it is completed. Any questions you have at any stage about the research or the project will be answered immediately.

How will my information be used? : The results obtained from your completion of the learning experience and your interview answers will be analysed and discussed in a written research project submitted to Trinity College Dublin. All information used shall be anonymous.

How will my identity/data be protected? : No personal information will be attached to your interview answers. All information collected by the researcher will be made anonymous, treated with full confidentially, and recorded to a secure storage platform for analysis. All of the information / data collected by the researcher will be encrypted and stored in accordance with the Data Protection Act at Trinity College Dublin. After analysis, all data will be securely destroyed no later

than the 31st of May 2017. In the unlikely event that information about illegal activities should emerge during the study, the researcher will be obliged inform the relevant authorities.

Availability of audio recordings : No audio recordings will be made available to anyone other than the researcher, nor will any such recordings be replayed in any public forum or presentation of the research.

Appendix E - Informed Consent Form for Lecturer Participants

Please read the Lecturer Participant Information Sheet and address any questions about the research to Brian Cahill before signing this consent form.

Lead Researcher : Brian Cahill

Background of Research : Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made within a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?
- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

Procedures of this Study : Using both Ableton Live and Splice, you will be asked to provide unbiased feedback and guidance on a collaborative composition that has been created by groups of two to three student participants.

Upon completion of the two week project, you will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding your thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. You will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all participants will be made anonymous.

There are no known risks to the participants other than the known risks associated with using a computer if the participant or a family member have a history of epilepsy.

Publication : The results will be published as part of my Dissertation for Year 2 in MSc. Technology and Learning.

Individual results will be aggregated anonymously and research reported on aggregate results.

Any questions should be directed towards Brian Cahill at cahillb2@tcd.ie.

Declaration:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Participant's Name: _____

Signature of participant: _____

Date: _____

Statement of investigator's responsibility:

I have explained the nature and purpose of this research, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

Researcher Contact Details :

Name : Brian Cahill

Email Address : cahillb2@tcd.ie

Investigator's signature : _____

Date : _____

Appendix F - Information Sheet for Board of Management

Title : Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition

Researcher : Brian Cahill

Introduction : Sound Training College students and lecturers are invited to participate in a research project which is part of the M.Sc. in Technology and Learning in Trinity College Dublin. This project will assess the effectiveness of implementing collaborative technologies in music composition.

Please read all of the information on this sheet carefully and contact Brian Cahill (cahillb2@tcd.ie) if you have any questions before, during or after the research. Participation is entirely optional and both students and lecturers may withdraw from the study at any time without penalty. Results of the project will be made available to you on request once the project has concluded.

Background to research : Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made within a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?
- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

What participation involves? : Student participation in this project involves creating a collaborative composition within groups of two to three individuals. This project will last for a two week period. At the beginning of the project, student participants will be required to attend a face-to-face introductory class in the Sound Training College, which will last for approximately two hours. In this class, student participants will be asked to complete a short Pre-Lesson Student Participant Questionnaire. They will be provided with the overall project brief, assigned into groups based on musical preference indicated on the Pre-Lesson Student Participant Questionnaire, and assigned a group lecturer. They will also be provided with access to the online collaborative file sharing platform, Splice, and any other necessary resources. Student participants will have a two week period in order to complete their collaborative composition using the Ableton Live composition software, and the Splice file sharing platform.

Upon completion of the two week project, student participants will be required to attend a face-to-face conclusion class in the Sound Training College, which will last for approximately three hours. Within this class, they will be provided with feedback regarding their composition from their assigned group lecturer. They will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding their thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. They will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all student participants will be made anonymous.

Lecturer participation in this project involves providing feedback regarding a collaborative composition that has been created by groups of two to three individuals. This project will last for a two week period. Lecturer participants will be provided with access to the online collaborative file sharing platform, Splice, where they can monitor the progress of their group. Lecturer participants will be asked to provide unbiased feedback and guidance to the students participating in this project.

Upon completion of the two week project, lecturer participants will be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding their thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. Lecturers will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all lecturer participants will be made anonymous.

