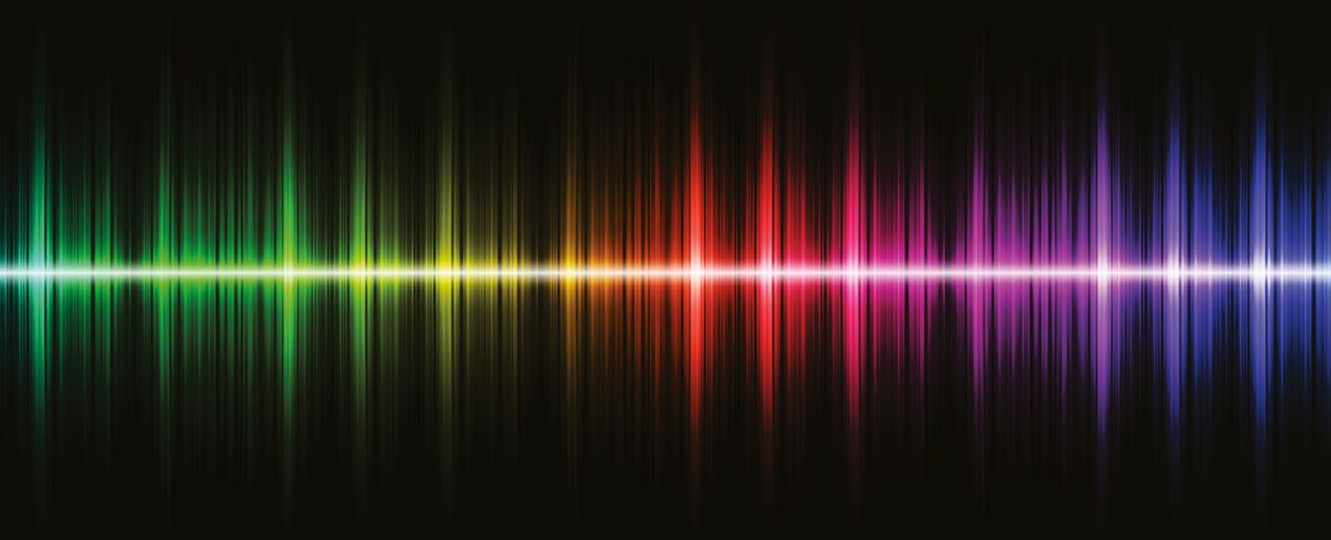
Learning Through Producing

The Pedagogical and Technological Redesign of a Compulsory Music Course for Finnish General Upper Secondary Schools

ALEKSI OJALA



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Learning Through Producing:

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Studia Musica 74

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Learning Through Producing: Pedagogical and Technological Redesign of a Compulsory Music Course for Finnish General Upper Secondary Schools

Tuottamispohjainen oppiminen: Lukion pakollisen musiikin kurssin pedagoginen ja teknologinen uudelleensuunnittelu

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Abstract

This scientifically oriented applied study is comprised of two blind peer-reviewed articles, two sets of e-learning materials, and a summary report. The study focuses on developing practical e-learning materials and theoretical principles for a novel pedagogical approach named *Learning Through Producing* (LTP). The rationale for the developmental work arose from the notion that collaborative and technologically aided creative music making seems to take place only randomly in many Finnish secondary music classrooms although core curricula for Finnish general upper secondary schools have guided music teachers to implement collaboration, creative work and the use of technology to their teaching for decades. The intent of LTP is to open up one possible way of systematically broadening the scope of institutional general music education, from reproduction and performance towards sustained interaction with shareable musical artefacts such as tracks and music videos.

The LTP approach was developed in the context of the Finnish general upper secondary school compulsory music course, using design-based research as a methodological toolkit. After the initial principles of LTP were addressed and the preliminary conceptual prototypes of the e-learning materials were developed, both sets of e-learning materials were re-developed, first with author's own students (1st and 2nd research cycle), and then towards the end of the research period in four different Finnish general upper secondary schools (3rd research cycle), with the intent of creating new understandings that would lead to developing the generative principles of LTP.

The conclusions of the study are primarily drawn from an analysis of the student-participants' course diaries, surveys, and video-recorded group interviews. The findings indicate that when musical knowledge and skills are constructed through arranging, songwriting, sound engineering, recording, and mixing students are able to work in their zone of proximal development, form music-related communities of practice, negotiate their musical identities, and work with tools and musical materials that they find relevant. LTP also seems to offer the possibility of harnessing the use of digital technology for musical learning in general upper secondary school. However, technology should not be used to replace, but rather augment the use of traditional instruments and face-to-face interactions with peers and teachers. The findings further suggest that, in order to effectively and purposefully learn music through producing, most students benefit from being introduced to the use of musical elements and tools in various cultural situations before the creative work in

producing teams takes place. While a collective knowledge and skill base can be successfully built through hands-on music making in the music classroom, the use of e-learning materials and mobile devices can successfully provide opportunities for personalized learning. However, wider and longer term studies would be required to assess these finding outside the scope of Finnish general upper secondary school compulsory music course.

Keywords

General music education, Popular music, Music producing, Blended learning, Collaborative learning, Design-based research

Tiivistelmä

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Tämä tieteellisesti painottunut soveltajakoulutuksen opinnäytekokonaisuus koostuu yhteenveto-osasta, kahdesta vertaisarvioidusta artikkelista sekä kahdesta verkko-oppimateriaalista. Tämän tutkimushankkeen tavoitteena on ollut kehittää ja testata koulujen musiikinopetukseen soveltuvaa tuottamispohjaisen oppimisen menetelmää *(Learning Through Producing)*, jossa musiikkia opitaan säveltämisen, sovittamisen, sanoittamisen, äänittämisen ja miksaamisen kautta. Tässä tutkimuksessa tuottamisella tarkoitetaan pitkäkestoista luovaa tiimityöskentelyä jaettavien musiikillisten artefaktien parissa. Tuottamispohjaisen oppimisen menetelmän kehittämisen tarpeellisuutta voidaan perustella aiemmalla tutkimustiedolla, jonka mukaan luova ja teknologia-avusteinen tiimityö toteutuu yläkoulujen ja lukioiden musiikinopetuksessa vaihtelevasti vaikka opetussuunnitelmatekstit ovat jo pitkään peräänkuuluttaneet yhteisöllisyyteen, luovaan työskentelyyn ja teknologian hyödyntämiseen perustuvien työtapojen tärkeyttä koulujen musiikinopetuksessa.

Tutkimushanke toteutettiin käyttämällä kehittämistutkimusta (design-based research) metodologisena työkalupakkina lukion pakollisen musiikinkurssin kontekstissa. Kehittämistutkimuksen periaatteiden mukaisesti kurssin uudelleensuunnittelu toteutettiin kehittämällä ja testaamalla kahta verkko-oppimateriaalia kolmessa eri tutkimussyklissä. Kun tuottamispohjaisen oppimisen alustavat tavoitteet olivat selvillä, molemmista verkko-oppimateriaaleista kehitettiin prototyypit, joita tutkija testasi kahdessa eri tutkimussyklissä omien oppilaidensa kanssa. Kolmannessa tutkimussyklissä uudelleen kehitettyjä verkko-oppimateriaaleja testattiin neljässä eri lukiossa. Kahden ensimmäisen syklin tavoitteena oli saada selville miten opiskelijat käyttivät verkko-oppimateriaaleja ja miten niitä pitäisi heidän mielestään kehittää. Kolmas sykli tähtäsi ennen kaikkea yleistettävän tuottamispohjaisen musiikinoppimismenetelmän periaatteiden kehittämiseen.

Tutkimusaineisto koostuu opiskelijoiden kurssipäiväkirjoista, opiskelijoiden haastatteluista ja opiskelijoille teetetyistä kyselyistä. Tutkimusaineistosta vedetyt johtopäätökset viittaavat siihen, että kun musiikillista tietoa, taitoa ja identiteettiä rakennetaan oman musiikin tuottamisen kautta, opiskelijoille avautuu mahdollisuuksia työskennellä omalla lähikehityksen vyöhykkeellään, muodostaa käytäntöyhteisöjä ja opiskella heille itselleen olennaisten musiikillisten materiaalien ja

työkalujen parissa. Tuottamispohjainen oppiminen näyttää myös tarjoavan mahdollisuuksia valjastaa digitaaliteknologian tuomia mahdollisuuksia musiikin oppimiseen lukiossa. Tulosten pohjalta voidaan todeta, että digitaaliteknologiaa ei tulisi käyttää korvaamaan, vaan laajentamaan musiikkiluokassa tapahtuvaa vuorovaikutusta ja koulu- ja bändisoittimista koostuvaa instrumenttivalikoimaa.

Tutkimuksen perusteella voidaan todeta, että useimmat opiskelijat kokevat luovan työskentelyn tuotantotiimeissä motivoivaksi ja hauskaksi, mikäli he ovat sitä ennen tutustuneet toisiinsa, musiikin peruselementteihin ja keskeisimpiin musiikillisiin työkaluihin. Musiikin luovaa tuottamista pohjustava kollektiivinen tieto- ja taitopohja voidaan tutkimusaineistosta vedettyjen johtopäätösten mukaan menestyksekkäästi rakentaa luokassa tapahtuvan yhteismusisoinnin avulla, kun taas verkko-oppimateriaalien ja mobiililaitteiden käyttö tarjoaa opiskelijoille mahdollisuuksia personoitujen oppimispolkujen rakentamiseen. Tutkimustulosten yleistäminen lukion pakollisen musiikinkurssin kontekstin ulkopuolelle vaatisi kuitenkin pitkäkestoisemman ja laaja-alaisemman tutkimuksen toteuttamista.

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Helsinki, August 2017 Aleksi Ojala

Published works by the author incorporated into the thesis

Ojala, A., & Väkevä, L. (2015). Keeping it real: Addressing authenticity in classroom (popular) music pedagogy. *Nordic Research in Music Education Yearbook, 16*. [Article 1, Incorporated in appendix A]

Ojala, A. (2017). Developing learning through producing: Secondary school students' experiences of a technologically aided pedagogical intervention. In: Smith, G.D., Moir, Z. Brennan, M. Rambarran, S., & Kirkman, P. (Eds.), *The Routledge research companion to popular music education.* New York, NY: Routledge. [Article 2, Incorporated in appendix B]

Short video-based e-learning material
[Development Project 1, Incorporated in Appendix C]

E-learning material that is optimised for tablet computers
[Development Project 2, Incorporated in Appendix D]

Additional published works by the author

Ojala, A. (2010). Is authenticity in formal education possible? In Rikandi, I. (Ed.) *Mapping the common ground: Philosophical perspectives on Finnish music education* (pp. 68–83). Helsinki, Finland: BTJ.

Korpela, P., Kuoppamäki, A., Laes. T., Miettinen, L., Muhonen, S., Muukkonen, M., Nikkanen, H., Ojala, A., Partti, H., Pihkanen, T., & Rikandi, I. (2010). Music education in Finland. In I. Rikandi (Ed.) *Mapping the common ground: Philosophical perspectives on Finnish music education* (pp. 14–31). Helsinki, Finland: BTJ.

Presentations by the author relevant to this work

Ojala, A. (29 July 2016) *Widening the perspective of general music education: learning through producing.* Paper presented at the 32nd International Society for Music Education (ISME) Conference. Glasgow, Scotland.

Ojala, A. (9 March 2016) *The role of mobile devices and e-learning materials in learning music through producing.* Paper presented at the 20th Nordisk Nettverk for Musikkpedagogisk Forskning Conference: Technology and creativity in music education (NNMPF). Hamar, Norway.

Ojala, A. (16 April 2015) *Learning Through Producing – music pedagogy for digital natives?* Paper presented at the Ninth International Research in Music Education Conference (RIME). Exeter, England.

Ojala, A. (17 October 2014) *The possibilities of producing, blended learning and online videos in school music education – a case of Rockway.* Keynote paper presented at the Seventh Intercultural Arts Education Arts, Technology and Cultures Conference: From Invisible to Visible. Helsinki, Finland.

Myllykoski, M., & Ojala, A. (16 April 2013) *Design and development of tablet-based compulsory music course.* Paper presented at the first virtual Conference for the International Society for Music Education (ISME) Music Technology Special Interest Group.

Ojala, A., & Väkevä, L. (23 July 2012) *Producing-based music pedagogy: A solution to the problem of authenticity in music education?* Paper presented at the first Rock & Roles Conference. London, England.

Contens

1 Introduction

When I began part-time teaching in the late 1990s, at first I used the reproduction and performance-based approach, which has been the dominant paradigm of Finnish general music education for decades (Muukkonen, 2010). Although this approach seemed to work quite well, especially when I encouraged students to bring their favourite songs to class, I felt that something was missing. Given that songwriting and producing had been at the centre of my personal self-expression as a popular musician[1], I wanted to include more creative music making such as composing and improvising in my teaching. Hence, I asked my teenage students to form friend-based bands and write their own songs at the end of the course, working in their *own songwriting corners* that I had set up in the available classrooms.[2] In my master's thesis (Ojala, 2001) I examined how a lower secondary school elective songwriting course could be put into practice, and I used the results of this case study to develop practical course instructions for other music teachers.

The original goal of my licentiate studies, which I began in 2003 at the Sibelius Academy, was to create a printed songwriting tutorial for music teachers, test it in schools during an action research project, and make a notebook and CD based on songs that students wrote during this intervention. At some point, I realized that I wanted to develop learning materials for students, rather than use the music teachers as the target group. Moreover, although I still wanted to help students write and learn music through the songwriting process, I also wanted to help them record and mix their songs, so that they would be able to share their works outside the music classroom.

1 My personal experiences have strongly influenced my work as a music teacher and as a researcher. I began to study classical piano in the early eighties, when I was seven years old, but soon I fell in love with popular music when I started to play in a band and write my own songs. During my adolescence I worked as a drummer, a keyboard player, and a singer in dozens of bands in the pop/rock scene of Joensuu, my hometown. Eventually one of my bands got a record deal from a Finnish indie record label in 1997. Five years later I signed a record deal with Universal Music for two albums as a solo artist. It is fair to say that even though I somehow struggled through my formal classical and pop/jazz training in conservatory and at university, I would not be a musician, an artist, a music teacher, and a researcher without the satisfactory and engaging learning experiences acquired through the songwriting and music producing processes. While composing, arranging, writing lyrics, recording, and mixing, I have spent thousands of hours studying music without necessarily even noticing it.

2 Without knowing it at the time, this practice was much like stage 4 of Lucy Green's *New Classroom Pedagogy* (2008).

After I attained my present post as a general upper secondary school music teacher in 2005, I had the opportunity to install a decent studio setup in a small space next to the music classroom. I taught all of my students the basics of laptop producing, such as how to record audio tracks, use software instruments, and create rough mixes. The problem was that all the students wanted to record and mix their songs in the studio more or less at the same time, at the end of the course. Later, the possibility to use the school's tablet computers and the students' own mobile devices solved this problem, and also opened up new possibilities for collaborative creative work in producing teams.

Over the years I have gradually expanded the length and depth of the producing projects in my own teaching and realized that everything we do in the music classroom supports the producing process, which in turn supports musical learning. By 2009 when I began my doctoral studies at the Sibelius Academy, I had systematically developed and tested the practical and theoretical principles for a novel approach, named Learning Through Producing (LTP). The general goal of LTP is to provide an opportunity to expand the perspective of general music education from reproduction to creative work, such as improvising, arranging, and songwriting, and from performance to producing shareable artefacts, such as tracks and videos. It is important to realize that the ultimate goal of LTP is not to teach students how to produce music, but to allow them to construct their musical knowledge, skills, and agency through the producing process.

In this study, producing is seen as an approach that supports trialogical musical learning (see Chapter 2.4). Trialogical learning emphasizes sustained, technologically mediated interaction through shared objects (Hakkarainen & Paavola, 2014; Paavola & Hakkarainen, 2005, 2009). In other words, here producing is conceived as collaborative, technologically aided creative music making, that may involve writing music and lyrics, arranging, sound sculpting, recording, mixing, and remixing—in other words, the whole span of the artistic-cultural processes of the creation of shareable musical artefacts.

At the Sibelius Academy one can choose between three types of doctoral studies: a scientific option, an artistic option, and the applied option, which I have chosen. The goal of the Sibelius Academy's applied program is to produce new experts, as well as innovative pedagogical or technical applications in the students' own fields (The University of the Arts, Helsinki, 2015). This scientifically oriented applied study comprises a summary report, two blind peer-reviewed articles (Ojala & Väkevä,

2015; Ojala, 2017), and two developmental projects. The development work was done using design-based research (DBR) as a methodological toolkit, in the context of the Finnish general upper secondary school compulsory music course, entitled *Music and Me*.[3] In educational contexts DBR allows the researcher to directly impact the practice by developing and testing a pedagogical innovation—in this case, two sets of e-learning materials—with the goal of generating approaches that can be generalized for use in other classrooms (Barab, 2014). In the present study this was achieved by developing a six-phase model for applying DBR, (see Figure 1).

The model for applying DBR in this study was modified from Reeve's (2006) and Mor's (2010) models for applying DBR. This means that the first and the second research cycles included the following phases: (1) framing the aims, (2) developing the e-learning materials, (3) testing the e-learning materials, (4) collecting data, (5) analysing data, and (6) drawing conclusions (see Figure 1). However, the third research cycle included only the last four phases, as will be explained later.

Figure 1: A six-phase model for applying DBR.

3 The fundamental aim of this course, 38 hours long, is to help students to find their own ways of operating within the field of music (Finnish National Board of Education, 2003).

This summary report will shed light on the theoretical exploration, context, research objectives, and questions (see Chapters 2, 3, and 4), as well as the methodological framework, methods, research design, and design narrative of this study (see Chapters 5 and 6). The summary also introduces the key findings and implications of the study, discusses their implementations for formal music education, and evaluates the study (see Chapters 7 and 8).

2 Theoretical points of departure

The identification of a significant educational problem is crucial when conducting a DBR project, since the creation and evaluation of a potential solution to such a problem forms "the focus of the entire study" (Herrington, McKenney, Reeves, & Oliver, 2007, p. 4092). Hence, in this chapter, I aim to provide a "convincing and persuasive argument" of the educational problem that is "worth researching" from both the practical and scientific points of view (Herrington et al., 2007, p. 4092; see also Amiel & Reeves, 2008; Bannan-Ritland, 2003; Joseph, 2004).

2.1 Earlier research on technologically aided creative music making

For decades, many music education researchers have acknowledged the need to support students' possibilities for creative work (e.g. Burnard, 2012; Paynter & Aston, 1970; Schafer, 1965; Wiggins, 1990; Younker, 2000). Scholars have been investigating for instance children's compositional processes (e.g. Delorenzo, 1989; Glover, 2006; Kratus, 1994; Muhonen, 2014) and compositional products (e.g. Barrett, 1996; Davies, 1986, 1992; Swanwick & Tillman, 1986). More recently, songwriting of young students has also been of interest to researchers (e.g. Farish, 2011; Wiggins, 2011).

Scholars have suggested different reasons why creative music making should be at the core of institutional music education. For instance, composing has been seen as an effective way to promote the theory, practice, and appreciation of music, and as a way to support students' opportunities to develop their emotional capacities, collaboration skills, and musical agency (e.g., Barrett, 2003, 2006; Espeland, 2003; Fautley, 2005; Kaschub & Smith, 2009; Muhonen, 2016; Strand, 2006; Westerlund, 2002).

The concept of musical agency refers to individuals' perception of their potential to act and interact musically, and is closely related to the notion of musical identity (Karlsen, 2011; Karlsen & Westerlund, 2010; MacDonald, Hargreaves, & Miell, 2002; Partti & Karlsen, 2010; Ruthman, 2008; Stålhammar, 2006; Wiggins, 2016). Given that young people are highly engaged in the process of personal identity development, they encounter learning initiatives primed with such questions as: "What does this mean to me?" and "What can I use this for?" (Illeris, 2009, p. 18).

Thus, learning can be seen as a part of becoming the kind of person one wants to become (Collins & Kapur, 2014; Lave & Wenger, 1991; Wenger, 1998). Today, people experience music in diverse ways, and in diverse contexts (MacDonald, Hargreaves, & Miell, 2002). Gracyk (2004) points out that especially during the teenage years and young adulthood "an individual's relationship to music plays a profound role in the formation of the very idea of self-identity" (p. 9; see also Ruthmann & Dillon, 2012). Moreover, identity work takes place in interaction with significant others (Taylor, 1991), and building an identity incorporates the meanings of our experiences of "membership in communities of practice" (Wenger, 1998, p. 38), including those in the musical context.

The rise of postmodern society has dramatically affected learning, by enabling people "to learn when they want… how they want… and what they want" (van den Brande, 1993, p. 2; see also Brown, 2010; Collins & Halverson, 2010; Prensky, 2010). Although this transition has not caused major changes in educational institutions on a global scale, it has put pressure on schools to change the focus from providing learning that is delivered "just-in-case" to learning that is delivered "just-in-time" (Traxler, 2007, p. 5). This kind of *authentic* learning "involves real-world problems and projects that are relevant to the learner" (Traxler, 2007, p. 7). The transition has also raised important issues about the status of traditional learner-teacher relationships: How will classrooms function as places of learning when students increasingly find content, support, and opportunities for learning in communities outside the school walls (Brown, 2010)? What kinds of qualifications are required for teachers to cope with such conditions?

The increasing availability of computers and mobile devices in schools has significantly changed the music composing, production, and dissemination processes in recent years and, in turn, has started a growing trend in music education research (e.g. Breeze, 2011; Chen, 2012; Folkestad, 1998; Kirkman, 2011; Martin, 2012; Mellor, 2008; Nilsson, 2003; Pitts & Kwami 2002; Ruthman, 2007; Savage 2012; Thorgersen, 2012; Ward, 2009; Wise, Greeenwood, & Davis, 2011). The creative use of music technology provides multiple opportunities for pedagogical experimentation, development work, and research in music education (Ruthmann & Hebert, 2012). Practitioners and researchers are currently searching for meaningful ways to use new devices and their applications as an integral part of musical learning (Juntunen, 2015). For instance, Brown (2015) suggests that digital music technology can be seen, to varying degrees, as a tool (i.e., a device to be controlled), as a medium (i.e., a conduit for artistic communication), or as an instrument (i.e., an amplifier of musical expression).

The use of technology in music education is also considered to provide opportunities for creative and active collaboration (Burnard, 2007; Dillon, 2010), to develop a critical awareness, autonomy, and project management skills (Odena, 2012; Zhou, Percival, Wang, Wang, & Zhao, 2011), to increase students' motivation towards studies (Karsenti & Fievez, 2013; Kinash, 2011), and to empower students' musical agency (Ruthman & Dillon, 2012). The most obvious and perhaps the most important advantage of digital technology, at least from the viewpoint of this study, is the fact that its use makes producing and sharing one's own music relatively easy and affordable (Bolton, 2008; Crow, 2006).

Digital technology also enables new ways of sharing music-related knowledge and skills. New technologies made possible by fast Internet connections have enabled the rise of the user-generated content (UGC) that has blurred the distinction between traditional user and producer roles (Bruns, 2008).[4] Bruns (2008) calls this continuous creation by collaborative communities *produsage* (p. 9). One can argue that the transition from the traditional producer-distribution-customer chain to produsage has been exceptionally clear in the field of music (Théberge, 1997; Zager, 2012). These major transformations in global music culture have challenged the romantic stereotype of the creator as an individual genius, and marked the rise of multiple musical creativities and the emergence of a new musicianship that is based on mastery of digital musical tools (Burnard, 2012; Hugill, 2008). For instance, it seems that in contemporary popular music there is no longer a clear line between creating, producing, and performing.

However, many scholars have also pointed out that teachers seem to lack personal experiences in promoting technologically aided musical creation, and in the development of versatile musicianship (Jorgensen, 2008; Kaschub & Smith, 2009; Kilpiö, 2008; Muukkonen, 2010; Partti, 2013; Randles & Muhonen, 2014). While music teachers often implement practices that they have adopted themselves (Sternberg & Kaufman, 2010), research suggests that practical barriers, such as lack of time, inappropriate classrooms, big class sizes, and the infrequency of music lessons have diminished music teachers' willingness to apply creative approaches, such as composing (Hopkins, 2013; Juntunen, 2011; Leung, 2004; Lewis, 2012; Miller, 2004; Muhonen, 2016; Oltedal, 2011). Hence, music teachers seem to need practical solutions and pedagogical support regarding how to organize their teaching in a way that supports creativity (Juntunen, 2015; Partti, 2015).

4 The rise of the UGC relates to a larger emerging cultural phenomenon that has been referred by scholars for instance as participatory culture (Jenkins, Purushotma, Weigel, Clinton, & Robison, 2009), or sharing culture (Aigrain & Aigrain, 2012; Davis, Carr, Howard, Millard, Morris, & White, 2010).

2.2 E-learning strategies in schools

Perhaps one of the first scholars who realized that computers provided an opportunity to transform teaching practice into a active, participatory learning style was Seymour Papert who expanded Jean Piaget's constructivist psychology into pedagogical principles that has become known as constructionism (Kafai & Resnick, 2012; Kafai, 2006). In the early 1980s, when computers "were ready to move out of the university laboratories into the world" (Kafai, 2006, p. 37) Papert's Logo programming language "provided a testing bed for engaging students in problem solving and learning to learn" (Kafai, 2006, p. 36). By the end of the 20th century many countries, including Finland, had begun to formulate policies to apply ICT in schools (Kozma, 2003). However, the impact of these investments seemed disappointing, since the use of computers did not correlate with improved student performance (Cuban, 2001). When researchers began to look at why computers were having so little impact, they discovered that the computers were being used mostly as add-ons to existing instructional classroom teaching (Cuban, 2001). Some commentators believe that this notion seems to be valid up to the present date (Henderson & Yeow, 2012; Kinash, 2011; Sawyer, 2014).

Today, computers and digital technology are still often viewed either with naive techno-centrism or scepticism in schools (Stahl, Koschmann, & Suthers, 2014). It seems to be especially difficult for teachers to appropriate and keep pace with the introduction of the open, collaborative, and contribution-based tools provided by Web 2.0 that boost the student-centred, interactive approaches being advocated by contemporary educational theory (Bower, Hedberg, & Kuswara, 2010; Ritella & Hakkarainen, 2012). Mikkilä (2013) suggests that the same is also true of Finnish general upper secondary schools. For instance, Finnish general upper secondary school students seem to have different experiences of how they use ICT at school as compared to how they use ICT after school (Mikkilä, 2013).