Both student participants and lecturer participants will be able to quit the project at any stage throughout the two weeks without penalty, and have their data immediately and securely deleted.

Conflict of interests : The researcher does not share an employer with the participant lecturers involved with this research, however they are considered as colleagues and associates of the researcher.

Voluntary Participation : Participation in this project is entirely of a voluntary nature. Participants have the right to withdraw from the project and to omit individual responses without penalty. Participants may also ask that any or all submitted responses are omitted following completion of the lesson.

Duration : The project will last for a two week period. At the end of the two weeks, the participants will be asked to participate in a one-to-one interview that will last no longer than fifteen minutes.

Risks : There are no known risks to the participants other than the known risks associated with using a computer if the participant or the participants family member have a history of epilepsy.

Debriefing : Before the experience, participants will be provided with an information sheet and the consent form. After the experience, they will be verbally debriefed about the research. Upon request, participants will be informed about the findings of the research after it is completed. Any questions participants have at any stage about the research or the project will be answered immediately.

How will participant information be used? : The results obtained from the completion of the learning experience and the participant interview answers will be analysed and discussed in a written research project submitted to Trinity College Dublin. All information used shall be anonymous.

How will participant identity/data be protected? : No personal information will be attached to participant interview answers. All information collected by the researcher will be made anonymous, treated with full confidentially, and recorded to a secure storage platform for analysis. All of the information / data collected by the researcher will be encrypted and stored in accordance with the Data Protection Act at Trinity College Dublin. After analysis, all data will be securely destroyed no later than the 31st of May 2017. In the unlikely event that information about illegal activities should emerge during the study, the researcher will be obliged inform the relevant authorities.

Availability of audio recordings : No audio recordings will be made available to anyone other than the researcher, nor will any such recordings be replayed in any public forum or presentation of the research.

Appendix G - Informed Consent Form for Board of Management

Please read the Lecturer Participant Information Sheet and address any questions about the research to Brian Cahill before signing this consent form.

Lead Researcher : Brian Cahill

Background of Research : Collaborative learning is an integral aspect of education. However, a problem with regards to collaborative learning is that it is difficult to assess the level of contribution that each group member has made within a specific project. This is especially relevant with regards to music composition, where a single artefact is created. The research topic under investigation in this project is "Assessing the Effectiveness of Implementing Collaborative Technologies in Music Composition". In order to truly analyse this topic, the three questions that need to be answered are as follows :

- Does the use of collaborative technology provide greater opportunities and insights into assessment for the lecturer?
- Does the use of collaborative technology provide a more effective method of delivering feedback to learners?
- Does the use of collaborative technology improve musical collaboration capabilities for learners?

Procedures of this Study : Using both Ableton Live and Splice, student participants will be asked to create a collaborative composition within groups of two to three individuals. At the commencement of the project, student participants will be required to attend a face-to-face introductory class in the Sound Training College, which will last for approximately two hours. In this class, student participants will be asked to complete a short Pre-Lesson Student Participant Questionnaire. They will be provided with the overall project brief, assigned into groups based on musical preference indicated on the Pre-Lesson Student Participant Questionnaire, and assigned a group lecturer.

Upon completion of the two week project, student participants will be required to attend a face-to-face conclusion class in the Sound Training College, which will last for approximately three hours. Within this class, student participants will be provided with feedback regarding their composition from their assigned group lecturer. Student participants will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding their thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. Student participants will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all participants will be made anonymous.

Using both Ableton Live and Splice, lecturer participants will be asked to provide unbiased feedback and guidance on a collaborative composition that has been created by groups of two to three student participants.

Upon completion of the two week project, lecturer participants will also be asked to take part in a short interview (consisting of no longer than fifteen minutes) regarding their thoughts on the overall project experience. With prior permission from participants, these sessions will be audio recorded. Lecturer participants will be free to omit answers for any of the questions asked in the interview, as they are all optional. Any data pertaining to the identity of all participants will be made anonymous.

There are no known risks to the participants other than the known risks associated with using a computer if the participant or a family member have a history of epilepsy.

Publication : The results will be published as part of my Dissertation for Year 2 in MSc. Technology and Learning.

Individual results will be aggregated anonymously and research reported on aggregate results.

Any questions should be directed towards Brian Cahill at cahillb2@tcd.ie.

Declaration:

- I am 18 years or older and am competent to provide consent.
- I am the Principal/Secretary to the Board of Management of the school in which this research will be carried out (Sound Training College, Temple Bar, Dublin 2).
- I understand that the students involved are over 18 years old and are competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I understand that the teacher's and students' participation is fully anonymous and that no personal details about them will be recorded.
- I agree to student data being presented as part of the project work for the MSc in Technology and Learning in a way that does not reveal students' identity.
- I freely and voluntarily agree to the school (Sound Training College, Temple Bar, Dublin 2) being part of this research study, though without prejudice to the school's legal and ethical rights.
- I understand that the school may withdraw at any time without penalty.
- I understand that in the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.

- I understand that student data will be stored securely and deleted on completion of the study.
- I understand that the study involves viewing a computer screen and that if a participant or anyone in their family has a history of epilepsy then they are proceeding at their own risk.
- I have received a copy of this agreement.

I _____ consent to taking part in this research project.

Signature of Principal/Secretary to the Board of Management (Sound Training College, Temple Bar, Dublin 2) : _____

Date: _____

Statement of investigator's responsibility:

I have explained the nature and purpose of this research, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

Researcher Contact Details :

Name : Brian Cahill

Email Address : cahillb2@tcd.ie

Investigator's signature : _____

Date : _____

Appendix H - Pre-Lesson Student Participant Profile Questionnaire

Please note that each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

Name :

Musical Genre of Preference (circle appropriate) :

Deep House

Tech House

Electro House

Techno

Dubstep

Trance

Trap / Hip Hop

Other (Please Specify) : _____

Email Address (in order to access the additional composition resources) :

Appendix I - Post-Lesson Student Interview Questionnaire

Please note that each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

1 - How did you find the learning experience overall? Why?

2 - How did the collaborative technology (Splice) affect your collaborative workflow?

3 - Were you happy with the final artefact (composition) that your group produced? Why?

4 - How do you feel your group worked together as a whole?

5 - What aspect of the experience did you like the most? Why?

6 - What aspect of the experience did you dislike the most? Why?

7 - Do you feel that there are any areas for improvement within the lesson delivery?

Appendix J - Post-Lesson Lecturer Interview Questionnaire

Please note that each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

1 - How did you find delivering the learning experience overall? Why?

2 - How do you feel the collaborative technology (Splice) incorporated into the learning experience impacted on the provision of individual learner assessment?

3 - How do you feel the collaborative technology (Splice) incorporated into the learning experience impacted on the provision of feedback towards the learners?

4 - How would you assess the results of the artefacts (compositions) overall? Why?

5 - Would you consider incorporating a similar learning experience into your classes in the future?

6 - Do you feel that there are any areas for improvement within the lesson delivery?

Appendix K - Key Lecturer Responses

Lecturer 1:

"Interaction is very good in the platform, you can pop in and whenever there is an issue with the students, just say 'Hi guys, maybe try this...', just, you know, offer solutions and point out any technical issues, or if there are any musical issues, it's very easy to jump in and point them out because you can see the whole process, the whole sketch of the composition from the beginning. It makes feedback really easy because of that reason, because it's a work in progress and you can see the process and how the composition is taking shape, you can easily jump in and offer your thoughts and help to guide the students."

"You don't have to just go at the end of the composition 'Oh guys, you did well...', you can actually intervene and give feedback throughout the procedure, if you see something that's not going well, or if somebody asks for help or asks for recommendations or something like that... It's as if you would have a live class in front of you, you know? There's interaction, you can pop in and you can ask questions and offer solutions, and from that point of view it's very interactive, it's really, really good. You can assist and provide feedback as well even if you're not present. So it's really convenient in a dual aspect sort of way for both the student and the lecturer".