In practice, the rise of networked technologies in schools has been adapted through partly overlapping, and compatible forms of e-learning strategies, such as blended learning, flipped learning, and mobile learning. I will next briefly introduce these e-learning strategies. In this study, e-learning means "the use of information and computer technologies to create learning experiences" (Horton, 2002, p.1). Here blended learning refers to educational designs that are generally considered to involve an appropriate combination of online and face-to-face activities (McGee,

2014; Strayer, 2012).[5] Flipped learning means a specific type of blended learning, which uses technology to move teaching outside the classroom in order to use the classroom time more efficiently for interactive and group-based problem-solving activities (Hawks, 2014; Moffett, 2014; Sams, 2013; Strayer, 2012; Wallace, 2014).[6] In turn, mobile learning (m-learning) utilises the ubiquitous and ambient opportunities for personalisation, social interactivity, and connectivity made possible by such mobile devices as smartphones and tablet computers (Pachler, Cook, & Bachmair, 2010; Seipold, 2014). Although e-learning has recently attracted academic interest, especially m-learning has raised deep ethical issues of students' privacy (Sharples & Pea, 2014). McGee (2014) also points out that the use of technology will not, in itself, guarantee effective learning strategies for students (see also Seipold, 2014). Nevertheless, the above-mentioned e-learning strategies have provided new ways to move from using software that guides students to learn as isolated individuals to computer-supported collaborative learning (Stahl, Koschmann, & Suthers, 2014).

2.3 A trialogical approach to computer-supported collaborative learning

Computer-supported collaborative learning (CSCL) research focuses on investigating how digital technology could bring students together to learn collaboratively and creatively in learning communities (Stahl, Koschmann, & Suthers, 2014). Moreover, CSCL researchers are interested in examining the connection between learning in a group and the learning of an individual group member. As CSCL has developed, researchers have discovered that the interplay of computer support and collaborative learning is challenging (Stahl, Koschmann, & Suthers, 2014). In this study, Hakkarainen & Paavola's (2009) trialogical approach is introduced as one possible way to overcome these challenges to CSCL in the context of formal music education.

The emphasis of a trialogical approach is not only on individual learner (a monological approach) or on the community (a dialogical approach), but on the way people collaboratively develop cultural artefacts (Paavola & Hakkarainen, 2005). The notion of trialogical learning owes a great deal to sociocultural and cultural historical theories about human cognition. For instance, Papert's constructionism comes close to many aspects emphasized in trialogues (Paavola & Hakkarainen,

5 Blended learning is sometimes referred as a hybrid, or mixed-mode classroom.

6 Flipped learning is also known as flipped classroom, inverted classroom, or reverted instruction.

2005, 2009). Sociocultural learning theory is founded on the notion that all intelligent behaviour is realized both in technical environments filled with tools and machines, and in social environments filled with collaborators and partners (Reich, 2009). The proponents of the sociocultural theory of learning draw on the ideas of Russian psychologist Lev Vygotsky, who argued that social interaction was the primary driver of intellectual development (Vygotsky, 1978). Vygotsky (1978) understood cultural constructions as expressions of human activities that are manifested as productive forces. He contended that students could perform on a higher level when the teacher or more competent peers help them to reach their zone of proximal development (Vygotsky, 1978). This can be accomplished through practices like scaffolding (Wood, Bruner, & Ross, 1976), meaning support tailored to meet the "learner's needs in achieving his or her goals of the moment" (Sawyer, 2014, p. 41). Moreover, trialogical learning is deeply rooted in previous models of innovative knowledge communities, such as Engeström's (1987) theory of expansive learning, Nonaka and Takeuchi's (1995) theory of organizational knowledge creation, and Bereiter and Scardamalia's (1993) knowledge building approach (Paavola & Hakkarainen, 2005, 2009; Hakkarainen & Paavola, 2014).

The trialogical approach aims to support the learners' sustained, focused learning when they are developing shareable artefacts collaboratively (Paavola & Hakkarainen, 2005; Hakkarainen & Paavola, 2014).[7] As illustrated in Figure 2, the development of shared objects has a prominent role in trialogical learning (Paavola & Hakkarainen, 2009). These objects can be, for instance, externalized ideas, plans, documents, models, project works, designs, practices, or concrete material products (Hakkarainen & Paavola, 2014; Paavola & Hakkarainen, 2005, 2009;). They are developed iteratively, since "novelty and innovation emerge only through sustained processes" (Paavola & Hakkarainen, 2009 p. 86). Moreover, the collaborative development of objects is supported by "appropriate technologies that help the participants to create and share as well as elaborate, reflect and transform knowledge artefacts and practices" (Paavola & Hakkarainen, 2009, p. 97). Even though new technology can offer opportunities for fluent and organized collaborative work, thereby supporting trialogical learning, it is important to realize that the use of technology as such is no guarantee of trialogicality (Paavola & Hakkarainen, 2005, 2009; Paavola, Engeström, & Hakkarainen, 2012).

7 Writing a research article collaboratively using web-based application is one example of the use of trialogical approach.

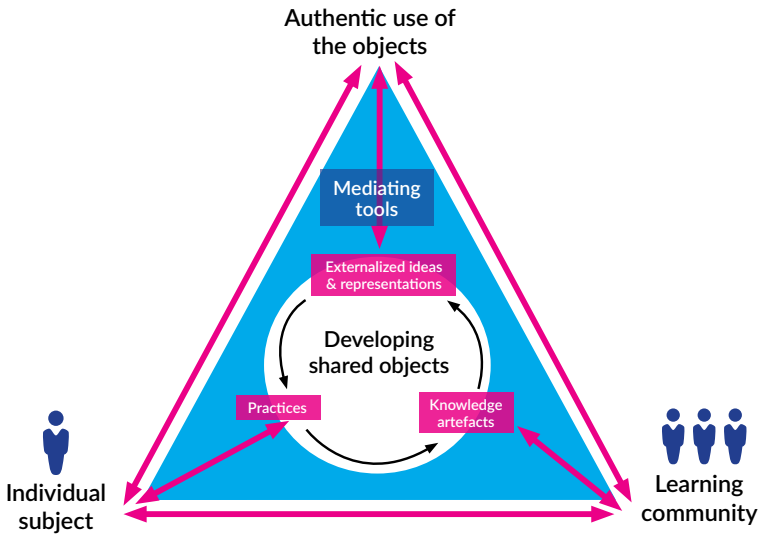

Figure 2: An illustration of the trialogical approach to learning (modified from Paavola & Hakkarainen, 2009, p. 87).

2.4 Music producing with mobile devices in the music classroom

In this study, producing is understood as collaborative, technologically aided creative music making, which caters to students' possibilities for trialogical learning (see Chapter 6.1). In the record industry, producing is one of the core creative practices, especially in rock music (Gracyk, 1996), Hip-Hop (Rose, 1994), and electronic dance music (EDM) (Butler, 2006).[8] In general, a professional record producer is responsible for the overall sound and creative quality of music production (Zager, 2012). In rock music, the music producer often functions as a creative leader of the recording project, acting in a role that, according to Gracyk (1996), transformed the aesthetic focus of the genre in the1960s from performance to production (see also, Burgess, 2014; Moorefield, 2005; Owsinski, 2010). In Hip-Hop and EDM, producers are frequently responsible for composing and recording the backing tracks (Butler, 2006; Rose, 1997; Zager, 2012).

8 The analysis of how recorded music has been produced during different historical eras is also seen as an emergent academic field (Frith & Zagorski-Thomas, 2016).

The evolution of music production has always been directly related to the creative use of music technology (Zager, 2012). Bell (2015) points out that the proliferation of laptop computers has resulted in digital audio workstations (DAWs), such as Apple's GarageBand, becoming widely distributed musical tools. He asserts that DAWs have the "capability to sequence, record, and mix music" and that they can also be 'played' using soft synths (software synthesizers) that emulate every instrument imaginable" (Bell, 2015, p. 45). Thus, music that could previously only be produced in a costly recording studio can today be created whenever inspiration appears (Bell, 2015; Zager, 2012).

Lately, music production has been made increasingly possible through mobile devices (Myllykoski & Paananen, 2009), heralding the beginning of a new era for music production (Bell, 2015). For instance, cartoon style supergroup Gorillaz produced their 2010 album, titled *The Fall,* on the road using mainly Apple's iPad (The Guardian, 2010). iPad effectively exploits touch screen gestures in the mobile audio workstation (MAW) environment (Bell, 2015). The use of MAWs can been seen as a "universal 'solution' to music-making that results from 'dissolving' the barriers that prevent people from experiencing their untapped musicality" (Bell, 2015, p. 45). The use of ready-made loops common to these applications has brought music producing within the reach of "almost everyone" (Väkevä, 2010, p. 61).

The new opportunities that mobile music technology has provided for creative music making have also recently been acknowledged in the research on music education (see e.g. Criswell, 2012; Rajan, 2014; Randles, 2013; Riley, 2013; Williams, 2014). The fact that, today, students carry devices that have the capability to be "all-in-one musical-instrument-recording-studio[s]" (Bell, 2015, 46) offers manifold opportunities for formal music education. However, since the results of the use of these devices are limited primarily by the musical skills and knowledge of the user, the educative use of music production tools depends on educators' abilities to recognize the potential, constraints, and conventions of the technology at hand (Bell, 2015; Regelski, 2007). Bell (2015) points out that a learning approach where the student is left alone to experiment with the use of DAW or MAW might not be ideal for formal education, considering that the music software and applications guide inexperienced users to use ready made loops and presets, and thus "to compose in a generic method" (p. 58). One could argue that students benefit if they have a collective musical knowledge and skill base before the collaborative creative work takes place, as suggested later in this study.

3 Musical learning in the context of the Finnish general upper secondary school compulsory music course

The current world is clearly a different place to grow up than it was a hundred, fifty, or even twenty years ago. For instance, when I studied in general upper secondary school in the early nineties, I could not imagine the possibilities of the Internet, whereas my students today probably could not imagine the word without these possibilities. Still, the schooling system of today seems to be globally based on the needs, technologies, and social practices of the industrialized economy of the early 20th century (Collins & Halverson, 2010; Sawyer, 2014). The system was built on the common sense assumption that the teachers serve as experts whose job is to get the fixed, progressively more complex facts and procedures into students' heads (Sawyer, 2014). The critics of this traditional, behaviourist-based learning approach, which has also been called instructionism (Papert, 1993), state that it has succeeded in eliminating the distinction between training aimed at performance and learning aimed at understanding (von Glaserfeld, 1995), but that it fails to educate our students to participate in the complex, user-driven word that we are living in today (Loveless & Williamson, 2013; Prensky, 2010; Ryan, 2010; Sawyer, 2014). The critics of instructionism usually share the assumption that, instead of memorization of facts and procedures, students need to develop a deep contextual understanding of complex concepts and the ability to work with such concepts creatively and collaboratively in real life practices (Illeris, 2009; National Research Council, 2000; Prensky, 2010; Sawyer, 2014).

Despite its success in international standardized tests throughout the 2000s (see e.g. Sahlberg, 2015), many scholars state that the Finnish educational system has not been able to respond to the pedagogical challenges and possibilities engendered by the information society (see e.g. Mikkilä, 2013). In Finland, about 50 per cent of comprehensive school graduates (Grades 1–9) continue their studies in general upper secondary school (Grades 10–12), which in turn grants eligibility for higher, university level education (Ministry of Education and Culture, 2014). During the time period of this study (2009–2016), the national core curriculum for general upper secondary schools guided the schools to provide students with capabilities to meet the challenges presented by society and "the ability to assess matters from different points of view" (Finnish National Board of Education, 2003, p. 12). Furthermore, Finnish general upper secondary schools are supposed to "support the de-

velopment of students' self-knowledge and their positive growth towards adulthood and encourage students towards lifelong learning and continuous self-development" (Finnish National Board of Education, 2003, p. 12). The Finnish general upper secondary schools' conception of learning emphasizes students' active knowledge creation "in interaction with other students, teachers and the environment and on the basis of his or her existing knowledge structures" (Finnish National Board of Education, 2003, p. 14). This conception of learning requires schools and teachers "to create study environments which will enable students to set their own objectives and learn to work independently and collaboratively in different groups and networks" (Finnish National Board of Education, 2003, p. 14).

Although the current Finnish national core curriculum for general upper secondary school does not explicitly follow any learning theory, one could argue that it has been influenced by constructivism.[9] From the constructivist perspective, "learning involves the active creation of mental structures, rather than the passive internalization of information acquired from others or from the environment" (Nathan & Sawyer, 2014, p. 63). In other words, learning is seen as knowledge production rather than knowledge reproduction (Gergen, 1995; Loveless & Williamson, 2013). Constructivism posits that learning can be motivated by letting students solve a problem that they see as their own (von Glasersfeld, 1995/2009). However, constructivism cannot be reduced to one version: we can distinguish, for instance, psychological, social, radical, critical, and contextual constructivism, each of which has many faces and are partly interconnected with each other (Reich, 2009).

Since the Finnish general upper secondary school's selection of students is based on their grades in academic subjects in the basic education certificate (Statistic Finland, 2014), it is fair to say that all Finnish general upper secondary school students—aged usually between 16 and 19 years—have succeeded relatively well in their earlier studies. However, they seem to possess very heterogeneous musical skills and attitudes towards music when beginning their studies (see Juntunen, 2011). From this viewpoint, it is understandable that during the time period of this study the general aim of music instruction at upper secondary school was to make students "aware of their relationship with music" (Finnish National Board of Education, 2003, p. 200). Music studies were supposed to create or nurture "a personal relationship with music", as well as reinforce "students self-knowledge…, holistic

9 Throughout the 20th century and up to the present day, constructivism has become an increasingly significant learning theory (Nathan & Sawyer, 2014; Reich, 2009; von Glasersfeld, 1995). Also many Finnish educational researchers have been attracted by the emergence of constructivist theories of learning (Lehto, 2005; Sahlberg, 2015).

well-being and self-esteem. "Furthermore, music lessons were supposed to focus on the "student's own expression, creativity, interaction skills, and positive experiences" by using listening, singing, playing, and composing as the core content of music lessons (Finnish National Board of Education, 2003, p. 200). In the core curricula, students' "musical competence, thinking, and ability to assess their own actions" were supposed to be developed "in interaction with their peers and the teacher" (Finnish National Board of Education, 2003, p. 200). Music making was seen as a "unique form of group activity, which will reinforce social and communication skills", that should take "students' different orientation and initial skills levels" into account (Finnish National Board of Education, 2003, p. 200).

Creative music making, such as improvising and composing, has been part of Finland's core curriculum for comprehensive school since the 1970s (Muhonen, 2016; Muukkonen, 2010). During the time period of this study (2009–2016) the national core curriculum for general upper secondary schools guided music teachers to "make use of technology in music" (Finnish National Board of Education, 2003, p. 200). However, general music education in Finnish comprehensive schools has in practice been largely based on reproducing and performance (Juntunen, 2011; Muukkonen, 2010).[10] Hence, the use of technology and creative work seems to take place only randomly in many Finnish music classrooms (Juntunen, 2011; Partti, 2013). One can argue that the reproduction of easy to play pop and rock hits with traditional pop/rock band instruments such as drums, percussion, guitars, and keyboards in large group settings and small peer groups provide starting points for general music education in Finland.[11] Still, it seems odd that technologically aided creative music making has remained marginalised, and in many cases completely absent, in music classrooms (Juntunen, 2011; Muukkonen, 2010; Partti, 2013).

A majority of the Finnish general upper secondary school students choose to study their compulsory music course during their first year in upper secondary school. In the national core curriculum, the objective of the first year course *Music and Me* is to find students' own ways of operating within the field of music by exploring their own possibilities to make, interpret, and listen to music. The students are supposed to learn "about each other's musical activities and local music life" and "to observe their acoustic environment" as well as to "develop their voice control

10 It seems that music education practices have also been reproduction-centred in many other countries (see e.g., Bresler, 1998; Cheung, 2004; Clennon, 2009; Drummond, 2001: Georgii-Hemming & Westvall, 2010; Jorgensen; 2008: Rozman, 2009).

11 In Finland popular music has been widely accepted as a part of music curricula in schools and teacher training courses for decades (Väkevä, 2006; Westerlund, 2006).

and instrumental skills as devices of musical expression" (Finnish National Board of Education, 2003, p. 201). The course is also supposed to "consolidate students' knowledge of basic musical concepts by means of making music" (Finnish National Board of Education, 2003, p. 201). Through their personal relationship with music, students "will reflect on its significance to people and interpersonal interaction" (Finnish National Board of Education, 2003, p. 201).

At the time of finalising this writing, a new core curriculum for general upper secondary schools (Finnish National Board of Education, 2015) has been taken into account. The Finnish National Board of Education published blog writings (e.g. Finnish National Board of Education's Core Curriculum Blog, 8 November 2013) and draft versions of the new curriculum when I was developing the LTP approach. Hence, I had an idea about what the content of the new core curriculum of music would be, and aimed to create learning materials that would be applicable in the future. In the new core curriculum "singing, playing instrument, listening, and creatively producing music are both working methods and important contents of the instruction" (Finnish National Board of Education, 2015, p. 221). Hence, one could argue that one of the main differences between the old and the new core curriculum of music was that in the new core curriculum *producing* had been included as part of the essential content and methods of music studies.

In order to understand why this study was conducted, it is important to realize that Finnish teachers are afforded considerable responsibility and trust since the national core curriculum and local curriculum offer only broad guidelines, and teachers' success is not measured by national tests (Kallio, 2015; Sahlberg, 2015). This means that the Finnish secondary school music teachers have the freedom to decide *how* to implement versatile ideals and goals introduced in the curricula (Muukkonen, 2010). Given that there might be twenty, thirty, or even forty students in the music classroom at the same time the above-mentioned freedom can also raise questions (Kallio, 2015). For instance, music teachers might wonder how they can nurture their student's creativity and interaction, and—at the same time—"take students' different orientation and initial skills levels into account" (Finnish National Board of Education, 2003, p. 200).

4 Research objectives

This applied study intends to provide new insights into collaborative, technologically aided creative music making, by developing the generative principles for a novel pedagogical approach called Learning Through Producing (LTP) in the context of the Finnish general upper secondary school compulsory music course. This study seeks an answer to the following overarching question:

How can a compulsory music course for Finnish general upper secondary schools be pedagogically and technically redesigned in order to facilitate learning that takes place through producing?

Guided by design-based research (DBR), which functions as the methodological toolkit for this study (see Chapter 4.1), the answer to this question is sought by developing and testing two sets of e-learning materials in natural settings. Besides aiming at developing pedagogical innovations—in this case e-learning material that is based around short videos and e-learning material that is optimised for tablet computers—design-based research projects should aim at making an impact locally by improving learning for the participants in the study (see Barab, 2014; Barab & Squire, 2004; Bell, 2004; Sandoval & Bell, 2004; Mor, 2011). Hence, more specifically this study aims to answer the following three research questions:

1. What kind of short video-based e-learning materials facilitate Learning Through Producing in the context of a compulsory music course in Finnish upper secondary schools? [Development Project 1]
2. What kind of e-learning materials that are optimised for tablet computers facilitate Learning Through Producing in the context of a compulsory music course for Finnish upper secondary schools? [Development Project 2]
3. In what ways do Finnish general upper secondary school students describe their experiences during and after technology-driven pedagogical intervention that aims to develop a Learning Through Producing approach?

These questions will be answered in Chapter 7.

5 Methodological framework and research design of the study

5.1 Design-based research as a methodological toolkit

Design-based research (DBR) has a dual agenda: on the one hand, it aims to produce better innovations by utilising theory; on the other hand, it aims to advance theory through the design of new innovations (Barab, 2014; Barab & Squire, 2004; Bell, 2004; Sandoval & Bell, 2004). DBR further intends to have a local impact by improving learning for the participants in the study (Barab, 2014; Mor, 2010). Demonstrating this local impact is also key to justifying the project on a more general level (Barab, 2014; Barab & Squire, 2004). As described by Shavelson, Phillips, Towne, and Feuer (2003), "such research…seeks to trace the evolution of learning in complex, messy classrooms and schools, test and build theories of teaching and learning, and produce tools that survive the challenges of everyday practices" (p. 25).

DBR can be traced back to 1992, when Ann Brown (1992) and Allan Collins (1992) introduced a new "methodological toolkit" (Barab, 2014, p. 270) for bridging research, design, and educational practice. Since then DBR has become an increasingly popular form of educational research for those interested in designing innovative learning environments and technologies (Bannan-Ritland, 2003; Barab & Squire, 2004; Bell, 2004; Brown, 1992; Bell, Hoadley, & Linn (2004); Cobb, Confrey, diSessa, Lehrer & Schauble, 2003; Collins, Joseph, & Bielaczyc, 2004; diSessa & Cobb, 2004; Dix, 2007; Hoadley, 2004; Joseph, 2004; Sandoval & Bell, 2004). Barab (2014) notes that DBR aims to firstly, change "the learning environment over time" (p. 276); secondly, collect "evidence of the effect of these variations" (p. 276); and thirdly, feed the evidence "recursively into future designs" (p. 276). Moreover, the arguments DBR makes should be understood within the broader scope of neighbouring fields (Mor, 2010). Hence, according to Barab (2014), researchers that use DBR have the Herculean task of grounding their theory, supporting the development of an innovation, implementing this in a naturalistic context, collecting and analysing data in rigorous ways, and reporting all of this in a way that will convince others of the local impact of their work while at the same time showing its experience-distant value. (p. 292).

The process of allowing the same people to carry ideas from the identification of the initial problems to the creation of polished applications seems to offer a great degree of methodological alignment, and to ensure that developed theories also have practical implications (Hoadley, 2004). The downside is that researchers can only generalize their findings on tentative basis (Engeström, 2011; Hoadley, 2004; diSessa, 1991; Shavelson et al. 2003). Typically, DBR favours a mixture of qualitative methods such as interviews, field notes, and recordings (Mor, 2010). Although DBR resonates also with grounded theory and phenomenology, the pragmatic, situated, collaborative and iterative nature of DBR forms its strongest methodological alliance with action research (Mor, 2010). Some scholars even argue that the similarities between these two approaches are so great that there are good reasons for combining them (see Järvinen, 2007; Lee, 2007; Papas, O'Keefe & Seltsikas, 2012; Sein, Henfridsson, Purao, Rossi & Lindgren, 2011; Wieringa & Morali, 2012). However, whereas action research usually uses robust technology and tends towards local inputs, DBR often demands the use of novel technology and aims for general goals (Mor, 2010).

5.2 Research design of the study

In theory, DBR takes place "through continuous cycles of design, enactment, analysis, and redesign" (Design-Based Research Collective, 2003, p. 5). However, in practice the boundaries between these phases are often blurred (Design-Based Research Collective, 2003; Mor, 2010). These phases of DBR have been presented using various models. For instance, Middleton, Gorard, Taylor, and Bannan-Ritland (2008) have their own, seven-phase model of DBR, whereas Reeves (2006) has introduced his own four-phase model, and Mor (2010) his own three-phase model for applying DBR. However, these above mentioned models share the following basic structure. After the preliminary goals are addressed and the first prototype is designed, the development of design principles undergoes an empirical phase consisting of iterative design experiments (Amiel & Reeves, 2008; Design-Based Research Collective, 2003; Middleton et al., 2008; Mor, 2010). Design experiments include both design and evaluation, the latter defining the agenda for the next iteration (Middleton et al, 2008). It is important to realize that this empirical stage needs to go beyond merely testing. The data should be systematically collected and analysed until new understandings are created that lead to new designs and generative models of learning (Amiel & Reeves, 2008; Design-Based Research Collective, 2003; Mor, 2010). The development of generative models might be possible only "after long-term engagement and multiple design investigations" (Amiel & Reeves,

2008, p. 35).

In this study DBR was applied in following way (see Figure 3).

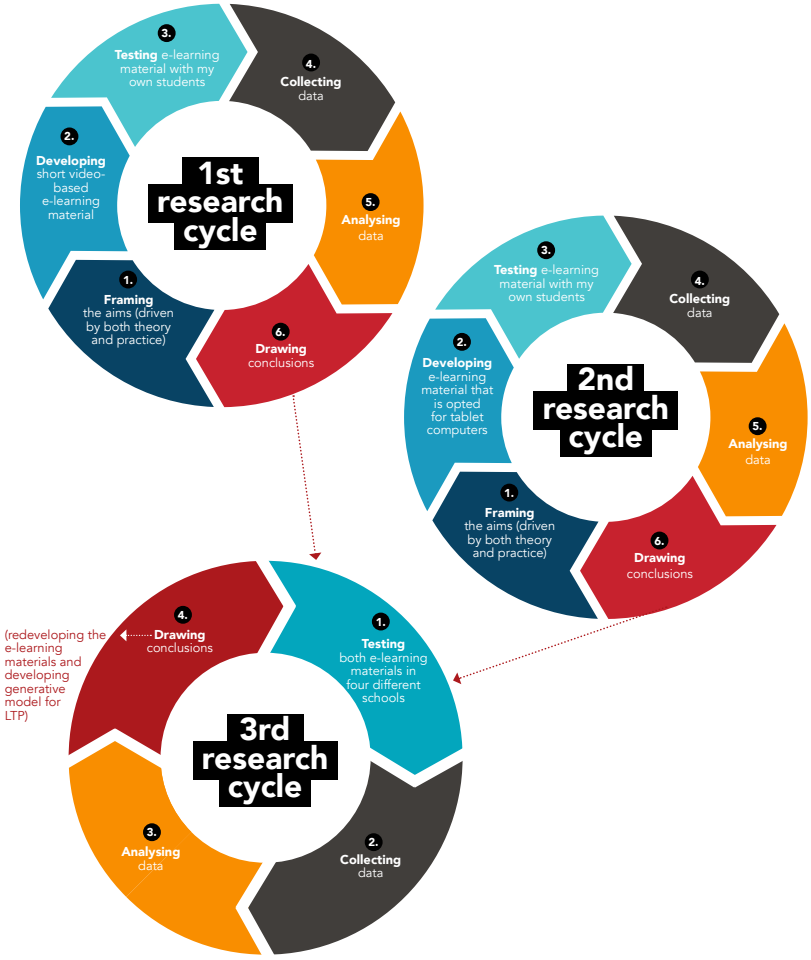

Figure 3: Research design of the study.

As illustrated in Figure 3, this research project was conducted by developing and testing two sets of e-learning materials over three research cycles. After the preliminary goals were addressed and the preliminary conceptual prototypes of the e-learning materials developed, both sets of e-learning materials were tested and re-developed, with the author's own students (1st and 2nd research cycle). Towards the end of the research period both sets of e-learning materials were tested and re-developed in four Finnish general upper secondary schools (3rd research cycle), with the intent of refining the e-learning materials and creating new understandings that could lead to developing the generative principles of LTP.

6 Design narrative of the study

Design narratives portray the complete path taken by educational innovation, from failed attempts and modifications to polished designs and theories (Barab, 2014; Mor, 2010). In other words, design narratives "provide an account of the history and evolution of a design over time" (Mor, 2010, p. 53). In the context of DBR, the use of design narratives can also be seen as a way to allow critics to assess the validity of DBR by tracing back researchers' claims in complex, messy, and unique settings (Barab et al., 2008; Bell, 2004; Design-Based Research Collective, 2003; Hoadley, 2004; Mor, 2010). Thus, when using DBR as a methodological toolkit the use of design narratives have been seen as a means of providing "sufficient contextual information for those who wish to conduct a similar experiment" (Mor, 2010, p. 53). As Barab (2014) cautions "carefully conducted design narrative… provides others insights into the challenges and opportunities that might emerge in their own work" (p. 273).

According to Mor (2010), a design narrative should (1) capture the voice of the designers, researchers and the participants, (2) delineate the context and educational goals of the design experiment, (3) "present a documented record of the researchers' [and] participants' actions [as well as] their effect", (4) "incorporate [the] data collected and processed in appropriate scientific methods", (5) unlink "reporting events from their evaluation", and (6) "be followed by… conclusions" (p. 55). Like all research narratives, design narratives should provide "rich and accurate descriptions of… pedagogical problem and its resolution from the researcher's point of view" (Mor, 2010, p. 55). However, the fact that design narratives focus on "the design and development of activities, social practices and supporting technology" makes them different from other research narratives (Mor, 2010, p. 55).

In what follows, I will describe how this study was conducted (see Figure 3). I will start by describing how practical problems and research literature guided the framing of the learning aims and first conceptual prototypes of the e-learning materials. Then, I shall describe how these prototypes were systematically tested and redesigned through iterative design experiments and retrospective analysis until new understandings, which led to polished materials and generative models of LTP, were created. Finally, in chapter 6, I will introduce the LTP approach in order to demonstrate these understandings.

6.1 First research cycle [Development Project 1]

6.1.1 Framing the aims: Early theory development

DBR usually starts from a theoretically driven learning goal that caters for the development of early versions of practical innovations (Mor, 2010). My first attempt (Ojala, 2010) to root the LTP approach in academic discourse adapted some general aspects of John Dewey's educational philosophy and proposed a critical review of Lucy Green's new classroom pedagogy. In the above mentioned book chapter I stated that Green's pedagogy play an important role when building a music curriculum that is based on authenticity, creativity, equality, and critical thinking. However, in line with Väkevä (2009), I further stated that Green's "New classroom pedagogy" appears to be incomplete in the sense that, in practice, it perpetuates the dichotomy between fully formal and fully informal music education by suggesting that formal music education is "unhelpful", or "boring" (Green, 2008, pp. 2, 97), and informal music education is "fun" and "superb" (Green, 2008, p. 111). My theory construction continued with the help of my responsible supervisor. I presented the philosophical grounds of our study in the Rock and Roles Conference, London, UK, 24th July 2012, hosted by the Institute of Contemporary Music Performance (Ojala & Väkevä, 2012).

The continual process of literature review is critical in DBR, because it identifies the conceptual underpinnings of the research problem and assists the researcher in understanding and predicting the elements of a potential solution (Herrington et al., 2007). In order to develop theoretical starting points for my development projects, I wrote a philosophical article with my responsible supervisor (Ojala & Väkevä, 2015). This article is first of the two blind peer-reviewed articles included in this study,[12] and will be referred to here as Article 1 (see Appendix A). In this article, we discussed theoretical implications of authenticity in the music classroom, especially as regards popular music in general music education. As Green's work was in the spotlight in the discussion of popular music pedagogy during the time of writing, we used her texts as a reflecting surface. Green's "New classroom pedagogy" is based on the idea that educators are able to bring a sense of authenticity to the music classroom if they cater to their students with real-world learning experiences (Green, 2008). From our point of view, the tangled theoretical issue of authenticity

12 Since the writing process took years and we produced several versions before the final one was submitted, it would be impossible to identify individual ownership of specific parts of the text. Nevertheless, my responsibility as a first author was over 50%.

in music classroom needed to be problematized through three themes: (1) how music sounds, (2) *glocal* music cultures, and (3) the role of mediation in framing the student's freedom of choice.

Several writers have pointed out that music education has a tendency to build its own specific genre of *school music*—that is, music that may not appear to the student as relevant at all (Georgii-Hemming & Westvall, 2010; Lindgren & Ericsson, 2010; Väkevä, 2010). In the above-mentioned article, we stated that the classroom might not offer suitable conditions for music-making that is relevant from the students point of view, due to restricted availability of resources, time, or space, or because the teacher's abilities to guide the student may be limited. Furthermore, even if the teachers were able to cater to the variety of learning needs that derive from different musical-cultural contexts, the students' room for authentic learning experiences might be narrowed both by the commercial mediation of the signifiers of common taste and by the teacher's personal preferences.

After problematizing authenticity in the music classroom we argued that the *authenticity gap* between the classroom and the *real-world* could be narrowed if the classroom is understood as a specific place for cultural production. In other words, instead of hindering authentic learning, the reality of the classroom can offer possibilities to extend the realm of authenticity from immediate contact with musical subject matter of the student's own choice to the culturally relevant uses of a variety of musics.

To sum up, in Article 1 we suggested that the music classroom could be seen as a complex learning environment that affords multiple trajectories for authentic learning. Moreover, we envisioned what our ideas could mean from the teacher's perspective. In line with Randles (2012), we suggested that the teacher could be seen as a facilitator, or producer, of learning that helps students to negotiate their musical identities within the communities of practice that glocal music-related interactions make possible.

Our article inspired me to further study and categorize what knowledge and skills students need in order to create shareable musical artefacts. In the article we suggested that students should be able to manipulate basic musical elements[13] by the using variety of tools, such as acoustic, hardware, and software instruments (Ojala

13 In the musical context, basic elements can be, for instance, rhythm, melody, harmony, timbre, and form (Duckworth, 2012).

& Väkevä, 2015). We also suggested, that students need to have an understanding of the relevant uses of such tools, together with some kind of plan for what they are about to build. In other words, even if students have an understanding of the basic elements of music and they are able to use the tools that they find relevant, they would still benefit from an overall picture of different meta-level options, which could guide their creative work. Lilliestam (1996) calls such meta-level options *formulas*. He defines formula as a "characteristic musical motive or pattern, which has a recognisable core even if the exact performance of the formula can be varied within given cultural frameworks" (p. 203). Lilliestam (1996) notes that "musical formulas are found in all parameters of music, and consequently we can speak of melodic formulas, chord sequences, rhythmic formulas, patterns of accompaniment ('grooves'), riffs, formulas for the construction of musical form, lyrical formulas, matrices for the construction of lyrics, etc" (p. 204). Lilliestam (1996) points out that "all creative acts have formulas as points of departure" (p. 203), which means that all possibilities are not open when producing music.

After framing the initial points of departure I was ready to start developing first prototypes of the e-learning materials. Given that I had already been trying different working methods with my own students over the years (see chapter 1) I had some presumptions on how producing could be facilitated in the music classroom. For instance, my own experience as a Finnish general secondary school music teacher suggested that musical basic elements, tools, and formulas can be successfully learned through creative work in small peer groups, but also through hands-on music making in a large ensemble. Together with the theoretically driven learning aims these practical presumptions influenced on the developing of the e-learning materials. However, as a researcher I was eager to challenge these presumptions through multiple cycles of design, enactment, analysis, and redesign.

6.1.2 Developing the first prototype of the short video-based e-learning material

I was not a technology enthusiast until I understood what today's fast Internet connections and powerful music technology could offer my students, who seemed to be "deeply and permanently technologically enhanced, connected to their peers and the world in ways no generation has ever been before" (Prensky, 2010, p. 2).[14] I familiarized myself with Internet content on music producing. However, I found

14 In 2013, as many as 75 per cent of Finnish comprehensive students carried their own smartphones already in primary years of the comprehensive school (European Commission, 2013; Verkkouutiset, 2014).

only few Internet sites and YouTube lessons that I could have used in my own teaching. This realization increased my need and urge to develop e-learning materials that would both facilitate LTP and adapt to recent shifts in pedagogical theory and media environments. As the first practical implementation of LTP, I created e-learning materials on the Sibelius Academy server during the Fall semester of 2008.

However, I quickly found that I needed an external partner to work with, because previous Sibelius Academy online materials were largely text-based, not video and multimedia based as I had envisioned. By that time, technological developments that had enabled new ways of sharing music-related knowledge and skills (see Chapter 2) had hinted at an emerging need for developing new working methods in music education. From my viewpoint, perhaps the most important of these changes concerned the developments relating to online user-created content that had expanded learning environments in the musical realm, and created new possibilities to learn and teach music outside the classroom. The use of video technology seemed to offer the possibility of situating my students' musical learning in an authentic context, and to provide my students with apprenticeship-like experiences (see Collins & Halverson, 2010; Collins & Kapur, 2014).

The birth of online communities—especially the inception of YouTube in 2005—allowed ordinary people to easily upload their own musical content to the Internet (Partti & Karlsen 2010; Salavuo 2006; Waldron 2013). However, since the ownership and maintenance of user-generated content (UGC) videos seemed unclear and unpredictable I found the use of e-learning material fully dependent on UGC at music classroom problematic. Instead of investigating completely open online communities, I was interested in co-operating with a company or institution with the goal of developing a more controlled model of music teaching and learning through the use of video-on-demand (VoD) services.

I had a lot of interesting conversations with various startup companies and schools at that time, but only began to move forward after visiting Rockway's office in March 2010. Established in 2007, Rockway (http://rockway.fi/) was the first Finnish online music school to offer lessons based on video clips. Rockway team liked my initial idea of developing e-learning material that helps students to create their own music and as a result I created a songwriting course for them. In practice, this meant that I personally designed the content of over 60 short video clips on composing, arranging, and writing lyrics, performing in front of the camera in their studio

(see appendix C, Figure 8). After the songwriting course was finished, I began to envision a bigger e-learning set that would include also the basics of recording and mixing. I familiarised myself with Rockway's content, which included thousands of lessons, chose proper videos from their service and, when there were none, designed new ones. The online version of the general upper secondary school compulsory music course was ready to be tested in January 2012. Altogether the course now includes 162 video-based lessons on the basics of pop/rock band instruments and music theory, as well as the basics of songwriting and music production techniques, such as how to use rhymes and how to record and mix acoustic guitar.

6.1.3 Testing the short video-based e-learning material with my own students

I tested the Rockway online course with 16 volunteer students, who opted for taking their compulsory music course independently, as an online unit, during the Spring semester of 2012 and the academic years 2012–2013 and 2013–2014. To pass the online course the students were asked to carry out the following tasks:

- make an arrangement
- write a song
- keep a course diary
- write a concert review

6.1.4 Collecting data

Students were allowed to freely decide how many arrangements and songs they would write, what tools to use, and what content to study online as long as they completed the required workload of 38–45 minutes. I interviewed every student at the beginning and at the end of the course. The students had different musical backgrounds and different reasons for taking the course online. In the first meeting, we discussed the students' musical backgrounds and their aims for the course. After that, I introduced the online material and asked students to log into Rockway. I

introduced different options concerning the course diary, and almost all of the students agreed to keep a shared course diary on the Etherpad environment[15] in order to share and see what other students were doing.[16] Besides writing regularly in the shared course diary, I also kept my own research diary.

6.1.5 Analysing data

Since the students began the course in different periods and were working freely at their own pace, I was able to organize the data collection and developmental work in a cyclical way, and in this way constantly found new questions and themes to reflect on. The idea was that at the end of the course each student would have an electronic portfolio containing reflective essays and an audiovisual document about their activities during the course. Whereas some students provided rich, personal, and detailed narratives, some of the students' course diaries contained only short, compulsory updates. I used end-of-the-course interviews as a way to verify the results of the thematic analysis (see Joffe, 2011) of the course diaries. Since I still considered these first design experiments as early pilots, I did not transcribe the semi-structured interviews word for word, and the analysis of the data was not deep. I simply concentrated on identifying the most fundamental and general tendencies in how students used the service, and how it could be developed from their point of view (see Appendix E for the group interview questions).

6.1.6 Drawing conclusions

The findings of the analysis suggested that in general, the students enjoyed the freedom to complete the required workload as they wanted, and they succeed well in all of the course's assignments. Whereas most of the students found short video-based e-learning material "useful" (28 May 2012 interview), those students who had been actively taking part in extra-curricular music education for years were able to successfully create their own original music even without tutorial videos. The students who had not participated in music-related hobbies would have benefited from a teacher being present when needed. However, the findings suggested that there was a need for more condensed course material. Using student participant's words, some video lessons were judged to be "too theoretical and boring" (14 October 2013 interview). Another student participant stated that he liked videos that go

15 Etherpad is an online word processor.

16 Two students wanted to keep private course diaries instead of participating in the shared course diary.

"straight to the point" (14 October 2013 interview). Some students also suggested that the course should have included waypoints towards more extensive goals and include authentic real life examples.

6.1.7 Developing the second version of the short video-based e-learning material

Given that the students' experiences after the initial developing phase were encouraging, the Rockway's team agreed to create a distinct learning environment to be used only in schools.[17] This decision was both practical and pedagogical. Since rockway.fi is designed for individual users who pay a monthly fee to subscribe to the content, there was a need to develop a way to purchase the service for the whole classroom, school, or district. Hence, during the Spring and Summer of 2014 I developed a new, more condensed course called *Luova musiikin tuottaminen* (Creative music producing), which used some of the older lessons but also had new content. For instance, in the course videos some of the most commercially successful Finnish singer-songwriter-producers demonstrated their working methods through real life examples (see appendix C, Figure 9). When I started to develop this new service, I called for features that enabled users to better organize the content and to create it themselves. Most importantly, as a response to encouraging learner feedback, I wanted to move from online courses to e-learning material, which would open up the potential for flipped learning. The Beta version of the Rockwaykoulut.fi ("Rockway Schools") service was released at the beginning of the Fall semester of 2014. Rockwaykoulut.fi (http://rockwaykoulut.fi/) now had new design, easier, code-based initialization for large student groups, and the possibility to create user playlists.

The course *Luova musiikin tuottaminen* contains altogether 61 video-based lessons, each three to nine minutes long (see appendix C, Figure 7). The lessons are categorized under four main sections: *intro* (introduction), *säveltäminen* (composing), *sanoittaminen* (writing lyrics), and *tuottaminen* (producing). The introduction section has six lessons that introduce musical basic elements. This is done by briefly analysing rhythmic, harmonic and melodic elements of a generic rock/pop hit, and by demonstrating different options of how this song could be played with drums, bass, guitar and keyboards. Each instrument is also recorded using a digital audio workstation. The composing section introduces different formulas that students can

17 By that time Rockway also had some other school pilots.

use as musical points of departure when composing. This section has 11 lessons dealing with: *"Mikä on sointukierto?"* ("What is chord progression?"), and *"Melodian teko soittaen"* ("Composing melody with instrument") for example. The lyric-writing section introduces lyrical formulas, and matrices for the construction of lyrics. It has 10 lessons that demonstrate such things as various ways to use rhymes. The producing section demonstrates how to arrange, record and mix a song. This section has 20 lessons and it contains two separate demo sessions. In the first demo session, a song is arranged, recorded and mixed using mobile audio workstation (iPad's GarageBand application) whereas the second demo session focus on the use of a digital audio workstation (Cubase). After the four main sections, the course has two demo sections that introduce producing processes of two different songs.

6.2 Second research cycle [Development Project 2]

6.2.1 Framing the aims

I had just started to realize the potential effects that the use of mobile devices, especially iPads, could offer for learning in music classrooms (see, Criswell, 2012; Williams, 2014) when I was asked to join the Tabletkoulu team as an author in February 2013. Tabletkoulu (Tablet school) had just been established, with the goal of offering pedagogically innovative e-learning materials for courses that the majority of the students in Finland could attend. The business idea behind Tabletkoulu is based on the fact that it is cheaper to buy e-learning materials and a tablet computer or laptop than traditional printed books.[18] At the same time, nationwide and worldwide enthusiasm for the educational use of electronic materials and mobile devices started to grow (Yle, 2014; Yle 2015). For instance, the city of Vantaa, which has approximately 200,000 inhabitants, bought tablet computers for 27,000 students (Helsingin Sanomat, 2014, October 8), and by the year 2013 approximately 4.5 million students were using an iPad in classrooms in the United States (Etherington, 2013).

Since I found Tabletkoulu's e-learning environment (https://www.tabletkoulu.fi/) promising, I started to develop Tabletkoulu's e-learning material for the general upper secondary school compulsory music course in close collaboration with Mikko Myllykoski, who is a leading expert and pioneer in the field of mobile music peda-

18 Finnish general upper secondary schools do not charge tuition fees. However, students have to purchase their books and other study materials themselves.

gogy in Finland.[19] When the developmental work started the published music course materials for Finnish general upper secondary schools compulsory music course was constituted from established publishing companies' printed songbooks. These songbooks also include basic information about musical basic elements, music theory, music appreciation, and music history. The ideals behind personalized learning, collaborative-learning, blended learning, flipped learning, mobile learning, and the culture of sharing guided our design work. In practice, this meant that we wanted to take students' musical identities and skills into account by letting them choose aims, roles, and tools that are challenging and real from their own point of view, and base the course material on a combination of face-to-face interaction and the use of e-learning material as well as a combination of digital tools and traditional instruments. Also, since students had the possibility to go through online materials before and after the actual classroom sessions, we wanted to encourage the teachers to use their classroom time more efficiently for collaborative producing, and to offer students tools to share their personal learning paths with their peers. We shared these early stage visions at ISME's first Music Technology SIG V-Conference on 16 April, 2013 (Myllykoski & Ojala, 2013) and received encouraging feedback from other scholars.

6.2.2 Developing the first prototype of e-learning material optimised for tablet computers

The authors of Tabletkoulu are not necessarily creating all of the material themselves, since they are encouraged to curate existing free online material that can be legally used for pedagogical purposes. The authors are also encouraged to utilise existing apps for learning and invite users to contribute to the material. We were excited at the opportunity to use free Android and iOS applications, since during 2013 and 2014, when we did most of the development work, new innovative music applications and updates were constantly launched on these platforms (see also Williams, 2014 for similar experiences). We imagined that if all students carried smartphones or tablet computers they would also have access to personal instruments and music studios, if only they purchased the right apps. However, our job would have been much easier if there had been only one operating system, and if we could have used commercial apps. Although most of the free apps available had some single feature that worked well, their combined use was limited (see also Williams, 2014).

19 I did approximately 50% of the development work in this project.

Besides containing free digital tools for musical learning, music making, and music production, our e-learning material offered an introduction to the basic elements of music using text, short videos, and practical exercises. We ended up with a structure where basic musical elements—rhythm, harmony, melody, sound, and form—have their own sections (see appendix D, Figure 11). However, the course material begins with an introductory section titled *Musiikki ja minä* (Music and me) that aims to stimulate discussions about musicality, musical identity and music as a hobby. In the introductory section, students are asked to keep a course diary where they evaluate their musical learnings and collect shareable artefacts throughout the course. After the introductory section, each basic musical element is introduced and studied in more detail with the help of assignments (see appendix D, Figure 12). In each section, the assignments begin with easy basic tasks and end up with producing tasks, such as "compose a beat" (see appendix D, Figure 13). From the home page, users find a curated list of applications that can be used during these producing tasks (see appendix D, Figure 10). After the musical basic elements are introduced students are asked to produce their own music as a final assignment of the course. When working with their final project, students can use ideas they have come up during previous producing tasks or start from the scratch. The last section—titled "Let's make music"—demystifies producing processes by user tips, curated videos, and assignments. Teachers are provided with a guide that explains the pedagogical ideals behind the course and provides different options on how the course material can be used in practice. After trying various versions, we were ready to test our ideas in natural settings.

6.2.3 Testing e-learning material optimised for tablet computers with my own students

After the headmaster of my school had agreed to buy 16 iPad tablet computers to be used mainly in our school's music classroom, I was ready to develop and test Tabletkoulu's e-learning material for general upper secondary school compulsory music course with my own students. These design experiments took place in the Spring semester of 2014, in three separate music courses. I had a novice teacher to substitute for me during the last weeks of the second course and first weeks of the third course, since I was on study leave. For the students of these two courses, I was partly researcher and partly music teacher. This arrangement catered for possibilities to study the role of the teacher in LTP.

At this time the development of the e-learning material was still at an early stage, and I did not have a clear picture of how to use it in the classroom. Finnish school music textbooks are usually collections of songs that also include music-related information. Since I have always preferred to choose the material that we play in the classroom in co-operation with my students, I had not seen the point of forcing my students to buy music textbooks.

6.2.4 Collecting data

I gathered the data by the use of 16 student-participants' course diaries and videotaped focus groups (Denzin & Lincoln, 2011; Johnson & Christensen, 2012). Before each course I created a Gmail account that allowed students to use shared Google Drive documents and YouTube services.[20] When the course started, I asked the students to create course diaries on their shared Google Drive, and to use a YouTube account to share their video productions. In the post-course focus groups, the main themes that were raised during the course were formatted as questions in shared Google Drive documents (see Appendix F). Each student answered those questions from their own computer. Later, I was able to verify my initial understanding of students' answers by starting up a real-time group discussion with the class. Hence, during the focus groups I combined both a semi-structured survey (Krysik & Finn, 2013) and a group interview (Kvale & Brinkmann, 2009).

6.2.5 Analysing data

Given that the developmental work of Tabletkoulu's music course was at an early stage, the data analysis concentrated primarily on identifying the most fundamental tendencies in how students used the service, and how it should be developed from their point of view. However, I was also interested in more general themes, such as musical identity, interaction, and tool selection, which would help me with the theory-building phase. When analysing the data I followed the typical qualitative analysis pattern of data reduction, data display, conclusion drawing, and verification (Miles & Huberman, 2014). In practice, these stages of analysis were interrelated processes that occurred throughout the Spring and Summer of 2014. I used iterative descriptive coding in order to organize the data, and to make accessible information about the most central topics and themes (see Appendix F for these

20 Given that our school's official learning platform did not offer possibilities for sharing the use of Google's services seemed to offer the easiest way for students to share their course diaries and their video productions. See chapter 8.3 for ethical considerations on the use of commercial services in schools.

early themes). Since the courses took place in different periods, I was again able to organize the data collection and developmental work in a cyclical way. Although the main themes were drawn from the theoretical literature, I tried my best to conduct the analysis with an open mind and let the data lead the process. This allowed me to challenge, change, and modify my presumptions. I also constantly visualized the data to move towards drawing and verifying conclusions.

6.2.6 Drawing conclusions

Perhaps the most important lesson learned from the second research cycle was that that the teacher has a major role in students' musical learning, even though they have e-learning materials at hand. This is in line with recent research (Anttila, 2013) that suggests that general upper secondary school students still need and expect teachers' support. For instance, students in my research complained that the novice teacher who was my substitute had an overly passive role, and relied too much on the e-learning material. In their opinion, the teacher should do more than just ask students to "study and learn" (26 May 2014 focus group). Students stated that the teacher is especially needed in the beginning of the course, to make the creative work accessible to all. One student complained rather justifiably that "all the assignments are not properly grounded" in the e-learning material (26 May 2014 focus group). Hence, the fact that the e-learning material was not ready may have increased the need for the teachers' active role. Although my students liked the idea of flipped learning, since "everybody has phone and earphones all the time in their pocket anyway", as one student pointed out (26 May 2014 focus group), some of them also emphasized that the content that is to be learned at home should not be too demanding. However, they enjoyed the possibility to independently follow their own interests.

Some students faced problems with using the technology, and low levels of musical skills caused problems for many of them. Still, most of them, using one student's words, were "surprised to hear that the songs sounded like real music in the end of the course" (26 May 2014 focus group). In particular, mobile applications such as GarageBand seemed to add value to the authenticity of the sound; one student said that the track they produced sounds "much better", than she expected (26 May 2014 focus group). She stated that the music they played in lower secondary schools music class where "one half of the class played guitars and other half percussions" often sounded "terrible" (26 May 2014 focus group).

6.2.7 Developing the second version of e-learning material optimised for tablet computers

My academic craftmanship developed during the Spring and Summer of 2014. I knew better what to ask from the students and from the data, and how to use this emerging knowledge to develop better e-learning materials. This new understanding led to redesigning of the e-learning material. For instance, since some students stated that it is much easier to understand musical things from videos than from written text (30 April 2014 focus group), we curated and produced more video-based material. I also started to gain an emerging understanding about how and when the use of e-learning material and mobile technology is beneficial when learning music through producing. At the same time, the Tabletkoulu's learning environment was developing, and I constantly asked their technical team for new features, such as a shareable portfolio. Although the learning environment did not yet have all the functionalities that we wished for, we published a Beta version of the e-learning material in late Spring 2014.

6.3 Third research cycle [Development Projects 1 and 2]

6.3.1 Testing both e-learning materials in other schools

Since I had so far been testing both Rockway's and Tabletkoulu's e-learning materials only with my own students, I organized a series of design experiments that took place in other schools. As a result of this work, four music teachers joined my research team.[21] Although they were interested in testing the LTP, and both sets of e-learning materials that facilitated it, their interest was also in finding ways to face the new possibilities and challenges that iPads brought to their teaching.[22] It is fair to say that they had positive attitudes towards mobile music technology, although none of them had used it in their teaching before. I found the teacher participants either through my personal connections or through various Facebook groups, such as "iPad opetuksessa" ("Educational use of iPad") during the Summer of 2014.[23]

21 Two of the schools that these teachers worked at were in the southern capital area of Finland (Uusimaa), one in a northern region (Lapland), and one at the eastern border (North Carelia). These schools' academic ranking, based on their students success in the matriculation examination, varied from being in the top two percent to the lowest 33 percent of the 442 general upper secondary schools in the country (see Tebest, 2014).