"I think because you could actually see who's doing what, and you can see the conversations that are taking place and who offered what, and you know, the participation basically, it's obvious who has engaged and who hasn't because it's right there in front of you."

"You can actually see who has engaged more, you know? Who's trying more, and you can see who's not engaging as well, which is again, is very good to know."

"The idea that you are able to start from scratch, and you're able to go and trace back through each of the steps, so you can see the process basically, and it's not just one final product you know you can see the whole procedure, who has engaged et cetera, it's really, really important."

"In future I think we need to give them specific directions from the beginning, like it's really important, so for example we could outline a little bit better what we're actually asking and what we expect from the procedure."

"It's definitely worth exploring and trying different things. We could even try for example to give them different tasks, so each student in a group has a specific task, so one of them let's say has the responsibility for delivering the rhythmic elements, so one is doing the Drums, one is responsible for the Bass, and so on and at the end of it they have their composition but each member was responsible for a specific element within it. And of course they could exchange ideas and opinions you know, but each one of the guys is responsible for a specific element of the track that has to be put together with the other elements and has to sound as one thing (a cohesive composition). If

somebody selects a specific scale for a bass line then the student that does the melody on top like, he has to "probably" select the same key. You'd hope so anyway!"

"The fact that the platform enhances collaboration, you know, the students don't have to be geographically close to be able to work together, is great. So if they have assignments that they need to collaborate on, which in itself is a really good idea because it works well, then even if they have for example a few days off or, you know, Easter break for example, they just could easily work from home or wherever".

"This is definitely something that could be used for educational purposes, but it also prepares them (students) for scenarios and collaborations within the real world also, so they already know how it works, you know what is expected of you, you know how to collaborate basically, which is super important."

Lecturer 2 :

"It's very easy for the assessor to give feedback. It's really, really good. Excellent actually, because a lot of my feedback that I'd be doing on someone's work, multi-track work, I'd have the multi-track open in front of me, and I'd be taking down notes in regards to where it's happening, and what it is, and the frequency response, or the content, or the issue, where with this I can see it's very visual for the learner, which I really like, so when they're getting feedback it's quite obvious what's going on and exactly what I'm referring to."

"With this (the collaborative platform) I can see exactly who is doing work and who isn't. I can see how I could gauge someone's involvement in the decision making process in other modules too, like what microphone we're going to use on the bass, or what type of recording we're going to go for in the drums, which is so important."

"Any sort of group work, you kind of set deliverables, and everybody sets their goals and targets beforehand, so students have a rough idea of what each person is expected to do beforehand. I can't see anything here that would be a hindrance once students get into it and get used to the platform. I think it's just a question of incorporating Splice into the lesson plan".

"I would definitely use it again, it's really good, and I like the way it's set up in regards to you're looking at it. I could see myself using it purely because of the incremental saves. Incremental saves are such an important aspect of professional production."

"What I like about this is you could do some elements of say the modules that I would work on, which is more recording, editing and mixing, I can see how Splice would be amazing for the group-based projects in regards to editing and mixing. I can also see how this would be really helpful, initially, on preproduction recording."

"In regards to editing and mixing, I could see actually how maybe I might change some assignments so that the editing process is done individually rather than in a group before mixing, and therefore it would be really easy to assess that with Splice, so that would be really handy. Also, giving guidance and giving feedback normally on a large assignment, a CA that is continuous, I would break down into small segments, so there'd be a pre-production grade, and feedback, there would be you know in editing I can see now how their perhaps could be an editing grade, and feedback that could perhaps be individual, but still be group based."

"I could see myself using this then where I've given the entire class a multi track to mix, and where they're perhaps sharing ideas, even though it's an individual assessment, maybe that sharing feedback as well, because I think half of the learning comes from that peer based feedback in particular, and I mean we can pretend it's not happening, but it's happening anyway so I mean it's I think it's absolutely imperative to make that easier for the students."

Lecturer 3 :

"It's really good for formative feedback because you get to do it more frequently. The difficulty of meeting people makes formative feedback less often than you'd like it, mostly, so for sure if the student is going to engage, it gives them a huge benefit to get you for 5 minutes at the end of your day, as opposed to a weekly one hour slot. So yeah, it can really allow people to excel and get more formative feedback, which is what we're trying to push, so very positive from that point of view".

"It's easy, you can use kind of more modern techniques of feedback, it's much more informal, where I suppose, you have to keep an element of formality when you're offering summative feedback, there's a grade, and it has to be very well justified. But here you can offer almost casual, conversational feedback. The more casual nature of the feedback, the collaborative nature is good in that way."

"I found that I always wanted to say to the person, 'just listen to this bit, and listen what I mean about this bit', and having them in the room is the only way to do that, so it (the collaborative platform) is definitely of benefit but it would take me a little bit of time to become convinced to get on board to use it fully, instead of sessions when I'm with the person, but I can see how it's very beneficial as an interim, between the times you meet with people."

"It's really great because you can see who has uploaded and who has made the comment, so that's brilliant. The way that it's stepped, like incremental saves, but they're labelled by the person who's done them. That really helps, and it was actually a gap before in where, we have problems with "how do you really tell who did what in a group project?", because you're never there. So this really does document that quite well and quite neatly."

"I think for everybody, every college in the world, student engagement is crucial, so anything that can help is great."

"I think that if we could have formalised it somewhat so that I could have met with the team, if at all possible, got a feel for the project, everybody got more of a feel for the project and the end goal, then I think we would have all been more on the same page. Proof of concept is great, but if I was to use it in the future then I would formalise it more. Also, some more in-depth instructions on how to use the platform would be good."

"I think that if people were forced to export the composition all of the time, as a smaller file, and I could provide feedback on a phone or anywhere, away from a computer or any music gear, it would be great".

"I would absolutely use it again, but I wouldn't say it's a replacement. For me it's not a replacement, but it would be more of an interim intervention, which is very convenient.

"I think anything kind of shared like that where it can be peer assessed as well I think really really opens it up because, there's almost a fear of that at the moment"

Lecturer 4:

"I found that it made providing formative feedback really easy as I could just dip into the project and provide some pointers and ideas and stuff. I think anything kind of shared like that where it can be peer assessed as well I think really opens it up because, there's almost a fear of that (peer assessment) at the moment".

"My group didn't really engage with it at all. One student didn't interact at all, with no comments, he doesn't seem to loaded or opened the project".

"I really like that you can see what everyone has done. You can see who's taken a run with it, and who hasn't. For example in this case, even though the students didn't engage much, I can clearly see who engaged a little bit, and who didn't engage at all".

"I think because there's a very clear path, so you can see exactly what each person has done, and what each person has kind of brought to it, and even as well if it's entirely that someone isn't actually doing anything but they're driving the creative process, by say asking the right questions in the comments or pointing out where issues lie, there is a strength in that even if that person isn't necessarily like writing the beats, writing the music, using Ableton, so I think it's really good in that sense."

"There's a couple of classes I think it could be quite poignant for. There's the third year class, the audio production for games. We do a lot of sound design at the start of the year, I think it could be

really interesting to have that as a shared global project, so essentially, you open up the classes track, and you throw in your bits and pieces, so everyone has this global palette that they can all kind of share and move on and search from, and then that would simplify things later on. And then again there is some kind of collaborative classes as well, there's a class which myself and Lecturer 1 did this year in terms of we gave a game concept document to the second years for practical composition, and each person got a scene from the game and had to pick instrumentation and keys and stuff, this would be perfect for that."

"It made providing formative feedback really easy as I could just dip into the project and provide some pointers and ideas and stuff. I think anything kind of shared like that where it can be peer assessed as well I think really opens it up because, there's almost a fear of that (peer assessment) at the moment".

"I think anything kind of shared like that where it can be peer assessed as well I think really really opens it up because, there's almost a fear of that at the moment".