22 Two of the schools had 16 iPads permanently in the music class, whereas two other schools provided personal iPad tablet computers for all of the students.

23 The implications on choosing teacher-participants through my personal connections or through Facebook are discussed in the chapter 8.4.

The teachers agreed to use the LTP approach, Rockway, and Tabletkoulu in their general upper secondary school compulsory music course during the academic year 2014–2015.

Although these four teachers used the e-learning materials and asked their students to create shareable musical artefacts in producing teams as final assignments for the course, they did not have a clear pedagogical model to be tested. Rather, guided by the idea of the DBR, the new understanding that this technologically aided pedagogical intervention provided was used to perfect the e-learning materials and the customizable LTP approach. Hence, the teachers were free to choose their working methods. Some teachers applied hands-on music making in a big group, whereas others utilized small-group work. Some teachers consistently used the e-learning environments in their course, whereas others just encouraged their students to use Rockway's and Tabletkoulu's course materials in order to personalize and deepen their learning. In what follows I will briefly introduce the teacher participants' music courses. To ensure anonymity, the teacher participants are referred by the pseudonyms: Albert, Benjamin, Cecilia, and Dolly.

Albert used a lot of iPads, but also used traditional pop/rock band instruments during the course. In his music course, producing was done in small sections, after studying musical elements and tools both through the use of e-learning materials and hands-on music making. However, the students also had a couple of lessons at the end of the course to finish their tracks and videos.

Benjamin's music course was conducted in a regular classroom, since another group used the music classroom. Hence, he was forced to use mainly iPads instead of the traditional pop/rock band instruments that he would normally have used during the course. The producing took place during the last lessons of the course, after students had studied musical elements and tools by using e-learning materials and by playing cover songs in the big group.

Cecilia utilized both iPads and traditional pop/rock band instruments during her course. She actively used Tabletkoulu's assignments, but her students were free to use Rockway however they wished. They studied basic musical elements and tools in small peer groups, but also played cover songs in the big group before the producing began towards the end of the course.

Dolly's group was really big, so she divided students into smaller groups. Some small groups studied through online materials, while others played together in the music class. However, since the solving of technical problems took too much class time during the music lessons, students were forced to produce their own songs individually at home, at the end of the course.

My own course was divided into three sections, each consisting of six or seven 75 minutes long lessons. The course started with the introductory section, which was based on hands-on music making in the big group. After that, students were asked to make a cover version of an already existing song in small groups that I had put together. After the cover project, students were then asked to form producing teams and to produce a track or a music video. We utilized both iPads and traditional pop/rock band instruments, and students were encouraged to deepen their learning with the use of e-learning materials throughout the course.

The student participants of this study reflected a wide variety musical skills and attitudes towards music. Although most of them had dropped extracurricular music activities by the age of 16, many of them wrote to their course diaries that they listen to a lot of music, and sometimes sing and play at home just for fun if they have a musical instrument available. The background, participants, methods, and results of these design experiments are described in the second research article (Article 2), included in this compilation dissertation (Ojala, 2017). In what follows, I will give an overview of the methods used and results obtained during these design experiments.

6.3.2 Collecting data

Altogether 97 students gave me permission to use their course diaries, surveys, and interviews as data. In line with earlier design experiments, all the students were asked to keep an electronic course diary during the course. This time the student participants were also asked to respond to surveys at the beginning and after the course. The aim of the preparatory questionnaire (52–71 respondents[24]) was to provide an overall picture of the students' musical background and expectations of the course, whereas the more detailed post-course survey (41 respondents) aimed to provide an overall picture of their learning experiences during the course (see Appendix G for the responses of the preparatory questionnaire, and Appendix H for the questionnaire of the post-course survey). Within a week of the end of the course

24 The discrepancy in sample size is due to the fact that not all students answered every question on the questionnaire.

this picture was clarified and verified with the help of video-recorded and transcribed group interviews (see Appendix I for the transcribed excerpt from one of the post-course interviews). Six students from each music course were interviewed in order to provide balance between participating schools. If there were more than six student participants in the music course, the teachers were asked to select students with different kinds of musical backgrounds and learning experiences. I also regularly held informal Skype meetings with the teachers during the course. The number of these meetings varied from 3 to 6, depending on the teachers' schedules. I also conducted video-recorded and transcribed interviews with each teacher after the course.

6.3.3 Analysing data

Given that DBR aims to produce better innovations by utilising theory (Barab, 2014) I realized that I needed to form and follow clearer pedagogical principles in order to finish the design process. Hence, this time the need to build generalizable LTP model provided a point of departure for the data collection and analysis. As before, the data analysis followed the typical qualitative analysis pattern (Miles & Huberman, 2014). Data reduction, data visualisation, and conclusion forming took place constantly throughout the design experiments. Since the compulsory music courses took place in different periods, I was once again able to organize the data collection and early analysis in a cyclical way. In this way I was able to condense large amounts of data into smaller number of analytic units (Miles & Huberman, 2014). Conducting preliminary coding concurrent with the data collection made the analysis an on-going enterprise that helped me to generate strategies for collecting new data (Miles & Huberman, 2014). In other words, when systematically reading the students' course diaries and the transcribed texts I coded each participant's story under emerging themes that in turn affected the questionnaires of the post-course surveys (see appendix J for an example of these emerging themes).

The first, descriptive coding cycle, which initially summarized segments of data, was followed by the second coding cycle, which provided a way to group those summaries into the most essential themes (Miles & Huberman, 2014). Since I continued my work from the foundation of previous research cycles, I was able to constantly modify and re-categorize the design patterns extracted from these themes. I first considered each student-participant, and then each individual music course, as a case before looking at the whole group of participants and all the music courses

to identify major themes[25], such as the role of the teacher, peers, mobile devices, and e-learning materials, that were present in different students and schools (Miles & Huberman, 2014). These overlapping themes allowed me to create visual models (see Chapter 6.1), which were essential tools for re-designing the e-learning materials.

Given that I was trying to make sense of the impact of a sustained, technologically aided pedagogical intervention that took place in tangled real life settings, I found the use of network displays (Miles & Huberman, 2014) very helpful. Although I usually drew network displays (see Appendix K) by hand, and they were often quite messy, they helped me to move towards drawing and verifying conclusions. However, I saw these network displays more as personal analysis tools for theory building than ways to validate my analysis process in the final research report. In order to equip the readers with a tool that they can use to better understand and share my analytical journey, I composed vignettes[26] from the narrative descriptions of the experiences of the five individual key participants (see Appendix B, Ojala, 2017).[27] The key participants were chosen because their experiences were representative in the context of their own type of musicianship, and they provided rich data in their course diaries, surveys, and interviews. From my point of view the vignettes provided a natural way to capture, identify, and display the findings. The main goal of the students' and teachers' interviews was to verify my initial findings. I also sent the final draft of the research article to the teachers of my research team to allow for critical comments.

25 Miles and Huberman (2014, p. 103) talk about "stacking comparable cases" when describing this kind of analysis technique.

26 A vignette is a narrative description of a representative series of events in the studied case (Miles & Huberman, 2014).

27 I translated the data from the participants' surveys and interviews from Finnish to English myself, and created pseudonyms for participants in order to maintain their anonymity.

6.3.4 Conclusions that guided the development work towards generative LTP model and final versions of both sets of e-learning materials

In this subchapter, I will introduce conclusions drawn from the third research cycle's main themes (see Appendix J). In the second research publication (see Appendix B), some of these deeply intertwined themes are discussed in relation to the experiences of five key participants. Here I aim to give a voice to a larger group of participants by sharing representative quotations that are taken from their interviews, post-course surveys, or course diaries.

Actualization of the students' aims

This study aimed to develop approach that facilitates collaborative technologically aided creative work and takes "students' different orientation and initial skills levels into account", as guided in National Core Curriculum for Finnish General Upper Secondary School (Finnish National Board of Education, 2003, p. 200). This was challenging task given that the general upper secondary school music education is usually organized in large group settings. This means that music teachers usually face the challenge of having a musically heterogeneous group of students in the music classroom, especially when teaching compulsory music courses. This was also the case in this study. Students participants had a wide variety musical skills and attitudes, and reported different aims for their course, that most of them also achieved. Although a majority of the student participants of the third research cycle simply desired a fun and relaxing course, they also had music-related aims:

> **Joshua:** "I just wanted to enjoy the music, to sing and play with others…, yes, I reached my goals" (3 December 2014 interview).
>
> **Sam:** "I learned the basics of the guitar and piano, just like I wished" (post-course survey).
>
> **Richard:** "It was nice to learn to play the guitar..., it is something that I had wanted to do for a long time" (17 December 2014 interview).
>
> **Thelma:** "The making of my own song was big deal for me" (post-course survey).

The majority of the students concluded that the things they learned were useful. For instance, Jonas said that: "[the things learned during the course] were useful to me since I am now a better piano player than before the course… it was important that we actively made music all the time" (26 November 2014 interview). Unfortunately, this was not the case with all the students. For instance, Laura pointed out that: "I did learn some basics of the piano and to use GarageBand, but I do not think that I will use those skills after this course" (3 December 2014 interview).

Constructing (musical) knowledge and skills

During the third research cycle of this study student participants reported that they acquired a wide variety of skills and knowledge during the course. Most, but not all, of these skills and knowledge were related to music. The participants estimated in their post-course surveys that they had learned, for instance:

Lisa: "basics of guitar and to use GarageBand"

Peter: "music producing and teamwork skills"

Isac: "to play bass and to use iPad"

Susan: "to better play the piano and the basics of guitar and drums"

Layla: "to make music with GarageBand and to play guitar and piano better"

Tiffany: "to make a music video and to play guitar"

Mary: "to play easy songs with the guitar, to use GarageBand, Soundcloud, and iMovie and to co-operate…, I also learned some music theory"

Felix: "to play, compose, arrange, record, and mix"

Betty: "more about music in general, while writing and producing our own song"

Cecilia: "new drum patterns, guitar riffs, more about scales and keys"

Greg: "to use music applications and to play the piano better"

William: "to make music with GarageBand"

Interaction

Whether the students just wished for a fun and relaxing time or had specific goals for the course, a majority of them reported a high level of enjoyment and engagement during their course, especially when producing collaboratively. Much as during earlier research cycles students also learned from each other when working in producing teams. The participants described their interaction in their course diaries for instance in a following way:

> **Sam:** "We had a good time together"
>
> **Fanny:** "It was nice to make music with others"
>
> **Kate:** "When we worked in small groups everybody was engaged..., I made new friends"
>
> **Rob:** "We had really good spirit in our team and I really enjoyed our songwriting process…, other students helped me"
>
> **Alice:** "Our team functioned well…, we supported each other and had plenty of ideas"

Working within the zone of proximal development and negotiating musical identities

Many students underlined the importance of being able to work with tools, musical materials and collaborators that they found relevant. For instance, one of the student participants said that: "it was good that I was able to choose what I concentrated on" (17 December 2014 interview). Producing also seemed to offer students possibilities to work on their zone of proximal development and to negotiate their musical identities. As one of the participants described: "[when producing] you can write a simple song with couple of chords or write a complex symphony (26 November 2014 interview). For some participants, the course seemed to open up new—or forgotten—opportunities for music making:

> **Anna:** "The music course woke up my interest to play the piano again… the interest came suddenly and I was not looking for it… I am now planning to start piano lessons" (26 November 2014 interview).

Joseph: "It was nice to learn to play guitar… I am going to keep on practising even though the course ended" (17 December 2014 interview).

Emma: "I want to acquire GarageBand and start making my own music" (post-course survey).

Annie: "The course woke up my interest in drum playing" (post-course survey).

Pete: "I will make more songs in the future" (post-course survey).

The role of the teacher

Similarly to earlier research cycles, students emphasised that the teacher is needed, especially in the beginning of the course, in order to make the creative work accessible to all the students. One of the student participants wrote in his post-course survey that it was good that his teacher took "leading role" at the beginning of the course. Another student described the teacher's role in her course diary in following way: "Composing a song did not seem impossible task after [the teacher] showed us how to form some guitar chords and other basics, and after we played together in the class". Although the participants emphasised the significance of the teacher's role during the introductory section of the course, again in line with earlier results, they also wanted the teacher to be available when producing. For instance, one of the student participants pointed out that it was good that the teacher "stayed in the background but helped us when we had trouble to put our lyrics and melody together" (1 October 2014 interview).

The role of the student

The student participants reported that they were free to choose their roles during the course (post-course surveys). Students thought that they had the possibility to be listeners, instrumentalists, singers, composers, lyricists, arrangers, sound engineers, cinematographers, editors, directors, or actors if they wanted. However, even if students generally agreed on different roles in their peer group, roles became mixed up when they started to work in the producing teams. This is in line with Tobias (2012), who studied "how students engaged with music and acted as musicians in a Songwriting and Technology Class" (p. 331) in the context of an American elective high school music course.

The role of the e-learning materials

The use of e-learning materials seemed to create opportunities for personalized learning, especially for the most motivated students. For instance, one student participant described her use of the e-learning materials in the following way: "I wanted to learn more…so I practised during the weekends with the help of course materials" (course diary). Interestingly, those student-participants who estimated that they had not achieved their aims were either in the Benjamin's course or in the Dolly's course where "time was wasted in the solving of technical problems" (7 January 2015 interview). Dolly's students were forced to produce their songs individually at home after the actual music lessons had ended, and many of them had difficulties in creating a shareable musical artefact. One of Dolly's students complained that she was actually "stressed" about final assignment of the course (7 January 2015 interview). Given that Dolly's students were able to use the same e-learning materials than other student-participants one could argue that the e-learning materials developed in this study should not be used to replace the face-to-face interaction with peers and teachers. This is in line with the conclusion drawn from the second research cycle.

The role of the mobile devices

A majority of the students did not see iPads as a real instrument that could replace the traditional instruments. This view was particularly clear among Benjamin's students who used mainly iPads instead of a mix of both iPads and traditional instruments. One of the Benjamin's students wrote that "it was interesting to play music with iPads…however, I personally prefer real instruments" (course diary). Another student stated that "this was the best music course that I have attended… [but] it would have been better if we had had the chance to play more real instruments, instead of iPads" (course diary). Although many students did not consider mobile devices to be real musical instruments, in a way that for instance Williams (2014) and Randles (2013) have suggested, the iPad seemed to function well as a portable studio for their audio and video productions.

Producing process

Student participants stressed that there should be enough time reserved for the producing process, and that the producing teams should not be too big or too heterogeneous when it comes to musical taste and musical skills. For instance, one participant complained that "some students in my team did not engage in our creative work at all, they were just freeloaders" (26 November 2014 interview). Another student described the situation where she had to work with lower-skilled peers: "Neither of them were really into music…they tried to use chords that do not fit together…I would have succeeded better on my own" (3 December 2014 interview). In cases where the students did not have enough time for their final assignment, they did not write the lyrics but instead used GarageBand's smart instruments or ready-made loops. On the other hand, if too much time was spent on production, the students complained that they did not have enough time for playing and singing cover songs in a big group. Although some of the most functional groups contained as many as six students, the majority of the students thought that ideally there should be two to four students in each producing team. If the team was larger than that, students faced problems with competing ideas and they had difficulties in choosing their roles.

Students had multiple working methods when producing. In line with Folkestad (1996) some student participants' creative work started by producing a lyrical or musical draft, such as an inspiring sound, beat, melody, or chord progression, whereas others started by creating song concepts. This is in line with Zager (2012), who points out that, much like authors who write an outline before writing a book, many music producers begin their work by developing a production concept—an overall vision of a song's lyrical theme, musical character, genre, and even visuals.

Sharing the learning process

At the beginning of the course, students were asked to keep private or shared course diaries that could include, for example, text, pictures, playlists, audio, and video. However, most of the students' course diaries contained only short compulsory updates. Some students reported at the end of the course that keeping the course diary was a fun and educative experience that, using students' words: "helped me to remember and revise what I learned" (26 November 2014 interview) and "made other students' background and progression visible" (26 November 2014 interview). However, the majority of the participants felt that course diary was "just another

obligatory thing, that did not really support learning" (1 October 2014 interview) and they "did not see the point" (1 October 2014 interview) of keeping it. When asking the reason behind this, the students explained that although they liked to share their ideas when working in small groups, sharing the learning process with all of the students in the music course felt "fake" (1 October 2014 interview).

Sharing the musical artefacts

During the third research cycle, more than 100 students tried out music producing for the first time and produced almost 40 new songs. Although the majority of the students were unenthusiastic to share their learning processes with the big group, the producing teams were eager to share their tracks and videos on a shared Soundcloud or YouTube account. They also actively sought out other teams' products. One reason behind this might be that the keeping of the course diary demands constant work, whereas the sharing of a musical product is simple and quick. Another reason might be that students are used to sharing music and videos with their peers, whereas they do not share their learning processes on a daily basis.

The authenticity of the sound

In general, the participants thought that they succeeded well in songwriting and were happy with their productions.[28] The biggest gap between the sound of the classroom and the sound of the real world was found in the students' vocal tracks. While it is relatively easy to produce backing tracks that sound good, especially when using samples, only a few of these students could actually sing so well that it would have sounded even nearly as good as the artists they listen to at home, especially when working without pitch correction tools, such as Autotune and Melodyne, that students are today used to hearing in many hit recordings. In one participant's words: "Our song had a good idea…, but the singing decreases the credibility of the track" (post-course survey).

28 To hear examples of participants' tracks, visit: https://soundcloud.com/keyparticipants/sets/tracks

Teachers' experiences of LTP and e-learning materials

Although accounts of the students' experiences comprised the primary data set used in this study, I was also interested in the teachers' experiences. I held weekly Skype meetings with the teachers, but also interviewed them. In what follows, I will shortly describe how teachers on the research team experienced the impact of the pedagogical intervention they took part in during one of their general upper secondary school compulsory music courses.

When asked in their post-course interviews, the teacher participants described the new practices that the research period introduced to their teaching in following ways:

> **Albert:** Producing remained a final assignment, but was also a continuing process…and the use of Rockway…and also the use of the course diary was maintained…it is nice to have a new assessment tool and follow how individual students progress, and it is also good for the students since they see what they have done…it is now normal routine in my class…students make audio and video recordings all the time with tablet computers and link them to their course diaries…now every student sort of makes their own e-book during their music course.
>
> **Benjamin:** I'll definitely continue [using LTP], I always want to have that. But I'll probably try to keep thinking of maybe a couple of options….The iPad makes it easy, but also some other way…it's always about the time, how much time you have...This new group also did the garage-band project and their stuff is now on SoundCloud too…One thing I've been thinking about this, do I want them to write the song that I would make, or do I want them to write a song that they like….I want them to see, if they can have just a tiny taste of how fun it can be to make your own music, regardless the style of the music.
>
> **Cecilia:** My course practices have changed, naturally, since I have not used Tabletkoulu and Rockway before, it has changed totally…I have now made some improvements…this time we started with hands on music making in order to get to know each other…I first try to find out what they already know by singing and playing keyboards, guitar, ukulele, and percussions together, you know…I wait couple of weeks before introducing the option to use e-learning materials…we also do exercises with a tablet computer,

so that they learn to use music applications…at the end of the course we then start writing songs…I think that it is a good final assignment since it also serves those students who do not actively play any instrument...after learning what elements music is built from they learn to listen to music differently.

Dolly: There were too many new things for me and my students at the same time during the research project…and then, when we faced technological problems, students got frustrated…However, the great thing was that students had the opportunity to take responsibility for their own learning… in the future I am going to keep on using this approach, and also Rockway and Tabletkoulu, but now I know better how to do it…I will introduce new things gradually, one by one.

In sum, all four teachers liked the basic idea of LTP, and reported that they are also going to continue using the approach in the future. In practice, this means that they will include producing in their courses, either as a final assignment or as a continuing process. All except one were also planning to use either one or both sets of e-learning materials in the future. Although technical and pedagogical challenges were faced during the courses, the teachers reflected on their experiences and planned how to better combine base building and producing stages, and to incorporate the use of mobile devices and the use of traditional instruments, in the future. One of the most important local impact of this study is that the teachers of the research team, including myself, learned from their experiences and developed new pedagogical tactics on the basis of their reflections.

Although I had already publicly presented the general idea of the LTP approach (Ojala, 2014), I was not ready to begin the development of the final model for LTP before the design experiments, which took place during the academic year 2014–2015 in four different general upper secondary schools in Finland, were finished. As a result of the careful analysis of the multiple data sets gathered from different schools and different students, I gradually gained a clearer picture of the LTP approach and a deeper understanding of the role of e-learning materials when applying LTP. Hence, after the design experiment phase of the third research cycle, I began to develop a generative model of LTP. I presented my new visions and the first version of the LTP model at the RIME conference on April 16, 2015 (Ojala, 2015). The LTP model (see Chapter 6.1) then guided the design and development work towards final versions of both sets of e-learning materials during the Summer and Fall of 2015.

7 Key findings, practical implications, and local impact of the study

In the school context, design-based research projects have three goals: firstly, they aim to develop new approaches that can be generalized to other classrooms; secondly, they aim to design new innovations; thirdly, they aim to have a local impact by improving learning for the participants in the study (Barab, 2014; Barab & Squire, 2004; Bell, 2004; Mor 2011; Sandoval & Bell, 2004). In this chapter I will explain how these goals were met in the present study.

Given that I have in chapter 6 portrayed how student participants' were heard when reinforcing and validating the findings of the study I do not use the primary data again in this chapter. Also, given that the chapter 6 presented the conclusions that guided the design and development work towards both sets of e-learning materials and generalized LTP model I do not represent all the findings of the study here. Instead, I simply represent the key findings by briefly answering my research questions presented in chapter 4.

I will begin by answering to the main research question: How can a compulsory music course for Finnish general upper secondary schools be pedagogically and technically redesigned in order to facilitate learning that takes place through producing? I will answer this question by introducing principles for generalizable LTP approach (subchapter 7.1). After that, I will answer the more specific research questions by introducing the e-learning materials designed during this study (subchapter 7.2), and by describing the local impact of the study (subchapter 7.3).

7.1 Introducing principles for generalizable LTP approach

In the line with the national core curriculum for Finnish general upper secondary schools LTP approach takes the constructivist learning perspective by emphasizing students' active knowledge and skill production with other students, teachers, and the environment (Gergen, 1995; Loveless & Williamson, 2013; Finnish National Board of Education, 2003). More specifically LTP approach caters to students' possibilities for trialogical learning (Paavola & Hakkarainen, 2009). This is done by offering students one possible way of systematically broadening the perspective of general music education, from reproduction and performance to collaborative creative

work and the production of shareable musical artefacts. Since student participants emphasised that the teacher is needed especially in the beginning of the course the generalized LTP model has two stages: the base building stage and the producing stage (see Figure 4). These stages can take place either once or over multiple lessons. For example, during the seven weeks' duration of the music course, there could be three weeks of base building that leads to four weeks of producing. Additionally, base building and producing can be done in small sections, for instance one element and/or tool at a time. In the next sections, I will introduce both stages in more detail.

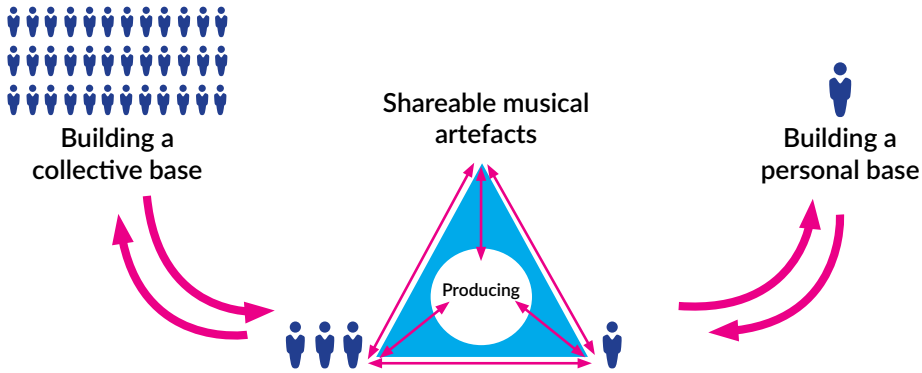

Figure 4: The twofold base building stage, in relation to the producing stage, taken from Ojala (2017).

7.1.1 Base building stage

Student-participants' experiences suggest that in order to effectively and purposefully learn music through producing, most students benefit if they are introduced to the elements that music is built from and technical tools that it can be built with, together with an understanding of the relevant use of these tools in authentic cultural situations. Hence, in the generalizable LTP model, the base building stage prepares students for the producing stage. The base building stage can be divided into deeply intertwined collective and personalized parts. During the collective base building, the most important basic elements, tools, and formulas (see chapter 2.4) are introduced to all the students. During the personalized base building, students create their own goals and work with musical materials and tools that are relevant to them. The basic idea behind the twofold base building stage is that at the beginning

of the course, during the building of a collective base, the teacher aims to create a warm and trustful atmosphere, and to make sure that the students have some kind of collective knowledge and skill base when collaborating in producing teams. After that, during the building of the personalized bases, the students can deepen their learning by creating their personal learning environments.

7.1.2 Producing stage

The present study (see chapter 6.3.3) suggests that musical knowledge and skills can be successfully constructed and shared through sustained collaborative creative work with shareable musical artefacts. Hence, the aim of the producing stage is to cater students' possibilities for trialogical learning that takes place in producing teams.[29] Figure 5—based on Paavola and Hakkarainen's (2009) illustration of the trialogical approach to learning—illustrates how student participants collaboratively produced practices, concepts, and drafts into shareable musical artefacts, using mediating tools.

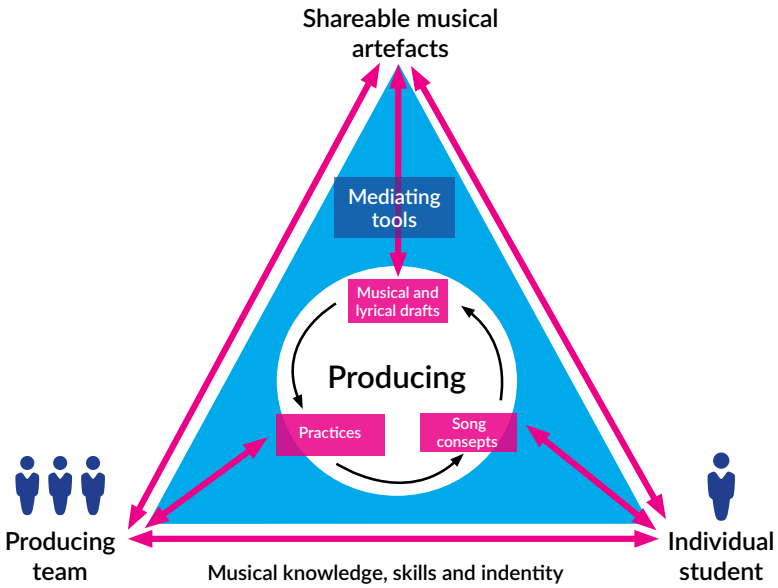

Figure 5: Producing stage.