Appendix L - Key Focus Group Responses

"It was cool, from what I learned from it, it's definitely something that I'd use again because I just found it easy enough to collaborate, swap ideas and stuff." - Participant 1

"I've never really collaborated before except on a college project or something, forced collaboration really! I think this was great overall." - Participant 2

"Compared to collaborating face-to-face with someone, I found this much easier because I just had the freedom to work on ideas anywhere without having to set a time to meet up and then travel, like it was just time saving, but then I guess that is important." - Participant 3

"Even though my group partner was in Belfast at the time, it just felt like you know, it was just very easy to see what he was doing, where he was going with the track, maybe with a bit more commenting and all that kind of stuff it would have been easier but, I definitely would use it again (Splice) and I'm thinking about using it again with someone else and just asking a random person on Facebook "Do you want to collaborate?" because I'll try and find somebody who is a little bit better than me and try and learn from them at the same time. I think it's great yeah. It's a good way to peer learn." - Participant 4

"It was good, he's a lot better of a producer than me, he's much more polished and knows what he's doing and stuff so I was learning from him when he's handing the session back because I could see the whole Ableton session that he had. I was learning from what he had done because he was doing compression and EQing, things that I wasn't even bothering with because I was just throwing stuff together at the start trying to get something going, and in that way it was great to just learn from somebody who I know is much better than me." - Participant 4

"It's like a really good idea because I know there's situations right now that I'm in and we just can't arrange band practice, our times just kind of clash with one another. I was really excited at the start of the project because there is loads of potential in the idea... I really liked the concept and I definitely wanted to give it a try." - Participant 7

"I was really looking forward to taking part in this (the project) and really enjoyed the collaborative aspect." - Participant 8

"I was kind of limited with my own equipment and supplies, but I really like the idea and I definitely wanted to give it a try." - Participant 10

"My laptop is like 6 years old so it's pretty low spec and old so not really made for this sort of stuff but I still tried to download Ableton and Splice. It didn't go too well!" - Participant 5

"I also didn't really have access to Ableton, I work more in Pro Tools so if it was available for that it would be great as I'm more used to live instruments and I understand Pro Tools more than Ableton, so if it was available for that it would be handy." - Participant 6

"It was good aside from some technical difficulties." - Participant 4

"I was a bit confused like how it actually worked at the start. I don't know, I didn't really know how this whole process worked and I was with Participant 10 trying to make the drum track that we put it, but we were both just kind of confused, we didn't really know how to use it. Like we did figure out how to upload the stuff but I didn't know how to drag it back in and then work on top of that." - Participant 9

"All three of us sort of experienced confusion, we didn't really know how it worked, how to really sync it all up together. We got there in the end though" - Participant 1

"I didn't really understand the commenting system initially, like how you can respond to someone's comments so well like if you're getting feedback, but overall it seemed really easy to and simple enough to share ideas." - Participant 4

"There was a little bit of a lack of communication overall, the other guy wasn't present all of the time and we went on four or five different tangents from each other." - Participant 8

I definitely would use it again (Splice) and I'm thinking about using it again with someone else and just asking a random person on Facebook "Do you want to collaborate?" because I'll try and find somebody who is a little bit better than me and try and learn from them at the same time. I think it's great yeah. It's a good way to peer learn." - Participant 4

Appendix O - Group Interaction Data Tables

Group 1 - Lecturer 1

Number of Student Participants	2
Composition Iterations	25
Composition Descriptions	8
Student Comments and Interactions	10
Lecturer Comments and Interactions	4
Final Composition Exported	Yes

Group 2 - Lecturer 2

Number of Student Participants	3
Composition Iterations	12
Composition Descriptions	5
Student Comments and Interactions	8
Lecturer Comments and Interactions	3
Final Composition Exported	Yes