29 Katzenbach and Smith (2005) emphasize that it is important to distinguish a team from a mere group of people with a common assignment. In this study, team means a small number of people with complementary skills who are mutually committed to a common purpose, goals, and approach (Katzenbach & Smith, 2005).

As illustrated in the Figure 5, before producing finished shareable musical artefacts, student participants developed their own working practices or produced song concepts. In turn, some student participants' creative work started by producing a lyrical or musical draft, such as an inspiring sound, beat, melody, or chord progression. If students were able to work with the tools, collaborators, and musical material that they found relevant, producing teams sometimes became music-related communities of practice (Wenger, 1998) where students were able to negotiate their musical identities (see chapter 2.1 and Appendix B).

7.1.3 Blended learning in LTP

The present study investigated also how online and face-to-face activities could be combined when learning music through producing in the context of the Finnish general upper secondary school compulsory music course. The findings of the study suggest that whereas the building of a collective base can be accomplished during face-to-face music making in large groups, the use of the online materials can be particularly beneficial when students create their own personalized bases. Figure 6 illustrates the roles of the teacher and the e-learning materials when using the LTP approach.

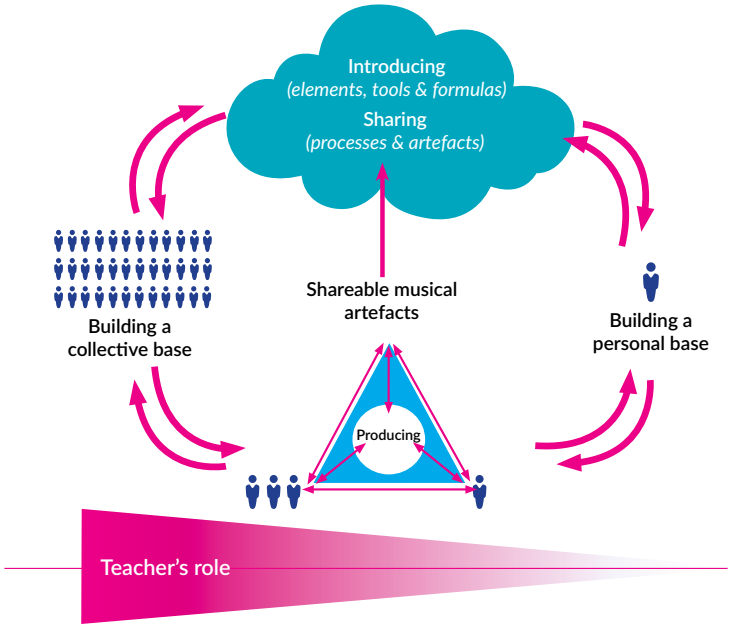

Figure 6: Blended learning when using the LTP approach, taken from Ojala (2017).

As illustrated in Figure 6, cloud services offered student participants myriad possibilities for building a personal knowledge and skill base, as well as for sharing both their creative processes and their musical artefacts. Hence, sharing of processes and artefacts can also be used as a way to support peer learning, and to build a collective base, when learning music through producing. From student participants' point of view the teachers should have different roles during different stages. As illustrated in the Figure 6, student participants pointed out that the teacher should take a leading role during collective base building. However, when producing and building the personal base teacher's role should be facilitative.

7.2 Introducing e-learning materials that facilitate LTP approach

Besides developing new "theories… and practices that can be generalized to other classrooms" design-based research aims also to design new innovations (Barab, 2014, p. 270; see also Barab & Squire, 2004; Bell, 2004; Mor 2011; Sandoval & Bell, 2004). In this study this means developing and testing two practical e-learning materials that facilitate LTP approach. On the one hand, the development and testing of e-learning materials served as a method to develop generalized principles for LTP in natural setting. On the other hand, e-learning materials can be seen as a two concrete outputs of the study, together with two blind reviewed articles.

7.2.1 Facilitating LTP through short the video-based e-learning material

The first of the two practical outputs developed in this study [Development Project 1] consists of video-based e-learning material. This e-learning material, titled *Luova musiikin tuottaminen* (Creative Music Producing) applies the Rockway online service for schools (http://rockwaykoulut.fi/), and is targeted at a Finnish general upper secondary school compulsory music course. This practical output answers the first specific research question: What kind of short video-based e-learning materials facilitate Learning Through Producing in the context of a compulsory music course in Finnish upper secondary schools?

The e-learning material is designed around short videos produced by professional music educators, musicians, songwriters, and sound engineers. However, the course material also includes text, tablatures, notation, and images. It contains les-

sons in the basics of pop/rock band instruments and music theory, as well as the basics of songwriting and music production techniques, such as how to use rhymes or how to record acoustic guitar. Hence, the course aims to introduce elements, a basic understanding of the use of the tools, and formulas that can be used when producing music (see Appendix C).

7.2.2 Facilitating LTP through e-learning material optimised for tablet computers

The second of the two practical outcomes developed during this study [Development Project 2] is e-learning material that was optimised for tablet computers and based on Tabletkoulu's e-learning environment (https://www.tabletkoulu.fi/). The e-learning material is targeted at the Finnish general upper secondary school compulsory music course. The material answers the second specific research question: what kind of e-learning material that is optimised for tablet computers facilitate *Learning Through Producing* in the context of a compulsory music course for Finnish upper secondary schools?

The e-learning material was designed to assist in the renewal of the Finnish general upper secondary school compulsory music course, through the utilization of various mobile music applications and digital learning tools. Besides offering introductory texts about the basic elements and collective formulas of music in short videos and practical exercises, the e-learning material contained curated tools for music making, musical learning, music producing, and sharing. Instead of offering "how to" tutorials for different music applications and software, the e-learning material encourages the students to choose the tools they identify with and to use them creatively. Hence, the e-learning material caters to the building of both collective and personalized knowledge and skill bases (see Appendix D).

7.3 Showing local input: Students' experiences when developing the LTP

Besides developing new generalizable approaches through the design of new innovations design-based research projects should also improve learning for the participants in the study (Barab, 2014; Barab & Squire, 2004; Bell, 2004; Mor 2011; Sandoval & Bell, 2004). The second peer-reviewed research article incorporated into this study (Ojala, 2017) shows the local impact of the research by highlighting

Finnish general upper secondary school students' learning experiences when developing and testing LTP in their compulsory music course. The findings presented in the article were mainly based on the analysis of the data gathered during the third research cycle, which took place during the academic year 2014–2015 in four Finnish general upper secondary schools. The goal of the article was to answer the third specific research question: in what ways do Finnish general upper secondary school students describe their experiences during and after technology-driven pedagogical intervention that aims to develop a Learning Through Producing approach?

After introducing the LTP approach and describing how the design-based research project was conducted the article introduces the following five main categories based on students' descriptions of their musical identities during and after the course:

1. Students who have a non-musician identity have never had organized music-related hobbies and goals outside the music classroom, although they might sometimes make music or play a musical instrument.

2. Students who have an ex-musician identity have at some point in their lives been actively making music or playing a musical instrument, but report no longer being involved in musical activities.

3. Students who have an informally trained musician identity actively make music or play a musical instrument without formal tuition. They have music-related goals outside the music classroom, but music-related hobbies do not necessarily take up the majority of their free time.

4. Students who have a formally trained musician identity have been actively taking part in extra-curricular institutional music education for more than 3 years. Music-related hobbies take up the majority of their free time, and they have ambitious music-related goals outside the music classroom.

5. Students who have a new-musician identity reported that they started or restarted actively playing some instrument or making music during, after, or immediately preceding the course.

The article is focused on describing and analysing five key participants' learning experiences during their course.[30] The article concludes that collaborative, technologically aided creative work, such as that which takes place in producing teams, seems

30 Each key participant had different teacher, different musician identity, and different course experience.

to bridge the gap between the real world musical experiences of young people, and what is taught and learned in the school classroom, by providing students with opportunities to work with tools and musical material that they find relevant. In line with Tobias (2012), the article suggests that music classrooms should be seen as hybrid spaces where students with "different goals, perspectives, musical interests and approaches" learn music together, and learn from each other (p. 342).

8 Discussion

In this chapter I discuss and evaluate the relevance of this study within the wider framework of educational discourse. First, I interpret the key findings of the study and make some recommendations based on them to other music educators (subchapter 8.1). Then I evaluate the practical and scientific outcomes of the study (subchapter 8.2), and evaluate how the study was conducted in ethical terms (subchapter 8.3). Finally, I discuss the implications that this study might have to offer for future research (subchapter 8.4).

8.1. Learning through producing: What, why and how?

As discussed earlier in this study, the pedagogical approach that is based on performing ready-made arrangements of ready-made pop/rock repertoire with traditional classroom instruments has, in practice, been a dominant paradigm in Finnish secondary schools' music classrooms for decades, in spite of the changes that have taken place in national core curriculum of music (Muukkonen, 2010). However, the findings of this study suggest that—at least in the context of Finnish general upper secondary schools' compulsory music course—the perspective of general music education could be expanded to also imply collaborative creative work with shareable musical artefacts.

In this study, musical creativity is seen "as something that people do together" in order to learn music, rather than "as something a person has or does not have" (Burnard, 2012, p. 3). Whereas there are multiple ways to foster collaborative musical creativity in the music classroom, the focus of this study has been on music producing. Here, producing has been seen as an approach that aims to support the students' trialogical learning through sustained, technologically aided creative work in small groups. Hence, the emphasis has not been only on "individualistic learning" or "highlighting such things as participation to expert like practices, communication, [and] dialogues", but on the students "joint work around shared objects" (Paavola & Hakkarainen, 2009, p. 97).

Creativity and collaboration have become essential areas for the research in education (Loveless & Williamson, 2013, Prensky, 2010; Sawyer, 2014), including music education (Barret, 2006; Green, 2008). Even if it might be easy to agree on the importance of fostering collaborative creativity in music classrooms, one might still ask: why do we need to produce shareable musical artefacts? The justification for expanding the scope of general music education from performance to producing relates to a larger, emerging cultural phenomenon that has been referred to earlier in this study as "participatory culture" (Jenkins et al., 2009), and "sharing culture" (Aigrain & Aigrain, 2012; Davis et al., 2010).

Today, an increasing number of people are not only consuming but also creating cultural content online (Loveless & Williamson, 2013; Partti, 2012). The findings of this study suggest that, if given time, tools, support, and collaborators, Finnish general upper secondary school students are capable of producing shareable musical artefacts, and willing to share them in and out of school. Moreover, the findings indicate that, from the student-participants' point of view, producing offers one possible way to construct musical knowledge and skills. However, the findings also suggest that trialogical learning by itself does not constitute an ideal model for learning in the context of general music education: other modes of learning are also needed.

As suggested in Article 2 (Ojala, 2017), producing in small peer groups offers opportunities to form music-related communities of practice. Furthermore, producing also seems to offer students one possible way to build their musical identities. This is important if one agrees that young people are highly engaged in the process of personal identity development, and that learning is part of becoming the kind of person one wants to become, as Collins and Kapur (2014), Illeris (2009), and Wenger (1998) have suggested.

Given that technological developments have enabled "people of all ages to pursue learning on their own terms" (Collins & Halverson, 2009, p. 18), schools are also under pressure to deliver personalized, "just-in-time" learning (Traxler, 2007, p. 5). When learning music through producing, the use of e-learning materials and mobile devices can offer new pedagogical opportunities for working with music and tools that are relevant to the individual student, as well as moving from a one-size-fits-all model of instruction towards an education that is tailored to meet the learners' needs to achieve their own goals (Sawyer, 2014; Ojala, 2017). This is important if one agrees that there may not be only one way of learning popular music, but rather different place-based variations that imply a multiplicity of pedagogical possibili-

ties, as suggested in Article 1 (Ojala & Väkevä, 2015). The use of LTP, e-learning materials, and mobile devices can offer ways for teachers to adopt an open-ended approach to popular music pedagogy.

In light of what has been discussed earlier, the use of LTP can provide opportunities for the students to "take responsibility for their own… learning" (Sawyer, 2014, p. 29), and for the teachers to treat learning as knowledge production rather than knowledge reproduction (Loveless & Williamson, 2013). With the help of teachers and e-learning materials, the use of LTP also seems to provide opportunities for the students—using Vygotsky's (1978) terms—to learn in their zone of proximal development.

Furthermore, this study found that in order to enhance the collaborative learning experience students benefit from having an understanding of the relevant use of authentic tools in real world cultural situations while producing. The findings of this study suggest that such collective understandings can be developed by active hands-on music making in the music classroom, deepened and personalized by active use of e-learning materials, and shared in producing teams. Although the student participants in this study underlined the teacher's significance during the introductory section of the course, they only wanted the teacher to be available during the creative work in producing teams so that they could ask for help if they had problems. Hence, when discussing the role of the teacher in LTP, the findings of the study suggest that students prefer the use of the *fade out strategy* rather than the *fade in strategy* (see Elliott, 1995), of which Green's (2008) new classroom pedagogy is an example.[31]

On the basis of the findings of this study, I suggest following practical recommendations for music teachers. At the beginning of the course, the teacher should create a warm and trustful atmosphere and make sure that the students have some kind of collective knowledge and skill base when working collaboratively with shareable musical artefacts. This can be successfully accomplished by face-to-face music making in large groups and personalized by the use of the online materials. The students should have the possibility to deepen their learning by creating their own goals, and work with musical materials and tools that are relevant to them. This can be successfully accomplished by creative work that takes place in producing teams. There should be enough time reserved for the producing process, and the producing

31 One of the characteristics of Green's new classroom pedagogy (2008) is autonomous learning that begins without structured guidance.

teams should not be too big or too heterogeneous when it comes to musical taste and musical skills. Although some students do not consider mobile devices to be real musical instruments, in a same way than for instance drums and guitars, they function well as portable studios for their audio and video productions. Finally, it is important to remember that students might be more interested in having fun with music than constructing their musical knowledge, skills and identity.

8.2 Evaluating the study

As suggested earlier, DBR involves developing and testing educational theories through innovations (Mor, 2010). This gives DBR the potential to act as a bridge between theory and practice, but it also poses the risk that practitioners may see the results of design-based research projects as too abstract or trivial (Mor, 2010). Guided by the methodological model of design-based research, I sought solutions to complex pedagogical challenges by developing and testing two sets of e-learning materials that are targeted for music teachers and Finnish general upper secondary school compulsory music course students. Together with the new theoretical knowledge presented in the two blind peer-reviewed articles, these e-learning materials can be seen as the concrete outcomes of this study.

The dual facets of DBR raise specific issues of validity, resonance, and cumulativity for consideration, as well as the evaluation of the quality of the developed innovations (Mor, 2010). Here, validity refers "to the [level of] scientific confidence" in the study, resonance refers "to the impact …[of the research] in the relevant communities", and cumulativity refers "to the extent to which existing knowledge is used as a foundation for new [practical and theoretical] developments (Mor, 2010, p. 64). In what follows I will first evaluate the e-learning materials developed during this research, and then evaluate the level of scientific confidence in the study.

8.2.1 Evaluating the practical outcomes of the study

Evaluating the practical outcomes of the study is problematic for multiple reasons. For instance, what might have been innovative, usable, or effective in 2014—when most of the development work took place—might not be innovative, usable, or effective in 2017 when the writing of the summary report was finalized. Also, a solution that might be innovative, usable, or effective in the context of Finnish general upper secondary school compulsory music course might not be innovative, usable, or effective in another context. Using the words of Collins, Joseph & Bie-

laczyc (2004, p. 18): "The effectiveness of a design in one setting is no guarantee of its effectiveness in other settings." It is also problematic to measure the significance of the researcher's personal input on the co-operational developmental projects.

Nevertheless, when evaluating the practical outcomes of the study, it is important to realize at least four points. Firstly, the e-learning materials developed during this study aimed primarily to offer alternative version of already existing learning materials targeted for Finnish general upper secondary schools compulsory music course. From this viewpoint one might agree that developing e-learning materials where musical learning is centered on producing is a novel and innovative idea. However, comparing e-learning materials that are centered on technologically aided creative work with printed books that are centered on reproducing and performance might not be beneficial. Secondly, although the research literature suggests that DBR should aim at developing and testing a pedagogical innovation (Barab, 2014; Barab & Squire, 2004) in this study the innovativeness was not seen as a main goal when developing the e-learning materials. Given that this study aimed at developing e-learning materials that would successfully facilitate LTP in the context of the study, the term "innovation" might be too bold when talking about the practical outcomes developed during this study. Thirdly, it is important to remember also that although nonlinear and open platforms for user-generated content could and should be used in music classroom when learning through producing, both developmental projects aimed to develop linear and controlled e-learning materials. Fourthly, it is important to remember also that this study aimed mainly at developing, not evaluating, the e-learning materials during and after the pedagogical intervention that took place in four general upper secondary schools.

Although post-course surveys (see Appendix H) and group interviews aimed also to solicit student feedback on the quality of e-learning materials, the evaluation of the e-learning materials turned out to be challenging when analysing the data. Student participants had different musical backgrounds and they studied with different teachers, in different courses, and in different circumstances. Some students liked both e-learning materials, whereas some other students did not like them, or liked only one of them, or did not even use them, or would perhaps use them in the other circumstances. For instance, one of the student participants evaluated online short video based e-learning material in the post course interview in following way: "I liked it, there was usable stuff, but I had to concentrate to my other studies…I could have used it more during some other time period" (18 December 2014 interview). Another student participant described the use of the e-learning material

optimised for tablet computers in following way: "It worked out well, because the chapters were not too long, and they did not require too much time even when studied at home" (18 December 2014 interview). Nevertheless, the practical outcomes of the study seemed to resonate among the teacher participants. When asked in their post-course interviews, all except one were planning to use either one or both of the sets of e-learning materials in the future.

Evaluating the short video-based e-learning material

Given that I produced most of the Rockway's videos during the academic year 2011–2012, the short video-based e-learning material that facilitate LTP may be now slightly out-dated. The findings of the design experiments suggest the need for more condensed course materials as well as a clearer structure that points the way to the students' own goals. Since it did not make sense to shoot all the online videos again, most of these revisions have to be planned as future developments. Now that Rockway is ready to launch a new service that is based on users' individual learning paths, I will design a better version of the course Luova musiikin tuottaminen (Creative Music Producing) both in Finnish and in English. This new version also includes possibility to add user-generated content to course materials. Although I have gradually found my own way to perform in front of the camera, I do not see myself as a charismatic and articulate media personality. Hence, in the new version, a more suitable person is going to perform in front of the cameras. I will be responsible only for the script, based on the LTP model. However, the development of this new version of the e-learning material is beyond the scope of this study. I will next provide review of similar e-learning materials in order to help the reader to better evaluate the developmental project 1.

At the time of this writing, there are many online music schools that are similar to Rockway that base their lessons around short videos (see e.g. https://www.playalongmusic.com/; http://www.musicdrivein.fi/). Some of them also offer e-learning materials on songwriting, recording or mixing (see e.g. https://www.youtube.com/user/BerkleeMusic?feature=hovercard; https://www.coursera.org/specializations/music-production; http://www.playwithyourmusic.org/ and http://therecordingrevolution.com). Furthermore, some of the e-learning materials on various aspects of songwriting and producing are even targeted at school context (see e.g. https://www.musicalfutures.org/resource/songwriting-resources). However, all these e-learning materials are in English and none of them are targeted to upper secondary school students.

There are only few e-learning materials on music producing in Finnish. For instance, Rytmimanuaali (Rhythm manual) aims at offering practical knowledge on music making and music business in Finnish (see https://www.rytmimanuaali.fi/). Rytmimanuaali's e-learning materials are based on interviews of musicians, songwriters, producers and sound engineers. However, they are primarily targeted at people who are interested in building a career in music business rather than secondary school students. Also, although Rytmimanuaali have some short videos most of the interviews are published as a written text.

Evaluating the e-learning material optimised for tablet computers

After I had analysed the data collected from the final design experiments, I started to re-develop the e-learning materials that facilitate LTP through the use of tablet computers with Mikko Myllykoski. The findings suggested that we had been too focused on things that students can do with mobile devices. We realized that we perhaps forgot that our ultimate goal is to support general upper secondary school students' musical growth. Mobile devices and their applications represent just one possible tool in order to reach that goal. Another thing that we realized after the analysis was that although the new core curriculum for Finnish general upper secondary school (Finnish National Board of Education, 2015) raises creative music producing to the centre of the musical activities, we still need to add content that supports active music making with traditional instruments through reproducing and performance. Although the course is optimised for tablet computers, it can be used on any devices, and can even be downloaded in PDF format. The course also includes the possibility to add user-generated content to course materials and to use peer assessment. I will next provide review of similar e-learning materials in order to help the reader to better evaluate the developmental project 2.

At the time of this writing, there are many e-books and Internet sites on various aspects of music producing available (see for instance https://makingmusic.ableton.com/). There are also numerous e-books that aim to guide teachers on how to facilitate composing in the music classroom (see for instance Hickey, 2012), and some them are even written in Finnish (see for instance Partti & Ahola, 2016). How-ever, these books are targeted at teachers, rather than students. Furthermore, these publications are textbooks that are also published online. Hence, they do not take advantage of the various possibilities that digitalization offers. There are also numerous e-books on the use of music applications in the music classroom and some them are written in Finnish. For instance, Finnish music educator Arto Jout-

simäki (2013) has written an e-book on the use of the iPad in music teaching (see: https://itunes.apple.com/fi/book/ipad-musiikin-opetuksessa/id703425350?mt=11). However, these e-books do not have special focus on music producing and they are, again, targeted at the teachers, rather than the students. Furthermore, there are various Internet sites that focus on music technology, including a Finnish site that aims to collect practical hands-on information on the use of various music applications, music softwares and musical devices to one address (see http://emute.edu.fi/). However, this music technology oriented site does not focus on creative side of the producing process.

8.2.2 Evaluating the level of scientific confidence in the study

The included articles, along with this summary, are meant to contribute to the international academic discourse and demonstrate the level of scientific confidence in the study, including the issues of reliability, validity, and cumulativity. However, Golafshani (2003) argues that since the concepts of reliability and validity "are rooted in the positivist perspective… they should be redefined… in order to reflect the multiple ways of establishing truth" in a qualitative research (p. 597). Barab (2014) states that in order to maintain the established demands of objectivity, reliability, and validity, researchers who use DBR must modestly accept its limitations, triangulate multiple kinds of data from different sources, use standardised methods, focus on causal explanations, and be stringent when analysing data across multiple cycles of enactment, which ideally results in increasing the alignment of theory, design, practice, and measurement over time (see also Design-Based Research Collective, 2003; Gravemeijer & Cobb, 2006; Maxwell, 2004).

On one hand, reliability has traditionally been seen as factor with which all researchers should be concerned (Patton, 2015). On the other hand, Golafshani (2003) points out that some scholars argue that "the concept of reliability is irrelevant in qualitative research" (p. 601). Still, researchers believe that they should somehow persuade their audiences that their research findings are worthy (Lincoln & Guba, 1985). In order to reach this goal, some scholars have suggested that instead of aiming for reliability, qualitative research should aim for dependability (Lincoln & Guba, 1985) or consistency (Campbell, 1996). Furthermore, reliability is often simply seen as a consequence of validity in qualitative research (Patton, 2015). However, also the concept of validity seems to be problematic in qualitative studies. On the one hand, "some qualitative researchers have argued that the term validity is not applicable to qualitative research" (Golafshani, 2003, p. 602). On the other hand,

researchers realize that some kind of measure of validity for their research is needed (Golafshani, 2003). As a result, validity can be described by a wide range of terms such as "quality, rigour, and trustworthiness… [and] many researchers have developed their own concepts of validity" (Golafshani, 2003, p. 602; see also for instance Davies & Dodd, 2002; Lincoln & Guba, 1985; Miles, Huberman, & Saldana, 2014; Seale, 1999; Stenbacka, 2001).

In this study, I collected multiple kinds of data from different kinds of sources by using multiple data collection methods such as surveys, course diaries, and interviews, in order to achieve a diverse construction of students' experiences. I used standardised instruments over multiple cycles of enactment, and the analysis of the data was stringent during the final design experiment. I have offered detailed descriptions of the data gathering and analysis, shared the initial findings with the teachers on the research team, double-checked findings using multiple sources of evidence, grounded my conclusions on the data, given dissenting explanations a chance to be considered, and sought contradiction with my initial findings by including the voice of the students with marginal points of view (Miles, Huberman, & Saldana, 2014). However, there are several dilemmas remaining typical to qualitative research in educational settings that need to be taken into consideration when evaluating this study. In what follows I will list multiple sources of analytical bias that can potentially weaken or even invalidate my findings, and show what I have done to increase confidence in what I have found. The most typical of the above-mentioned biases are the holistic fallacy, elite bias, personal bias, and "going native" (Miles, Huberman, & Saldana, 2014).

During the empirical design experiments, the e-learning materials and LTP approach were developed in five different Finnish general upper secondary compulsory music courses. It is important to remember that since the core idea of DBR is that "emergent phenomena regularly lead to new lines of inquiry" (Design-Based Research Collective, 2003, p. 7), the aim of the design experiments was not to replicate previous findings. Two of the above-mentioned courses were particularly interesting. The first one was a music course that was conducted in a regular classroom, since the music classroom where the traditional instruments were kept was being used by another group, forcing the teacher to use mainly iPads instead of the traditional pop/rock band instruments that he would normally have used during the course. The second one was a music course in which, according to the teacher, "the solving of technical problems took too much class time during the music lessons" [interview], since (s)he had not previously used iPads, Rockway, Tabletkoulu, or the

school's own learning platform, which was used as a shared cloud service for the students' course diaries. As a result of these technological problems, which took up much of the teacher's and students' shared classroom time during the music course, the students' base building relied heavily on e-learning materials, and majority of them produced their own songs alone after the actual music lessons had ended.

Many student participants from these two courses reported that they would have preferred a traditional music course that is based on singing and playing cover songs in the music classroom. When analysing the data, I had to keep in mind that, rather than measuring how the LTP approach and the e-learning materials that facilitate it worked in different specific music classrooms, my initial goal was to gain a new understanding that would allow me to redevelop the e-learning materials and a generalizable LTP model. Hence, instead of drawing a quick conclusion that students did not like the LTP approach in two of the schools, I needed to dig deeper into their experiences and to get clearer picture of what happened during their music course. As a result of such conceptual thinking, these two extreme cases (Miles, Huberman, & Saldana, 2014, p. 294)—together with the case of a novice teacher that was not part of my research group, but still participated in earlier design experiments—provided me with valuable data concerning the relationship between the roles of the teacher and the e-learning materials. However, while categorizing these as extreme cases, I might have increased the risk of interpreting events as more patterned than they really are, and over-emphasizing data from elite cases (Miles, Huberman, & Saldana, 2014).

The fact that students volunteered to participate in this study raises the possibility that these student participants had a better musical knowledge and skill base, and a more positive attitude towards the music course than students who chose not to participate in the study. In other words, it is possible that some students agreed to participate in this study because they are more interested in music than students in general. Whereas I got to know all of the students in my own courses, I had only limited possibilities to rule out or even recognize bias during the design experiments taking place in other schools. I interviewed teachers in order to get a picture of the student participants as soon as I received signed consent forms granting permission to use the course diaries, surveys, and interviews as data. I chose the most musically heterogeneous participants possible to interview at the end of the course. During the interview, I intended to verify my initial categorizations by asking each participant to choose one of the musician identities presented in Table 1.

Furthermore, the fact that I found the teacher participants either through my personal connections or through various Facebook groups such as "iPad opetuksessa" ("Educational use of iPad") may be seen as problematic and raises the possibility of the bias. Although the teacher participants worked in different schools, cities, and regions, it is possible that they had a more positive attitude towards the e-learning materials and the general idea of learning music through producing than Finnish music teachers in general.

One of the dilemmas faced when conducting research in educational settings is that the students may say what they think the researcher or teacher wishes to hear (Cohen, Manion, & Morris, 2011). This was a particularly challenging potential obstacle when I was interviewing my own students, and acting in the dual role of a practitioner-researcher (Cochran-Smith & Lytle, 2009). However, in their course diaries the students seemed to share their music-related experiences honestly, since they also reported negative feelings and failures. When I met the participants for the first time, I introduced myself and briefly explained what I was interested in, how I would collect information, and what I would do with it, as Miles, Huberman, and Saldana (2014) recommend. Furthermore, when the students' experiences were clarified and verified during the video-recorded interviews, I made it clear that constructive criticism about the e-learning materials and the LTP approach in general would be extremely helpful and desirable. As a result, the students were even more outspoken and critical during the interviews than in their course diaries.

When conducting DBR, the same people usually engage with theory, implementation, and the measurement of outcomes (Hoadley, 2004). Although this can help "with the problem of methodological alignment" (Hoadley, 2004, p. 203), working alone can also be seen as a problem of qualitative studies, since it increases the risk of having personal bias when analysing the data (Miles, Huberman, & Saldana, 2014). In other words, when evaluating the trustworthiness of the results of this research it is good to remember that it is challenging to critically examine one's own ideas and ideals.

I recognized the risk that my various personal agendas as a practitioner, researcher, and designer may have decreased my ability to analyse the data in a sufficiently unbiased manner (Miles, Huberman, & Saldana, 2014). However, since I was developing my initial theories and prototypes, it would have made no sense to purposly look only for positive feedback from participants. Furthermore, I was fortunate to co-operate with many critical friends while developing the e-learning

materials and the LTP approach. I co-operated with Rockway's staff when developing the short video-based e-learning material, with Mikko Myllykoski and Tablet-koulu's staff when developing the e-learning material that is optimised for tablet computers, and with my mentors and supervisors at the Sibelius Academy when developing the LTP approach. Still, the trustworthiness of the study would be better if some other researcher had analysed the data with me.

In addition, the decision to choose five individual key participants, who represent their own music course and type of musicianship, might have raised the risk of having elite bias, as well as losing track of the big picture. The key participants were chosen because their experiences were relatively typical, and they provided rich data in their course diaries, surveys, and interviews. I shared their experiences in vignettes (see Ojala, 2017) to further elaborate the overall picture of all participants. However, since the study was conducted across multiple music courses rather than investigating a specific group of students over a longer period of time, I was not so much concerned about being co-opted into the local participants' perceptions.

8.3 Ethical considerations

The question of ethics in social research is a highly complex issue, especially in educational settings (Cohen, Manion & Morris, 2011). In this study, I followed the national guidelines for research ethics in Finland (see Finnish Advisory Board on Research Integrity, 2012) and the general ethical guidelines for social research (see Cohen, Manion, & Morris, 2011; Miles, Huberman, & Saldana, 2014).

Social research necessitates obtaining the consent and cooperation of the subjects who are participating in the research, and who are providing permission for conducting the research in the institutions or organizations (Cohen, Manion & Morris, 2011). Before beginning the research, all research participants should agree on the researcher's rights, responsibilities, and obligations, as well as questions concerning the archiving and accessing of the data (Cohen, Manion & Morris, 2011). My strategy was first to recruit music teachers to my research team, and then start formally requesting permission to carry out my research (see Appendix L for the participant information sheet for teachers, and Appendix M for the informed consent form for schools). I contacted my participating music teachers' headmasters and asked for permission to conduct research in their school. I also asked for their help in order to be able to find and contact the accountable person in each district's administration. When I had received official authorization to conduct the research

I started to recruit the students. For this purpose, I provided written information regarding the students' possible participation in the study (see Appendix N), and arranged a short-spoken introduction about myself, my research goals, and the students' role in the research. In cases when the school was located in other parts of the country than where I live, this introduction was done via Skype. If the students stated their preliminary willingness to join the research, they, and their guardians, were asked to sign an informed consent form (Appendix O), which briefly related the nature of the research and asked for permission to videotape their interviews and use their videotaped interviews, survey answers, and course diaries as data. The students' right to withdraw at any stage was repeatedly made clear.

Social researchers must take into account the effects of the research on the participants, and consider what the participants have to invest in time, energy, or financial resources when participating in the study, and whether the study may hurt the people involved (Cohen, Manion, & Morris, 2011; Miles, Huberman, & Saldana, 2014). The teachers that joined my research team invested a lot of time in this project. However, rather than being under investigation, they were participating in the research. They were eager to test and develop new ideas and improve their own teaching. They were also allowed to freely use e-learning materials that were normally paid for.

The main focus of the empirical phase of this study was on the students' experiences. To the student participants of this study, participating in the end of the course survey and interview was the only extra effort associated with the research. Otherwise, their studying did not differ from their classmates during the music course, nor did the study affect their music grade. All the students used the same e-learning materials and produced shareable musical artefacts, whether they participated in the research or not. All the students also kept course diaries that were intended to support their active knowledge creation and peer learning, as well as work as an assessment tool for the teachers. I analysed only the participants' course diaries. The course diaries and interviews were not of a sensitive nature.

If a researcher faces ethical dilemmas, these are usually the result of conflicting values (Cohen, Manion, & Morris, 2011). For instance, the participants' right to privacy can sometimes be contrasted with the public's right to know. However, the obligation to provide anonymity for participants should be fulfilled (Cohen, Manion & Morris, 2011). I was able to ensure the student-participants' anonymity, since the research continued for years, took place in different schools, and involved

all together over one hundred students. The names of the participants were changed in the reports.

Although Finnish general upper secondary schools do not charge tuition feeds, their students have to purchase study materials themselves. Against this backdrop one might welcome a study that aims—among other things—to develop and test usable and affordable alternatives to already existing commercial products. Still, there are many ethical questions about combining research, public schooling, and commercial companies. One might argue that it is ethically problematic to conduct this kind of study in a public school. For instance, it is possible that a commercial company goes bankrupt or takes the e-learning materials down. Furthermore, considering that the e-learning materials were developed with the participants of the study, one might ask if they should have some ownership of the commercial product. In order to avoid these ethical problems, I could have kept my original plan and develop e-learning materials on the Sibelius Academy's server. However, in this case the e-learning materials would have been text-based, which would have hindered the innovativeness and the resonance of the developmental projects. I could have also conducted the study outside the music classroom. However, DBR projects should be conducted within naturalistic contexts, which in my case meant conducting the study in the context of Finnish general upper secondary school's compulsory music course. Furthermore, taken that there were more than 100 student participants in total, it would have been impossible to equitably distribute the ownership of the developmental project among all participants. None of the student participants contributed to the developmental projects significantly as an individual. Given that Google collects user data one might also find problematic that the data in my study were collected using Google's services, such as Drive and YouTube. However, taken that participants were asked to sign in to the shared Google account that I created—instead of using or creating their own Google account—I did not see this as a major problem.

8.4 Implications for future research

As I have worked on this thesis over the past seven years I have found my own path as a music educator and as a music education researcher. What began as a mere idea, first to use songwriting —and later also recording, mixing, and sharing—to help my students to construct their musical knowledge, skills, and identities, ended as two sets of e-learning materials and a framework of tested pedagogical principles that can be used in music classrooms. I conclude this work by suggesting some directions for extending the work reported herein.

Pratt (1998) offers the notion of convergence to help researchers identify when a DBR project can be drawn to a close. Convergence can be said to have occurred when the re-designing phases eventually consist of mere finer-scale refinements and tinkering (Pratt, 1998). However, convergence does not always happen as cleanly as this picture suggests, and final iterations may involve a substantial element of retrospective analysis (Pratt, 1998). Since designs can never be perfect, as Pratt (1998) reminds, I will continue updating and developing both sets of e-learning materials in the future. For instance, there are plans to make English versions of both sets of e-learning materials for the international market. Given that I was not a programmer, and did not have the resources to hire one, I chose to develop the e-learning materials in co-operation with companies who shared my pedagogical visions. Luckily, my co-operation with Rockway and Tabletkoulu turned out to be inspiring, educating, and fruitful. However, I would also be interested to cooperate with other companies. For instance, one option would be to co-operate with a gaming company in order to explore what kind of learning game would facilitate LTP.

Wider studies would be required to assess the findings of this study outside the scope of Finnish general upper secondary school compulsory music course. It would be important to further develop LTP outside Finnish general upper secondary school compulsory music course. Further development and testing of LTP with students that come from different age groups and cultures is needed. It would also be possible to use, test, and develop LTP outside the music classroom, for instance when learning languages. This kind of pedagogical intervention could involve writing lyrics in a foreign language. Furthermore, as technological developments will continue to create new possibilities for music making, learning, and sharing the findings of this study will become out-dated. Hopefully this inquiry encourages future researchers to bridge the gap between theory and practice and to examine how creative collaborative work with shareable musical artefacts may be supported by the use of new technological innovations in general music classrooms.

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Appendix A: Article 1

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Keeping it real: addressing authenticity in classroom popular music pedagogy

Aleksi Ojala and Lauri Väkevä

ABSTRACT

This article provides theoretical understanding for a development project that is reported in a separately published item. We discuss the implications of authenticity in music pedagogy, especially as regards popular music in general music education. First we problematize authenticity in music classroom through three themes: (1) how music sounds, (2) "glocal" music cultures, and (3) the role of mediation in framing the student's freedom of choice. After that we argue that the authenticity gap between the classroom and the "real-world" can be narrowed if classroom is understood as specific place for cultural production, in which the students can experiment on the use of technical tools guided by a variety of culturally specific psychological tools to construct their identity. Finally we vision what this could mean from teacher's perspective. Our article suggests that authenticity can be seen as a function of musical productivity that is meaningful both from the standpoint of the culture and from the standpoint of the individual learner.

Keywords: authenticity, informal learning, popular music pedagogy, general music education

Introduction

A growing body of research indicates that music educators are increasingly integrating their students' "own" music into the curriculum (Georgii-Hemming & Westvall, 2010; Green, 2008; Muukkonen, 2010; Väkevä, 2006; Westerlund, 2006). It has also been suggested that informal learning contributes to music education by helping teachers focus on how their students learn music outside school (Folkestad, 2005, 2006; Green, 2001, 2008; Karlsen & Väkevä, 2012). The rationale unifying these two premises appears to be that formal music instruction should focus on subject matter derived from a cultural domain that most of the students are familiar with, and on teaching such subject matter in ways that are intrinsically motivating (Crawford, 2014).

Lucy Green (2008) has argued that by focusing on musical learning as it takes place in the "real-world" outside of school, educators can bring a sense of authenticity to the music classroom. In the philosophy of music, the term "authenticity" has been used to signify qualities that make a performance true to the work, or to the conventions of a given stylistic-historical period (see e.g., Davies, 1991; Levinson, 1990; Young, 1988). In music education, authenticity has also been linked to membership, values, and identity (Kallio, Westerlund & Partti, 2013). On one hand, authenticity has been discussed as a function of culture that frames the meaning and value of musical experience in situations of musical learning (Dyndahl, 2014; Martin, 2012; Small, 1998). For instance, Martin (2012: 1) argues that because culture provides meaning through "negotiations among [its] present and past members …. learning activities should be contextualized by the authentic situations from which they are derived." This necessitates that the students are given "real-world models, resulting in a meaningful, engaging and potentially life-long learning experience" (ibid.). On the other hand, authenticity has also been discussed as a function of individual agency and ownership of learning. For instance, Karlsen (2010: 44) suggests that music educators should create learning environments that fulfil their students' personal needs for authenticity. In other words, authenticity can be taken as a function of learning that is meaningful both from the standpoint of the culture as a whole and from the standpoint of the individual.

In the following, we will first problematize authenticity in relation to three themes: musical sound, the "brokering" pedagogies of "glocal" music cultures, and the influence of mediation in students' freedom of choice. We then argue that the "authenticity gap" between the classroom and the "real-world" can be narrowed if the classroom is understood as a specific place for glocal cultural production. In such a classroom, the students would be able to experiment with the use of technical tools, guided by a

variety of psychological tools, in order to construct their identities. Finally, we envision what this could mean from teacher's perspective.

Obviously, we do not profess to exhaust the potential for discussion of these themes. However, we hope that we can shed light on the tangled theoretical issue of authenticity by addressing problems specific to classroom music pedagogy. While these themes are not genre-specific, we will discuss them in relation to popular music. The reason for this is simple: because popular music appears to represent "real-world" music to most (if not all) students, it seems to provide the most accessible platform for authentic learning within the classroom. As Lucy Green's work has been in the spotlight of the discussion of popular music pedagogy in recent years, we will use her texts as a point of departure and a reflecting surface.

Sonic authenticity

According to Green (2006, 2008), it is in authentic (or "natural", or "real-world") situations that people become motivated to learn music. As far as most young people are concerned, such situations often relate to popular genres, which in turn means that such genres can provide authenticity to the music classroom by connecting the students to the "real-world" music outside school (Green, 2008). Thus, Green advises teachers to look at how popular musicians learn, as an indication of how to develop their pedagogies in ways that are inviting and intrinsically motivating. Furthermore, Green (2008: 83–84) argues that by building on the informal learning practices of popular music, a resourceful music teacher can raise her students' interests in other kinds of music and, in this way, help her to develop the "critical musicality" needed to judge authentic musical meanings in connection with a variety of cultural fields.

Hence, in its ubiquity, popular music appears to offer a fruitful point of departure for authentic musical learning. However, one may argue that, when taken into the classroom, it might lose part of its appeal, because it might not sound "right". Indeed, several writers have pointed out that music education has a tendency to build its own musical practices, which may be sonically irrelevant to the students' lives outside school (Paynter, 1982; Regelski, 2004; Stålhammar, 1995; Swanwick, 1999; Tagg, 1982). An unwanted outcome of such practices may be the creation of a specific genre of "school music"—music that is alienated from its cultural origins to a certain degree, and which may not appear to the student as relevant at all (Georgii-Hemming & Westvall, 2010; Lindgren & Ericsson, 2010; Väkevä, 2010).

One way to rationalize the authenticity gap between classroom and "real-world" popular music might be that the students' "aural awareness" (Hugill, 2008; Partti, 2012) is pre-tuned to musical sounds in such a way that they do not accept what they hear in the classroom as authentic. Furthermore, the students might not be able to produce authentic sounds in the classroom because the classroom might not offer suitable conditions for authentic sound-making, due to availability of resources, time, or space. Also, the teacher's abilities to guide the student may be limited as a result of previous musical training and experience.

As an answer to such concerns, Green (2006: 114) maintains that it might be an error to expect that students are "that concerned about the authenticity of their musical products as adults expected them to be". Perhaps "the problem of authenticity in the classroom is an adult construction, caused by too much focus on the product" instead of the "process of music-making"? (ibid.) Green even posits that "no ordinary class of mixed-ability children is likely to be able to play any kind of music in a way that is musically authentic" (ibid.).

However, we believe that there may be possibilities to cater to *both* the authenticity of learning and sonic authenticity in classroom. This necessitates paying attention to at least four factors: the pedagogical implications of "glocal" music cultures, the role of mediation in determining what sounds authentic, the authentic use of tools in the classroom, and the role of the teacher in guiding such use.

The "brokering pedagogies" of the "glocal" music cultures

It has been said that we live in an increasingly "glocal" culture that exist at the crossroads of global and local interests (Dyndahl, 2009; Folkestad, 2006; Söderman & Folkestad 2004). It might also be argued that each "glocal" music style introduces its own way of learning and, in this respect, its own pedagogy. Thus, today's popular music pedagogy might have an increasing need of "brokering" – transformative learning that helps the learners to travel fluently "between communities, transferring ideas, styles, and interests from one practice to another" (Partti, 2012: 154). Hence, while it is probable that many young people today identify with *some* kind of popular music, this does not suffice as reason to assume that *all* popular music should be taught in the same way (Allsup, 2008; Clements, 2012; Väkevä 2009, 2010). Instead of constituting a unitary musical field, in its "glocal" variety popular music present itself as a dynamic "mix" of creative influences that flow freely between musical styles (ibid.). This might

mean that perhaps there is no one authentic way of learning popular music, but rather different place-based varieties that imply a multiplicity of pedagogical possibilities.

Attempting to define a means to guide students in all "glocal" idioms would certainly be too overwhelming a task, even for teachers specialized in popular genres. Still, the teachers should have an understanding of the students' musical lives. However, recent research (Georgii-Hemming & Westvall 2010) claims that music educators who teach popular music in schools may make repertoire choices on the basis of their own preferences, rather than those of the students'. In Nordic countries, this often means utilizing popular songs accompanied with guitars, basses, drums, percussion instruments, and keyboards, in order to obtain goals that are taken to be relevant to the aesthetics of mainstream pop and rock styles (Georgii-Hemming & Westvall 2010; Lindgren & Ericsson 2010; Muukkonen, 2010; Väkevä, 2006; Westerlund, 2006). This practice might lead to a new ethnocentrism, wherein some students might actually have their learning hindered (Dyndahl, 2014).

Furthermore, if we accept the Wengerian perspective that "building an identity consists of negotiating the meanings of our experience of membership in social communities" (Wenger, 1998: 145) it is essential that music educators offer their students possibilities for creative conjoint "brokering". In light of the glocal multiplicity of popular musical genres and styles, we might question all approaches that reduce the variety of popular music pedagogies. Instead of accepting that there is a "natural" way to learn popular music, we should embrace a variety of learning styles and strategies as a point of departure for designing local curricula. If we further accept that music educators should be interested as much in the authenticity of musical sound as in the authenticity of musical learning, we might conclude that they should be able to cater to a variety of learning needs that derive from different musical-cultural contexts.

Freedom of choice and the role of mediation

In the late modern culture, in which we allegedly live today (see e.g., Giddens, 1990; Beck, 1992; Fornäs, 1995; Bauman, 2000), popular music is globally mediated (Born, 2005). Indeed, one may ask whether it is possible to talk about authenticity in contemporary popular culture at all, given that the latter is largely dependent on mediation to get its message through, and that mediation influences the mediated content (Väkevä, 2009). Concerning the authenticity of learning, the question emerges whether our students are free to make informed choices, given that the production, distribution, and consumption of media content are to a large degree regulated by the marketing

tactics of the entertainment conglomerates that use glocal cultural signifiers to convey globally intended messages. Because of the dependence on the distribution of popular music in the global commercial market, some music education scholars have insisted that popular genres should not be accepted as a part of music education (Bayles, 2004; Bloom, 1987; Handford & Watson 2003; Scruton, 1999; Walker, 2007). One way to justify such assertions is to claim that because authentic musical experience is not possible in conditions regulated by the cultural industry, music education should look elsewhere for lasting cultural (and thus educational) value.

While this is not the place to examine such arguments in detail, they are relevant here, as they suggest that one of the concerns of contemporary music educators dealing with glocal popular culture may be that "children are insufficiently equipped to defend against [the] market exploitation" that the music industry allegedly represents (Allsup, 2008, 6). Such concerns imply that music educators should be at least aware of the major influence that global marketing tactics have on the local cultural consumption and experiencing of music, and how this is reflected in the students' choices.

If we accept that authenticity is at least partly linked to freedom of choice, as Taylor (1991: 67) suggests, we may ask how music education can provide room for manoeuvre between the students' freedom to choose their "own" music and the conditioning factors of the media-dependent global cultural economy. Green (2008: 46) also acknowledges this: she argues that it is important to recognize that, even when we give the pupils free choice in terms of what music to study, there are in fact many restrictions on their choices. For instance, some students might feel pressure to conform to the mainstream definitions of popular music, which in turn might prevent the teachers from suggesting approaches that deviate from the norm. In such conditions, authenticity of learning may become restricted both by the commercial mediation of the signifiers of common taste and by the teacher's personal aesthetic and didactic preferences. It is between these two coercive factors that the student must find her niche for an authentic learning experience.

Green (2008: 83–84) argues that increasing the musical understanding of different music genres can lead to an awareness of how musical mediation and the music industry work, and encourage alternative ways of viewing music in society, thus teaching the student to examine musical cultures critically. Following this rationale, contemporary market-oriented popular music can be brought into the formal educational environment, but it should be accompanied by a critical attitude that helps students evaluate its cultural meanings. However, a critical consciousness of music's cultural meanings best grows out of a productive hand-on music experience, shared in social space. Hands-on musical involvement provides a material basis for authentic learning,

regardless of where this learning takes place. We will argue next that this necessitates the understanding of, and ability to use, the proper tools in relevant contexts.

The use of authentic tools

Vygotsky (1978) famously argued that our living conditions affect the way we learn, and that learning can be improved through using different aspects of our environment as tools. There are two kinds of tools we use to expand our learning environment:

- *Technical tools* are used to control the environment. For instance, in the context of music education, technical tools can include any devices used to manipulate sound, such as acoustic, hardware, and software instruments.
- *Psychological tools* control thinking and help us to solve problems regarding the use of technical tools. In music education, psychological tools can include e.g., instrument playing skills, theoretical concepts, or the critical understanding of musical culture.

If "learning activities should be contextualized by the authentic situations from which they are derived" (Martin, 2012: 1), it logically follows that students should use tools derived from the "real-world" of musical situations. However, even more critical than their origin, is how these tools are used in problem solving activities in the classroom "reality". In other words, authentic learning requires more than emulating the use of the "real-world" tools: it also requires an understanding of the relevant use of these tools in the actual situations of problem solving. The relevant use of technical and psychological tools is determined partly by broader culture, and partly by the specific community of learners that negotiates the use and meaning of these tools in their individual learning situations. Wenger (1998: 46) also emphasizes the importance of tool selection, by pointing out that "having a tool to perform an activity changes the nature of that activity". For instance, experimentation with contemporary digital tools can gradually transform teachers' pedagogical approaches from teacher-directed towards student-centered, and in this way embrace new possibilities of learning (Wise, Greenwood & Davis 2001: 118).

The teacher as a producer of authentic learning

As Green's (2001, 2008) research suggests, outside the classroom much of musical learning takes place in voluntary conjoint activity, at least as pertains to popular genres. However, this does not have to make the teacher obsolete in the classroom (Sexton, 2012). Rather, it shifts her role from being a provider of information to a facilitator, manager, or *producer* of learning. The teacher-as-producer analogue could be remarkably useful, if a "producer of learning" would be understood as someone who works between the musical and pedagogical domains in a creative manner, recognizing her responsibility for the outcomes of the learning. In the same way that a music producer is expected to bring forth the capacities that potentially exist in unfinished musical ideas, and in the persons involved in the production process (Hepworth-Sawyer & Golding 2011), the music educator can produce learning by bringing forth the capacities that already potentially exist in her students, and in their constructive interactions (see also Jorgensen, 1997).

If we think of music education in terms of producing, we may argue that teachers are especially needed in the beginning of the learning process, as learners have to be supported and scaffolded (Elliott, 1995) sufficiently to find relevant goals and working methods – a procedure akin to that of a professional music producer, whose role is to encourage the musicians to partake in the creative process and to see that everything takes place fluently (Hepworth-Sawyer & Golding, 2011). If we accept that the "reality" of music classroom is a complex learning environment that affords multiple trajectories of learning, it might be feasible to expect that the teacher has a say in how the students work towards an authentic goal without unequivocally dictating the procedures and outcomes. Thinking of herself as a producer of learning, the teacher may find a mediating role that contributes to the artistic outcomes of the students in ways that support authentic learning experiences: however, this necessitates that the teacher builds social competencies that engender trust in the students –something that is also required for successful music producers (Hepworth-Sawyer & Golding, 2011).

Conclusion: education as an extension of the realm of authenticity

We have argued in this article that it may be possible to cater to both the authenticity of learning and the authenticity of musical sound in the music classroom. However, this necessitates paying attention to at least four factors: the pedagogical implications of

"glocal" music cultures, the role of mediation in what sounds authentic, the authentic use of tools in the classroom, and the role of the teacher in the reality of the classroom.

We suggested that the music classroom could be seen as a complex learning environment that affords multiple trajectories for authentic learning. In such conditions, the teacher can be seen as a producer of learning that helps her students to negotiate their musical identities within the communities of practice that glocal music-related interactions make possible. This would fit with the notion that there may be no "natural" way of learning popular music. Instead, popular music pedagogy could adopt an open-ended and "brokering" approach, through which the teacher could address a variety of issues related to glocal and mediated music cultures without losing her focus on hands-on music making.