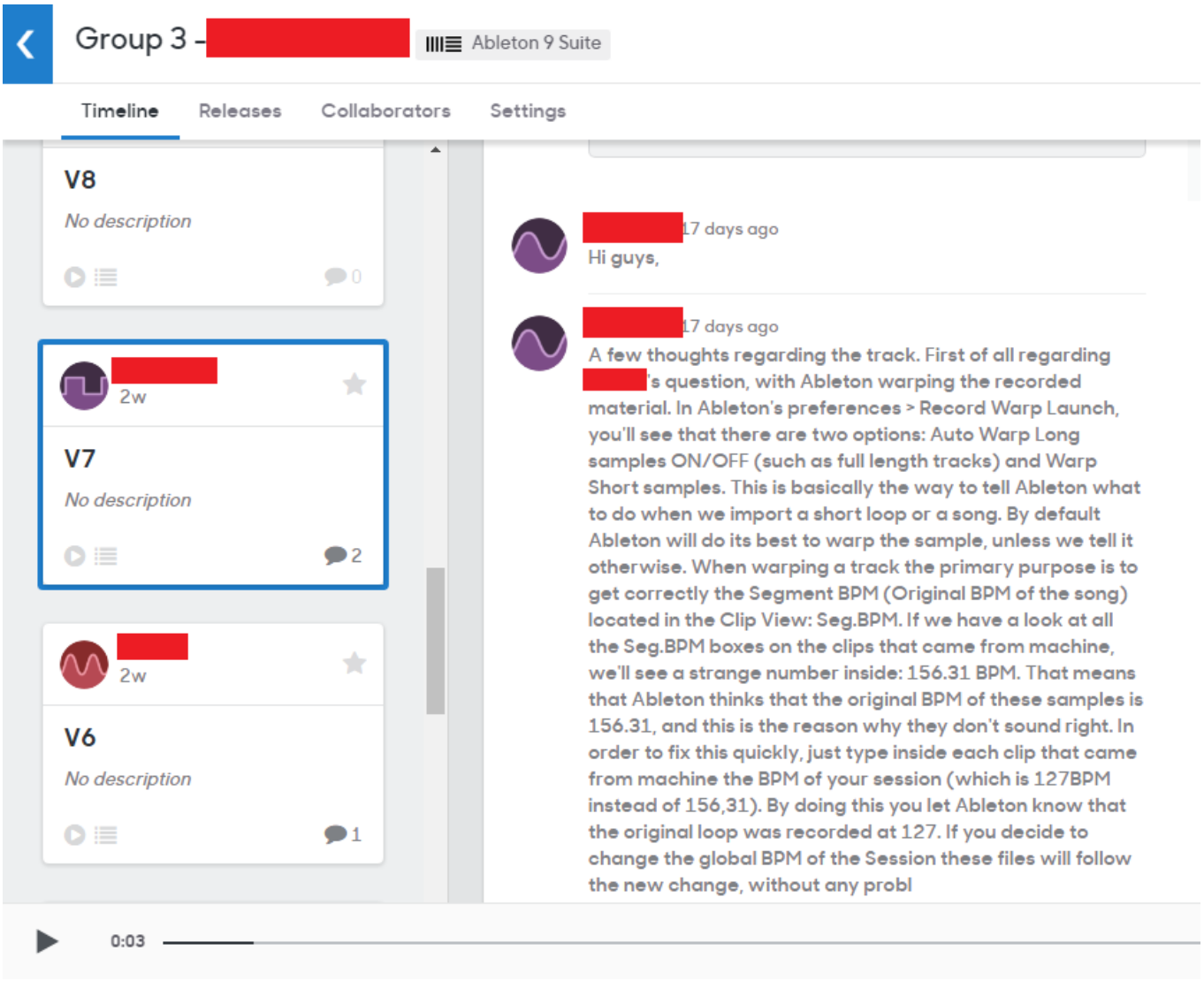
Group 3 - Lecturer 3

Number of Student Participants	2
Composition Iterations	37
Composition Descriptions	6
Student Comments and Interactions	14
Lecturer Comments and Interactions	5
Final Composition Exported	Yes