Through creative hands-on involvement, students can expand their musical understanding and incorporate new realms of cultural meanings (Green, 2008: 4). However, the students' room for authentic learning experience may be narrowed by two coercing factors: the commercial mediation of the signifiers of common taste, and the teacher's personal preferences. Nevertheless, formal music education can reach out towards a more expansive understanding of how music is globally mediated: this, however, necessitates that music teachers are themselves aware of the complex dynamics of glocal music cultures, and allow their students to experiment with the use of different technical tools guided by a variety of psychological tools.

In light of what has been discussed above, it seems that, *pace* Green, music classrooms can offer places for negotiating musical identities in ways that support authentic learning. The "reality" of the classroom does not have to hinder authentic learning: it can offer possibilities to extend the realm of authenticity from immediate contact with musical subject matter of the student's own choice to culturally relevant uses of a variety of musics. The individual situations of music classrooms should not be understood as distinct from "real-world" musical and music-related activities, but neither should music classrooms be understood as merely derivatives of "natural" learning environments. Music classrooms, in this sense, can be taken as specific places for glocal cultural production, where a teacher equipped with pedagogical tact can channel uses of the tools in ways conducive to both cultural and individual authenticity.

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Appendix B: Article 2

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Developing learning through producing

Secondary school students' experiences of a technologically aided pedagogical intervention

Aleksi Ojala

Introduction

As a practitioner-researcher I have gradually developed a pedagogical approach that has seen the teaching and learning in my classroom move from a one-size-fits-all education towards personalized learning paths. Through this approach, which I refer to as Learning Through Producing (LTP), students have been engaged in learning music through collaborative, technology-aided, creative music-making. As part of this project, the scope of student work was broadened from the reproduction of musical works to creative work such as arranging and songwriting, and from performance to producing shareable artefacts such as tracks and videos.[1] LTP was developed using design-based research (DBR) as a methodological toolkit. DBR allows the researcher to directly impact practice by developing and testing an innovation, in this case two e-learning materials, with the goal of generating approaches that can be generalized to other classrooms (Barab, 2014). In this chapter I first introduce the LTP approach and the e-learning materials that facilitate it, and then describe how the design-based research project was conducted. Following this, I share insights into secondary students' learning experiences during this technologically aided pedagogical intervention.

1 In Finland, where popular music has been widely accepted as part of music curricula in schools and teacher training courses, general music education is often based on rehearsing easy-to-play pop hits in large group settings with traditional pop/rock band instruments such as drums, percussions, guitars and keyboards (Juntunen, 2011; Muukkonen, 2010; Väkevä, 2006; Westerlund, 2006).

Learning Through Producing, and the e-learning materials that facilitate it

The LTP approach has two stages: the initial *base-building* stage feeds into the producing stage (see Figure 6.1). These stages can take place either once or over multiple lessons. The *producing* stage sees musical knowledge, skills and identities constructed through sustained collaborative work that aims at creating shareable musical artefacts from the basic elements of music, using appropriate tools. As illustrated in Figure 6.1, this creative work of the producing teams takes place after the *base-building* stage, which can be further divided into common and personalized parts. A teacher-led, collective introduction of the most important basic elements and tools is targeted to all the students in a big group. After this, students can deepen their learning by creating personal learning environments and collaborating in producing teams. The teacher's role in this process is to create a warm, nurturing atmosphere and make sure that students have at least some kind of shared knowledge and skill base before they create their own goals and start working with musical material and tools that they find of relevance and interest to them. Figure 6.1 also shows how this process, which can take place once or several times during the course, moves from a formal, didactic approach towards a more informal pedagogical model (Green, 2008), recalling Folkestad's (2006) "continuum" of learning modes.

As part of the development and implementation of LTP, I came to the realization that my students were able to use their mobile devices[2] to consume, produce and share music and music-related knowledge (Partti, 2012; Salavuo, 2006). This inspired me to develop two e-learning materials that utilize LTP: an online video-based course and an e-book. When using LTP, the main aim of the online materials is to help students to develop their personal knowledge and skill bases by introducing elements and tools that they can use when they produce shareable musical

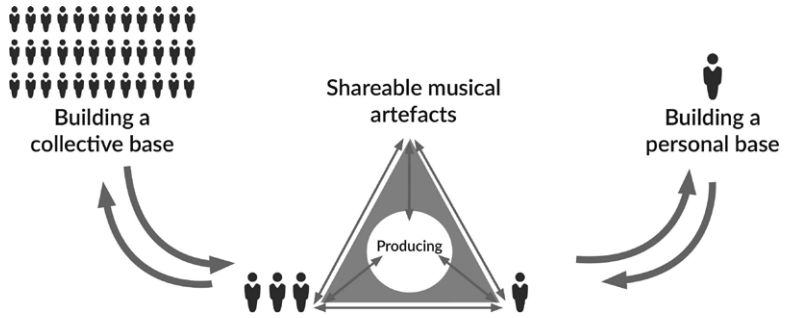

Figure 6.1 Twofold base-building stage in relation to the producing stage

2 In 2013, 77 percent of the students in Finnish general upper secondary schools had smartphones, and 80 percent laptops (Mikkilä, 2013).

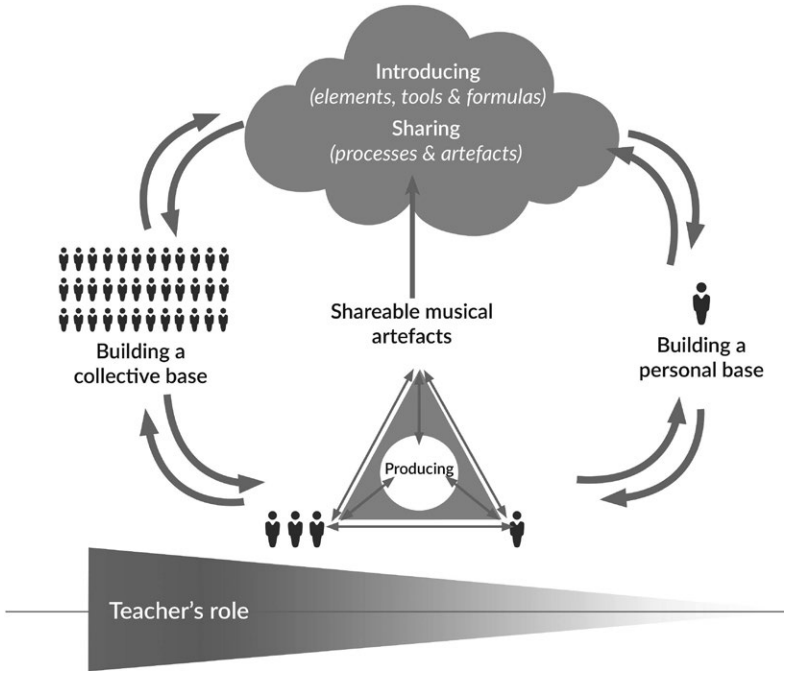

Figure 6.2 LTP approach in relation to the use of e-learning materials

artefacts. Furthermore, during and after the producing stage the use of cloud services offers myriad possibilities for students to share their creative processes and musical artefacts; in the LTP model this sharing can be used to support peer learning and to build collective knowledge and skill bases. Figure 6.2 illustrates the use of e-learning materials when using the LTP approach.

The online video-based course that utilizes LTP is called *Luova musiikin tuottaminen* (Creative Music Producing). It incorporates short videos produced by music educators, musicians, producers and students for the Rockway[3] online music platform for Finnish schools (Rockway, 2015). The material contains lessons on the basics of pop/rock band instruments and music theory, as well as on songwriting and music production techniques, such as how to use rhymes in creating lyrics, and lessons on recording acoustic guitar. The second developed e-learning outcome[4] is an e-book that focuses on using various free online applications that are curated for the *Tabletkoulu*[5] ('Tablet school') e-learning environment. Besides containing free

3 Rockway is a Finnish online music school based on video lessons.

4 This author developed the course with Mikko Myllykoski who is one of the leading experts and pioneers in the field of mobile music pedagogy in Finland.

5 The purpose of Tabletkoulu is to offer pedagogically innovative e-books for courses that a majority of the comprehensive school and general upper secondary school students in Finland will attend (Tabletkoulu, 2015).

digital tools for music production, the e-book offers an introduction to the basic elements of music using text, short videos and practical exercises in music-making.

Conducting the design-based research project: Context, methods and participants

The development and implementation of the LTP approach took place in the context of the only compulsory music course[6] in Finnish general upper secondary schools. In Finland about 50% of 15- to 16-year-old comprehensive school graduates continue their studies in general upper secondary school (grades 10–12), which provides eligibility for higher education (Ministry of Education and Culture, 2014; Statistic Finland, 2014). The Finnish general upper secondary schools' conception of learning emphasizes students' active knowledge creation (Finnish National Board of Education, 2003). This conception of learning requires schools and teachers to develop learning environments that enable students to set their own objectives and to work collaboratively in different groups and networks, also engaging with available technologies (Finnish National Board of Education, 2003).

I developed and tested the LTP approach and the e-learning materials that facilitate it with my own students during two research cycles of design, enactment, analysis and redesign. Four other teachers agreed to join the research team during the third research cycle, which took place during the autumn semester of 2014. The teachers were free to choose what elements and tools they introduced and how. Some teachers introduced the elements and tools mostly through hands-on music-making in a big group, whereas others utilized small-group work. Some teachers consistently used the e-learning environments in their music lessons, whereas others used the idea of the flipped classroom,[7] where students would go through introductory and/or optional e-materials before and after the actual classroom sessions in order to use the classroom time more efficiently for hands-on music-making and creative work. All teachers asked their students to create shareable musical artefact as final assignments for the course.

The four music teachers who joined the research team worked in different general upper secondary schools. Two of the schools were in the Southern capital area of Finland (Uusimaa), one in a Northern territory (Lapland) and one at the Eastern border (North Carelia). According to matriculation examination statistics (Tebest, 2014), the schools' ranking varied from being in the top 2% to the lowest 33% of the 442 general upper secondary schools in the country. Two of the schools provided personal iPad tablet computers for all of the students, whereas two other schools had 16 iPads permanently in the music class (for one or two students to

6 The general aim of this course, titled "Music and Me" – approximately 38 lessons long – is to help students to find their own ways of operating within the field of music (Finnish National Board of Education, 2003).

7 The 'flipped classroom', also known as 'flipped learning', 'inverted classroom' or 'reverted instruction' means a specific type of blended learning that uses technology to move traditionally class-based learning outside the classroom in order to use classroom time more efficiently for interactive, group-based, problem-solving activities (Sams & Bergmann, 2013; Strayer, 2012).

use at any given time[8]). The students were free to use these devices during music lessons or to bring their own devices. During the research the teachers shared experiences through email, a closed Facebook group and weekly Skype meetings. I also interviewed them either in person or through Skype approximately two months after the main research period.

A majority of the students took the compulsory music course during their first year in upper secondary school, at the age of 16. All the participants had free access to e-learning materials during the course. Besides using mobile devices to access the Rockway and Tabletkoulu online environments, the students used tablets, phones and laptops as musical instruments and as portable workstations for audio and video production. All the students were instructed to keep an electronic course diary and were encouraged to share their diaries with peers. The idea was that at the end of the course each student would have an electronic portfolio containing reflective essays and/or an audio-visual document about their activities that included work undertaken and artefacts developed during the course. The course diaries were intended to support students' active knowledge creation and peer learning, to work as an assessment tool for the teachers, and to provide data for the research project.

The student participants were asked to respond to surveys before and after the course. The aim of the short preparatory questionnaire was to provide an overall picture of students' musical backgrounds and expectations of the course, whereas the more detailed post-course survey aimed to provide an overall picture of their learning experiences during the course. This information was then clarified and verified through video-recorded and transcribed group interviews which took place within a week of the end of the course. Informed consent forms granting permission to use course diaries, surveys and interviews as data were signed by 97 students and their guardians. There were 52–71 respondents[9] to the preparatory questionnaire and 41 respondents to the post-course survey. Six students with different musical backgrounds and learning experiences from each music course were interviewed either individually or in small groups, depending on their teacher's preferences, to provide balance of representation from the participating schools.

It is important to realize that no 'polished' materials or pedagogical models were available to teachers and students during the data collection. Rather, guided by the idea of the DBR, new understandings brought about by this technologically aided pedagogical intervention were used to refine the e-learning materials and LTP approach. Hence, design work and theory building provided points of departure for the data collection and analysis. The data were analyzed following the typical qualitative analysis pattern of data reduction, data display and conclusion drawing and verification (Miles & Huberman, 2014). Since the compulsory music courses took place in different periods in different schools, I was able to organize the data collection and preliminary coding in a cyclical way, which made analysis

8 The student participants took the compulsory music course with 21–33 peers, depending on class size.

9 The discrepancy in sample size is due to the fact that not all students answered every question on the questionnaire.

an ongoing enterprise (Miles & Huberman, 2014). I considered first each student participant and then each music course as a case before looking at the whole group of participants and all the music courses for themes, such as the role of the teacher, peers, mobile devices and e-learning materials that were present for different students and schools[10] (Miles & Huberman, 2014). These overlapping themes allowed me to create the visual models presented in Figures 6.1 and 6.2, which became, in turn, essential tools when re-designing the e-learning materials.

According to the preparatory questionnaire, student participants reflected a wide variety of musical skills and attitudes towards music.[11] In addition, they reported different aims for their compulsory music course (Miles & Huberman, 2014). Since one of the aims of LTP is to generate possibilities for personalized learning paths, I wanted to find out a) what, and b) how, students with different musical identities report about their learning experiences. The analysis process led to the formation of the following five main categories, based on students' descriptions of their musical identities during and after the course:

1 Students who have a 'non-musician identity' have never had organized music-related hobbies and goals outside the music classroom, although they might sometimes make music or play a musical instrument during their free time.
2 Students who have an 'ex-musician' identity have at some point in their lives actively made music or played a musical instrument, including outside the music classroom, but report no longer being involved in musical activities.
3 Students who have an 'informally trained musician identity' actively make music or play a musical instrument without formal tuition. They have music-related goals outside the music classroom, but music-related hobbies do not necessarily occupy the majority of their free time.
4 Students who have a 'formally trained musician identity' have been actively taking part in extracurricular institutional music education for more than three years. Music-related hobbies take up the majority of their free time and they have ambitious music-related goals outside the music classroom.
5 Students who have a 'new musician identity' started or re-started actively playing an instrument or making music during or immediately following the course.

In what follows, I provide insights into the students' perspectives during and after their music course. I begin by providing an overview of the experiences of the whole group of participants. This picture is elaborated through the presentation of vignettes[12] that share narrative descriptions of the experiences of the five individual key participants (see vignette 1). The vignettes represent relatively

10 Miles and Huberman (2014, p. 103) write about "stacking comparable cases" when describing this kind of analysis technique.

11 This is in line with recent research that investigated Finnish comprehensive school leavers' musical skills and attitudes (Juntunen, 2011).

12 A vignette is a narrative, focused description of a series of events taken to be representative in the studied case (Miles & Huberman, 2014).

typical responses from the course participants. The data from participants' surveys and interviews have all been translated from Finnish by the author, and participants are all referred to by pseudonyms in order to maintain their anonymity.

Vignette 1 introduces each key participant's music course and describes their musical identities.

Vignette 1

Non-musician 'Ingrid' was a student of a technologically oriented teacher, who utilized a lot of iPads but also used traditional pop/rock band instruments during the course. In her music course, base-building and producing were done in small sections, one element and/or tool at a time. Ingrid describes her relationship with music: "I listen to music every day at home and when I work out . . . sometimes I play piano at home, even though it has never been my hobby and even though I am not good at it . . ." (survey).

Ex-musician 'Emma' was in a music course that was conducted in a regular classroom since the music classroom was used by another group. Hence, her teacher was forced to use mainly iPads instead of the traditional pop/rock band instruments that (s)he would normally use during the course. During the base-building stage they utilized e-learning materials and played cover songs. The producing stage took place during the last lessons of the course. Emma describes her relationship with music: "I love to listen to music and I listen to it a lot, mostly alternative rock . . ., I played piano for two years but quit it in fifth grade [five years ago]" (survey).

One of the informally trained musicians, 'Sarah', whose teacher utilized both iPads and traditional pop/rock band instruments during her course, describes her relationship with music: "I listen to all kinds of music from classical to K-pop [Korean pop]. . ., I started to play the piano when I was small but have never had a piano teacher" (course diary entry). Her teacher usually gave Tabletkoulu assignment as homework but students were free to use Rockway how they wished. Sarah studied constantly with her team members during the base-building stage, and they also played cover songs in the big group before the producing stage began.

'Joanna', who represents formally trained musicians, was in a course in which, according to her teacher "the solving of technical problems took too much class time during the music lessons" (interview). Since her group was really big, her teacher divided students into smaller groups. Some studied basics through online materials while others played together in the music class. Students produced their own songs individually, at home, at the end of the course. Joanna describes her relation to music: "Music has been and will always be an essential part of my life . . . I listen to lot of music, and study piano at the extracurricular music school. At home I also play guitar and accordion" (survey).

One of the new-musicians, 'Tina', was the author's own student during a course where we utilized both iPads and traditional pop/rock band instruments. She describes how the course changed her musical identity: "I listen to all kinds of music all the time . . ., I played classical piano for 11 years, but I quit the piano lessons last spring . . . I think it is thanks to this course that I got really excited about the guitar . . . my parents were astonished since I would just grab my brother's guitar and play it the whole evening. I also spent a lot of time with GarageBand and taught my brother to use it" (survey).

Tina's music course was divided into three equally long sections. After the introductory section that was based on hands-on music making in the big group, students were asked to make a cover version of an existing song in small groups that I had put together. At the end of the course students were asked to form producing teams and to produce a track or a music video. Throughout the course students were encouraged to deepen their learning with the use of e-learning materials.

Students' learning experiences in the base-building stage: Introduction of the elements and tools

Even though the participants had considerable musical information available through e-learning materials,[13] they underlined in their post-course survey responses that they felt that the teacher's presence was especially necessary in the beginning of the course to ensure that the creative work was accessible to all

13 There are altogether approximately 3500 online lessons available in the Rockway service.

students. This is not surprising considering that only a minority of the participants reported at the beginning of the course (preparatory questionnaire, 65 answers) that they could sing well (13 answers) or play an instrument well (17 answers).

The teachers had the opportunity to introduce elements and tools that the students needed when producing their own music either by the use of hands-on music-making, or through assignments that were completed in small groups or at home. However, some students were disappointed, feeling that they did not have enough time for hands-on musicking during the course. The students liked the basic idea of flipped classroom since "everybody has [a] phone and earphones all the time in their pocket anyway", as one student pointed out in interview. Still, only the most motivated students actively utilized the opportunity to deepen their learning through the use of e-learning materials during their free time [survey], and many students agreed that there should not be homework as part of a compulsory music course [survey].

Although the students reported that they were highly motivated to learn traditional pop/rock band instruments, they did not see the iPad as a real instrument (Randles, 2013; Williams, 2014). This view was particularly clear among the students who were forced to use iPad as their primary instrument during the course because they had no access to a music classroom (where the traditional instruments were kept). For instance, one of these students complained that "since we used mainly iPads I did not progress as a player" [survey]; another commented that "the students get more out of the course when playing real instruments than just touching a screen" [survey].

In vignette 2 the key participants describe in their course diaries their learning experiences during the base-building stage of the course.

Vignette 2

Ingrid (non-musician): Today was our third lesson. We uploaded the GarageBand application and everybody was supposed to compose a beat with a partner, which was really fun. At the end of the lesson we listened to what the others had done . . . During our fourth lesson we added virtual bass, piano and guitar tracks to our beat. It started to sound good! Then the teacher said that we should learn to play the product of our assignment with the real instruments. Luckily we had easy chords.

Emma (ex-musician): It has been fun playing with the iPads in the lessons, though sometimes it is a bit boring, depending on which instrument you play . . . during our three lessons in the actual music classroom I started remembering some chords on

the guitar, which is funny since I've always thought that I'm useless with the guitar.

Sarah (informally trained musician): Some students loved Rockway it but I only watched couple of videos about piano playing . . . Today we practised using GarageBand by making a short song. Some instruments sounded funny and we laughed a lot. After that we began to play and I found myself sitting behind the drums.

Joanna (formally trained musician): The basic assignments were too easy for me, but I learned useful songwriting, guitar playing and vocal techniques from online videos.

Tina (new musician): I learned the basics of the guitar during music lessons . . . I used Rockway to learn how to form barre chords . . . During the weekend I practised our arrangement a lot. I hope I have time to master F sharp major before we are supposed to perform the song in front of the class.

Students' learning experiences in the producing stage: Creating songs, tracks and videos in producing teams

Since tool selection has been seen to be a significant influence in shaping the creative processes when producing contemporary popular music (Partti, 2012) it is important to provide students with authentic technical tools. However, the educative use of LTP requires that students have an understanding of the relevant use of these tools in 'real world' cultural situations (Ojala & Väkevä, 2015). For instance, one of the teachers pointed out that students who did not have this understanding seemed to just "randomly play around with ready-made loops" [interview]. Furthermore, another teacher stated that after the students gained the basic understanding of the elements and tools during the base-building stage, they not only expanded their musical knowledge and skills during the producing stage but also "started to listen to music more analytically and critically" [interview].

Most of the student participants thought that they succeeded in songwriting, and produced tracks[14] that sounded "surprisingly good", as one student put it [interview]. In general, they reported a high level of peer learning, and stressed the benefits of a warm and trusting atmosphere when working in producing teams. However, the students emphasized that there should be enough time reserved for the producing process, and that the producing teams should not be too big or heterogeneous when it comes to musical taste and skills. Although the participants underlined the teacher's

14 To hear key participants' tracks, visit: https://soundcloud.com/keyparticipants/sets/tracks

significance during the introductory section of the course, they wanted the teacher to be available during the creative work in producing teams so that they could ask for help if they had problems. As soon as they got the first musical or lyrical ideas and overcame the first technical problems, the creative process "started to roll under its own weight", as one student described it [interview].

Although the students did not consider mobile devices as real musical instruments, the iPad seemed to function well as a portable (and virtual) studio for audio and video production. Most of the students used iPad's GarageBand application as their primary producing tool, but a couple of students preferred to work with other music software, such as FL Studio, on their own laptops. Smartphones were used mostly to capture and share unfinished musical ideas. The students who had enough time to make music videos used their iPads' iMovie application and thought the process was "funny" and "inspiring" [survey].

Vignette 3 describes the key participants' experiences during the producing stage of the course.

Vignette 3

Ingrid (non-musician): We had a really good team spirit . . . it was hard to get started, but after the first draft we progressed well . . . I enjoyed the making of the video – it was the climax of the course that really allowed us to use our creativity [survey].

Emma (ex-musician): It was fun to compose with a friend – we just tried different things and listened for what sounded good . . . I think we succeeded quite well, although we used a lot of loops [survey].

Sarah (informally trained musician): We all had our own roles in the team and everybody's ideas were respected. Sometimes somebody took the lead and others just commented . . . I tried composing for the first time and I think I will try it again after the course [survey].

Joanna (formally trained musician): I wrote a song for the memory of my father at home. He passed away four years ago . . . Lyrics just started to come and then also a melody, almost suddenly . . . After the song was written I just took a drum loop from GarageBand and recorded guitar, piano and vocal tracks on top of that [interview].

Tina (new musician): Our teamwork was really effective and we had a good time together . . . I ended up working a lot at home too, since I wanted to learn how to use GarageBand and

> iMovie properly, but it was worth it . . . I have shared our video with all my friends and I played our song on my grandfather's birthday to all my relatives; everybody wondered how on earth we were able to produce such a great song [survey].

Conclusion

Given the major transformations of the contexts of learning brought about by the digital revolution (Collins & Halverson, 2010; Prensky, 2010), and the contexts of global music culture (Hugill, 2008), it seems reasonable to claim that music educators should have an understanding of digital musical tools and their implications for the "democratization" of creativity[15] (Loveless & Williamson, 2013; Väkevä, 2006, 2009, 2010). In this chapter, I have introduced some possible ways to widen the perspective of institutional music learning from reproduction and performance to include arranging, songwriting, recording, mixing and sharing music, and to see music classrooms as hybrid spaces (Niknafs & Przybylski, chapter 32, this volume; Tobias, 2012) where students with different knowledge, skills, goals and identities learn music together. This introduces new ways to bridge the 'gap' between the 'real world' musical experiences of young people, and what is taught and learned in the school classroom. I have suggested that when musical knowledge and skills are constructed through producing, and when students are able to work with tools and musical material that they find relevant, opportunities arise for them to form music-related communities of practice (Wenger, 1998) and negotiate their musical identities (Burnard, 2012; Green, 2008). Furthermore, the findings of the study reported in this chapter suggest that in order to learn music effectively and purposefully through producing, many students benefit if they are introduced to musical elements and tools, together with the understanding of the relevant use of these tools in authentic cultural situations (Ojala & Väkevä, 2015), before the creative work in producing teams takes place.

While building a collective knowledge and skill base can be successfully accomplished through hands-on music-making in the music classroom, the use of e-learning materials and mobile devices can transform music learning in schools by offering ubiquitous affordances for personalized learning (Pachler, 2010). Therefore, for teachers, the use of LTP and e-learning materials can offer new pedagogical possibilities in moving from a one-size-fits-all model of instruction towards an education tailored to meet a learner's individual needs in achieving his or her goals (Sawyer, 2014) and achieving in his or her zone of proximal development (Vygotsky, 1978). The findings also indicate that e-learning materials and

15 Thus it is understandable and justifiable that technology-aided creative music making is going to be a prominent part of Finland's new core curriculum of music, taking effect in 2016 (Opetushallitus, 2015).

mobile devices cannot replace traditional instruments, the teacher or face-to-face interaction with peers, but, rather, that they can be used in ways that complement these established practices effectively.

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Appendix C: Development Project 1

In order to see short video-based e-learning material that facilitates LTP go to www.rockwaykoulut.fi and make a user account. The service is subject to a charge, but you can contact me (ojaleksi@gmail.com) and apply for free user account. In the service 'luova musiikin tuottaminen' is categorized under "muut" (other) and "jatkokurssit" (extension courses). Given that the service is chargeable and short video-based e-learning material that facilitate LTP is in Finnish, I will next provide selected screenshots of the e-learning material with English explanations in order to provide overall picture of the Developmental project 1 here. Figure 7 is an example of 'luova musiikin tuottaminen' course contents view in a Rockwaykoulut service. Figures 8 and 9 illustrate the lesson views. Figure 10 illustrates lessons view with the additional materials.

Figure 7: Screenshot of the course contents.