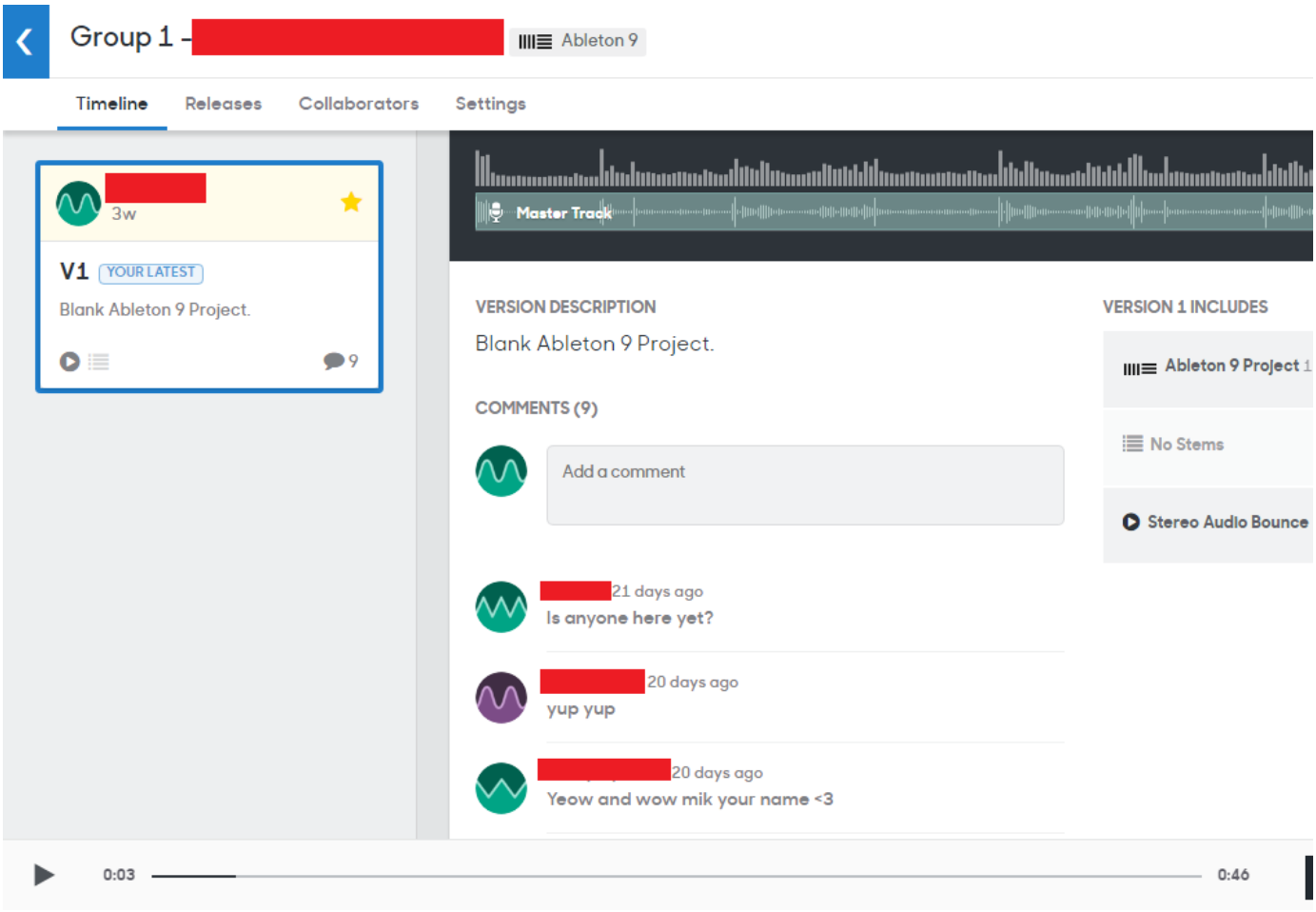
Group 4 - Lecturer 4

Number of Student Participants	3
Composition Iterations	1
Composition Descriptions	1
Student Comments and Interactions	4
Lecturer Comments and Interactions	2
Final Composition Exported	Yes

Appendix P - Screenshot of Lecturer Feedback in Splice



Appendix Q - Screenshot of Initial Student Interaction in Splice



Appendix R - Screenshot of Advanced Composition in Splice