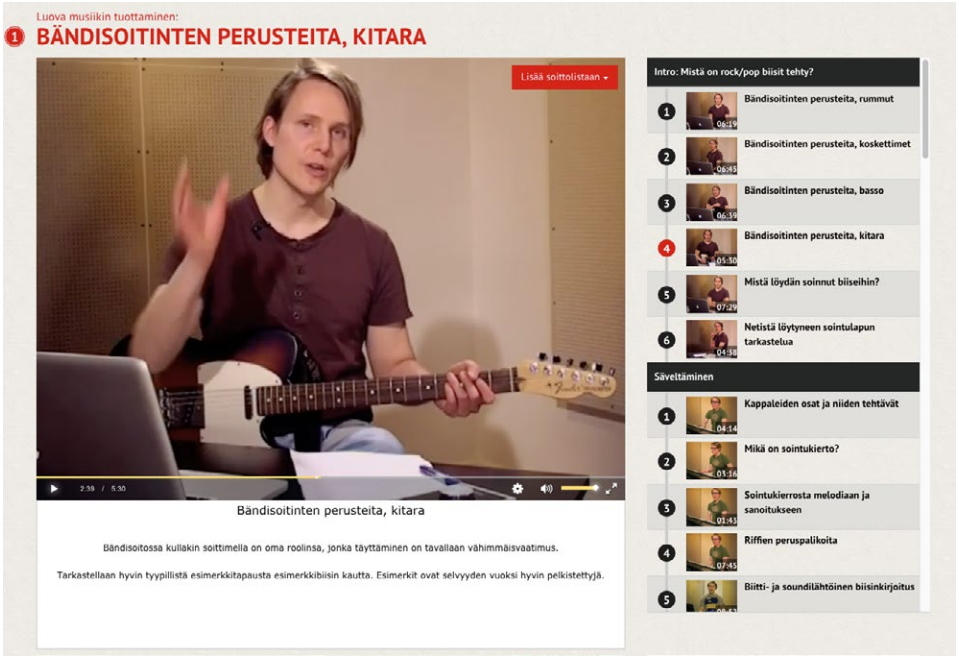


Figure 8: Screenshot of the introductory guitar lesson.

Figure 9: Screenshot of the artist interview in demo section.

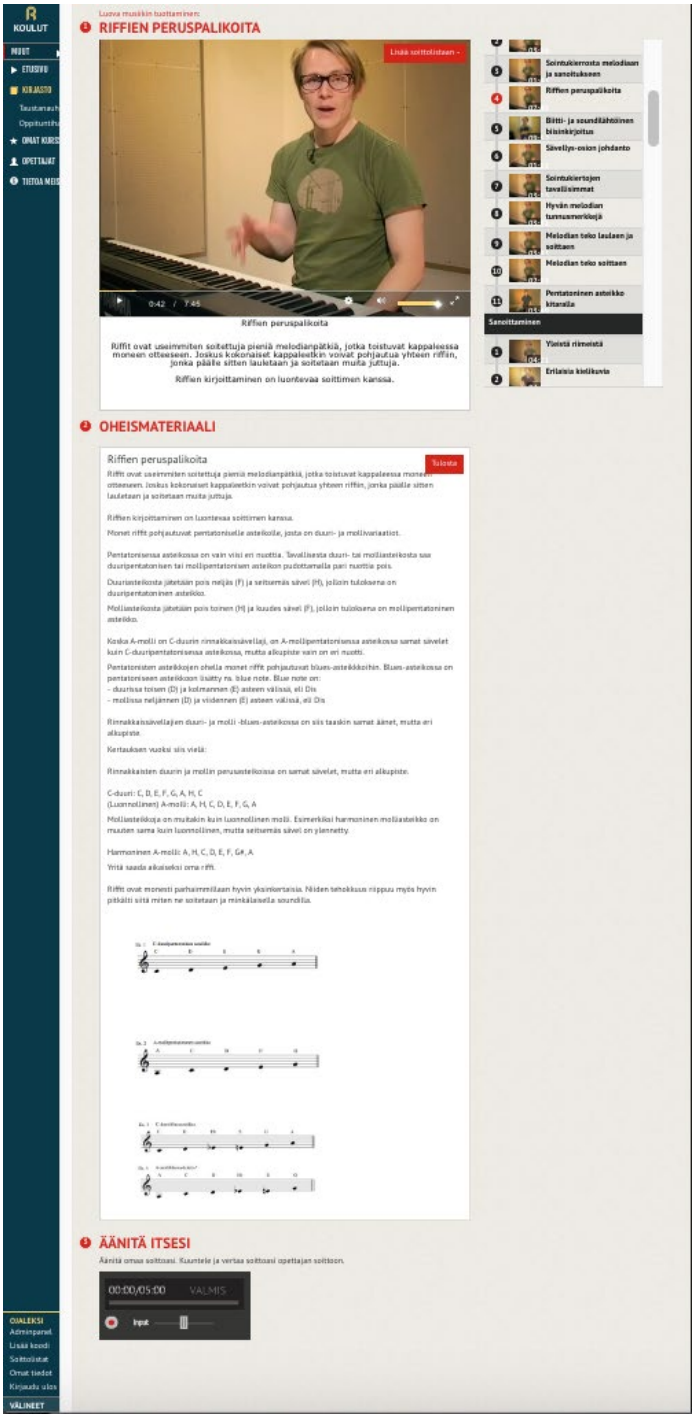


Figure 10: Screenshot of the composing lesson with the additional materials.

Appendix D: Development Project 2

In order to see the e-learning material that is optimised for tablet computers, and facilitates LTP go to https://www.tabletkoulu.fi/ and create a free user account as a teacher. Under service, choose the course "musiikki ja minä" (Music and Me). Given that the e-learning material is in Finnish, I will next provide selected screenshots of the Tabletkoulu's Music and me course with English explanations in order to provide overall picture of the Developmental project 2 here. Figure 10 illustrates the curated applications in home page view. Figures 11, 12 and 13 illustrate three different section views in the melody chapter.

SYNTETISAATTORIT

- Syntorial: Äänissynteesin harjoittelusovellus, joka opettaa käyttäjälleen äänisynteesin perusteet oikean virtuaalisyntetisaattorin avulla.
- Nanologue: monipuolinen syntetisaattori, IAA (Inter app audio)
- Novation launchkey: hyväsoundinen syntetisaattori, soundien muokkaus, audiobus
- Novation launchpad: triggerpad-sovellus elektronisen musiikin (eri alalajit) tekemiseen
- PPG free: syntetisaattori, jossa suuri määrä syntikkapresettejä, ei soundien muokkausmahdollisuutta ilmaisessa versiossa
- Sampletank free: erilaisia virtuaali-instrumentteja
- LH Rubbing: syntetisaattori, subtraktiviinen äänisynteesi
- Soundprism free: syntetisaattori, joka havainnollistaa soinnut ja harmoniat mielenkiintoisella tavalla.
- Voice synth free: syntetisaattori, jota voi ohjata omalla äänellä.

PIANO

- Riffstation: esittää tuttujen kappaleiden soinnut ja soittaa taustalla alkuperäiskappaletta. Erinomainen sovellus sointuharjoitteluun!
- Tonara: opiskele pianonsoittoa nuoteista, jotka seuraavat soittoasi. Free zonessa paljon ilmaisia nuotteja eri vaikeustasoilla.
- Synthesia: opiskele pianonsoittoa, 'dropping notes'
- Piano dust buster: 'dropping notes', 21 biisiä ilmaisia...voi soittaa oikealla pianolla tai kosketusnäytöllä.
- Piano melody free: opiskele pianonsoittoa, 50 ilmaista kappaletta

Figure 10: Screenshot of the curated synthesizer and piano applications for iOS operating system in the "musiikki ja minä" home page.

Figure 11: Screenshot of the melody chapter's basic concepts sub chapter.

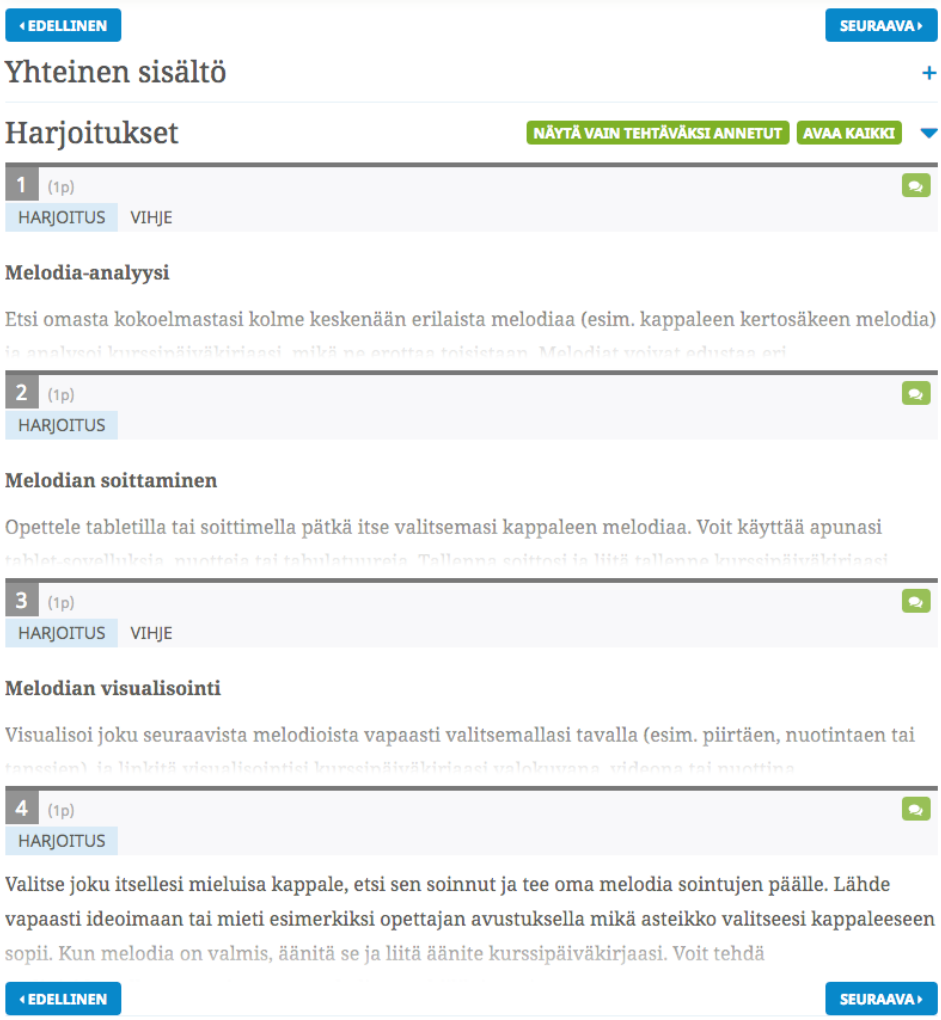


Figure 12: Screenshot of the assignment section of the melody chapter.

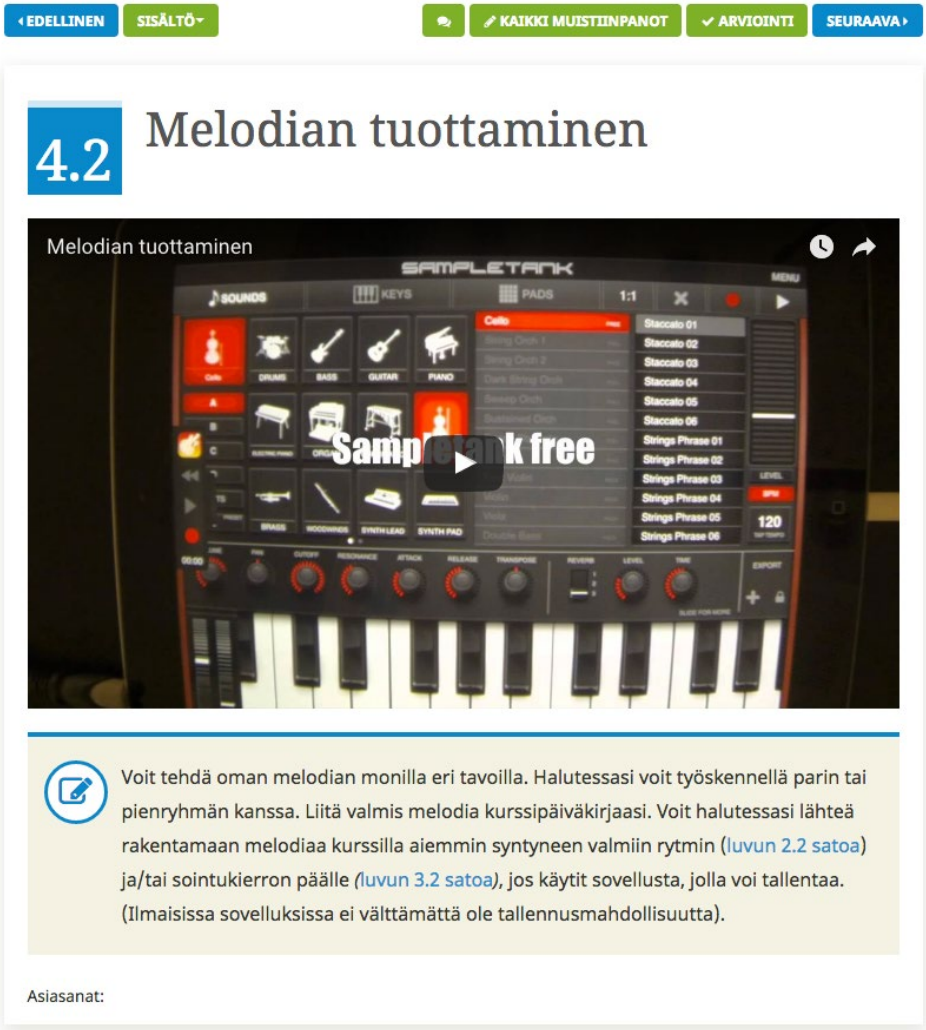


Figure 13: Screenshot of the melody chapter's producing task.

Appendix E: Group interview questions (1st research cycle)

1. Did you use Rockway lessons? If not, why? If yes, which lessons did you use, and for what purpose? What kind of lessons did you prefer?

2. What was good in the course and what was not? How could the course be developed? What would an ideal *Music and Me* course be like?

3. What have you learned during this course?

4. Describe the working methods you used in this course.

5. Describe your songwriting and producing process. If you have produced your own music before, either at home or in school, describe how this project was different from your previous projects.

6. How are you planning on sharing your own song?

7. How could social media and new technology (smart phones, tablets, etc.) be utilised in this course?

8. Should there be more online courses in the upper secondary school?

Appendix F: Post-course Focus Group Questions (2nd research cycle)

Please write your own name after the question and then your answer after the name. We will have a discussion on these themes while you write your answers here. If you want, you can of course also write your answers here beforehand.

1. What kind of music do you listen to? What does music mean to you? What kind of relationship do you have with music?

2. Please give your score for the following parts of the mu1-course. Give grounds for your score as well.

-Atmosphere in the group

-The quality of the Tablet School learning material

-Benefits of the course

3. What skills did you learn during the course?

- music-related skills: playing, singing, composing, adapting, writing lyrics, producing, music technology, critical listening, analysing, music styles, music knowledge, theory etc.

- others skills: ways of thinking (creativity, critical thinking, problem solving), ways of working (communication and co-operation), the use of information technology (searching for information, using tablets, using applications).

4. Did you have a chance to study the things you wanted?

5. What is the best way to learn (music and things in general)? Did the course give you opportunities to learn the way you want?

6. Did you study the Tablet School materials at home and/or in school?

7. How did the traditional instruments fit together with the music applications? For example, did you learn guitar chords with the help of an application?

8. What was the role of the teacher? What should it have been?

9. What helped you during the course: tablet school chapters or exercises, applications, working in the big group, small group work, working alone, teacher's help?

10. Did you learn things that are important to you? What would you have wanted to learn?

11. Did you get a chance to make the kind of music that you wanted?

12. What composing exercises, such as making your own beats, did you take part in during the course?

13. What factors hindered or supported your creative work in the course?

14. What kind of roles did you have in your producing team? Did you get the roles you wanted? Did you learn something from the other students?

15. What difficulties did you face in the course and how did they get solved, if they did?

16. How could the *Music and Me* course in general be developed?

17. Are you planning on making music in the future? Are you planning on getting some music application, or some traditional instrument?

Appendix G: Responses to the Preparatory Questionnaire (3rd research cycle)

1. Sex, 72 answers

	Sex
Female	63,89%
Male	36,11%

2. Musical skills, 65 answers

	Musical skills
I can accompany easy songs with piano	32,31%
I can accompany easy songs with guitar	23,08%
I can play easy rhythm patterns with drums	58,46%
I can play some musical instrument a little bit	72,31%
I can play some musical instrument well	26,15%
I can sing a little bit	43,08%
I am a good singer	20%
I can read traditional notation	36,92%
I can read tablature	16,92%
I can improvise	20%

3. Aims for the course, 72 answers

	Aims for the course
I want to learn music theory	16,67%
I want to learn music history	9,72%
I want to learn to use music technology	20,83%
I wish that we listen to a lot of music	40,28%
I wish that we sing and play together	48,61%
I wish to learn the basic elements of music	34,72%
I wish for a fun and relaxing course	87,5%
I would like to learn to make my own music	38,89%

4. Songwriting and production tools, 72 answers

	During the course I had at home
a guitar	55,56%
a keyboard	41,67%
some other instrument	25%
Computer	19,44%
laptop computer	50%
tablet computer	88,89%
Smartphone	69,44%

5. Experience in music producing, 51 answers

	I have produced original music
sometimes at home	62,75%
sometimes at school	49,02%
I actively produce original music	3,92%

6. Experience in using mobile devices as a music learning, producing and sharing tool, 58 answers

	I have used a computer or a phone as a music learning, producing, or sharing tool
sometimes at home	68,97%
sometimes at school	39,66%
all the time	6,9%

Appendix H: Questionnaire of the post-course survey (3rd research cycle)

1. What kind of music do you listen to? What does music mean to you? What is your relationship to music in your free time (listening/playing/creating)?

2. What were your aims for this course?

3. Describe actions that took place during the music course:

4. Write your name after the roles that you had during the course:

    - listener,
    - player,
    - singer,
    - composer,
    - writer of lyrics,
    - adapter,
    - producer,
    - the one filming,
    - editor,
    - something else:

5. Were you able to get the roles you wanted?

6. How did you interact with the other students during the course?

7. What did you think about the course diary?

8. Which instruments did you use in the course? (Write your name after the instrument you used.)

- guitar
- bass
- keyboard
- drums
- percussion
- GarageBand application
- iPad gadgets (external microphone etc.)

9. What skills did you learn in the course?

- music-related skills: playing, singing, composing, adapting, writing lyrics, producing, music technology, critical listening, analysing, music styles, music knowledge, theory etc.

- others skills: ways of thinking (creativity, critical thinking, problem solving), ways of working (communication and co-operation), the use of information technology (searching for information, using tablets, using applications).

10. How do you learn the best (music and things in general)? Did the course give you opportunities to learn the way you want?

11. How did you use the e-learning materials during the course?

12 How did the traditional instruments fit together with the music applications? For example, did you learn guitar chords with the help of an application?

13. What was the role of the teacher? What should it have been?

14. What helped you to learn music during the course:

- Tablet School
- Rockway
- teacher's help
- iPad applications
- working together
- group work
- working alone
- keeping course diary
- reading other students' course diaries
- something else, what?

15. Write your name after things that are true in your opinion. In the lessons, we had to:

- Remember
- Understand
- Apply
- Evaluate
- Create

16. Did you learn things that are important to you during the course?

17. Did you get a chance to make the kind of music that you wanted?

18. What factors hindered or supported your creative work in the course?

19. Describe your songwriting process.

20. Describe your recording and mixing process.

21. Describe your process of filming the video.

22. What problems did you face in the course and how did they get solved, if they did?

23. Score the following aspects of the course (in words or with a grade 4–10). Give grounds for your score.

- Comfortableness of the course
- Usefulness of the course
- The quality of the Tablet School learning material
- The quality of the Rockway learning material

24. Write your name after the statement that is true in your opinion. Compared to the the traditional music course book, the online learning materials are:

- worse
- substitutive (they perform the same task)
- extended (they perform the same task, but a bit better)
- modified (enabling a significant change for the better)
- redefining (enabling things that wouldn't have been possible with the traditional book)

25. Suggest improvements to the course materials and practices.

26. Did the music course awake your interest in playing, singing, or making music?

Appendix I: Excerpt from the post course interview (3rd research cycle)

Aleksi: Well, what about the others? That already sounds like the course was pretty nice in general.

Student 1: Yeah.

Aleksi: Well. That's good. That's nice to hear. Then... it looks like quite a lot of things were tried out during the course. There was songwriting... and you also worked with iPads… and also online learning materials. But let's look into the songwriting aspects a little closer. What did you think about that? Would it have been nicer to just play other people's songs for the whole time? Not talking about whether they were made with iPads or real instruments, but about making songs in general? Was it fun to make your own music?

Student 2: It was quite fun to make my own things as well. I had an optional course in 9th grade and we only played there. So it was fun to try making things myself like this.

Student 1: Well, it was fun, because I have never tried anything like this, like making songs or anything. I have only just played piano. Yeah, it was good to make songs ourselves.

Aleksi: Yeah. What about the others? Do you agree or disagree?

Student 3: Agree. It was good.

Aleksi: Good. Okay. That was the one big question. Let's talk about your music course in general. Did you learn knowledge and skills that helped you to produce your own music? Could you have done the same songs even before this course? Did you learn new things about music?

Student 4: I wasn't even able to use GarageBand before. Or I didn't even know it existed.

Aleksi: But was it a useful tool in your opinion?

Student 4: Well, yeah, it was.

Aleksi: Good, okay.

Student 5: I could have made songs before, but then when you look into things more you kind of notice them more. And that then helped with the song making a little.

Aleksi: Yeah. What about the others? Do you have opinions, or do you agree? Does anyone disagree?

Student 2: Don't think so.

Student 1: No.

Aleksi: Okay. Well... What if you were a music teacher and you could plan freely, what would the first music course be like? What would be done in the course?

Student 3: I would put quite a lot of playing in. And then, of course this song making would be quite good to put in.

Student 6: Mostly in the same way, like playing together and then this song making. I would try to get students to participate more. I have to say that when I myself wanted to try to play a new instrument, it took courage to try.

Aleksi: How could it be done? How would you encourage others to participate?

Student 6: I don't quite know.

Aleksi: Yeah, that was a difficult one.

Aleksi: When I have done these interviews all around Finland that has been said many times – and this is quite surprising considering there have been different teachers and a bit different courses in general upper secondary schools all over Finland – students wish for more playing with real instruments. But they also think that it would be nice to make songs. Do you mean playing real instruments in a big group? Did you play mostly in big group during your course? And when you worked in small groups you had iPads?

Student 1: Yeah.

Aleksi: Okay. Would it have been good to have real instruments in the small groups too?

Student 4: Well, it could have been. But we were always in different units, in our own places. So how would we get the instruments there...

Aleksi: Yeah, lots of instruments would have been needed.

Student 6: Yeah, when we tried to think of a melody for our song, we tried it on a piano in another place, so we also used real instruments.

Aleksi: Yeah, but now we're getting into small group work. You produced your songs in small groups, but you did other things in small groups too. Would you have cut down on group work and done more in that big group?

Student 5: Well I think it's sensible to do things in smaller groups, because then everyone has something to do. And we were able to do more in a small group than in a big group. Working in a big group just does not benefit everyone.

Aleksi: Mhmm. How about the others? …On the other hand, this is kind of contradictory, on the one hand students want to play together in the big group, but on the other hand working in small groups is sensible. Was the ratio between those two working modes wrong? How much did you work in the big group, and how much was done in small groups? And could you define some percentages: how much would you have wanted to work in the big group?

Student 5: Well, it would have been fun, if we could have played maybe half in the big group and do half the things in the small groups. But then it's kind of difficult, because it just doesn't work in a big group. It just doesn't sound like you'd want it to. We just can't play that well in a big group. It gets almost annoying.

Aleksi: Was it annoying because it didn't sound so good?

Student 5: Well, yeah. There are a lot of people who haven't played that much.

Appendix J: An example of the emerging themes (3rd research cycle)

Learning

What?

Constructing (musical) knowledge, skills and identity

Why?

Aims

How?

The role of the teacher

The role of the student

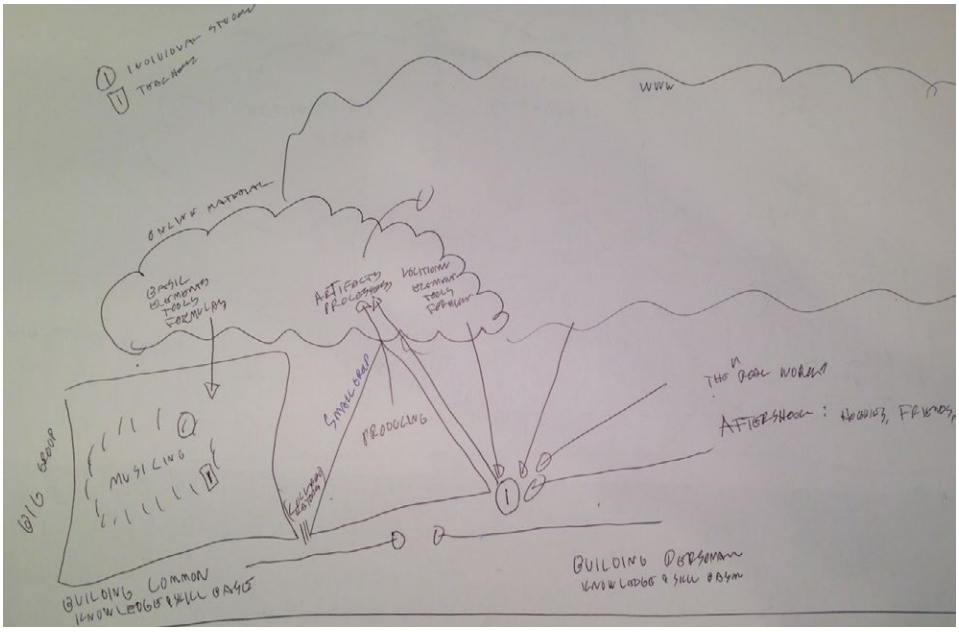
The role of the e-learning materials

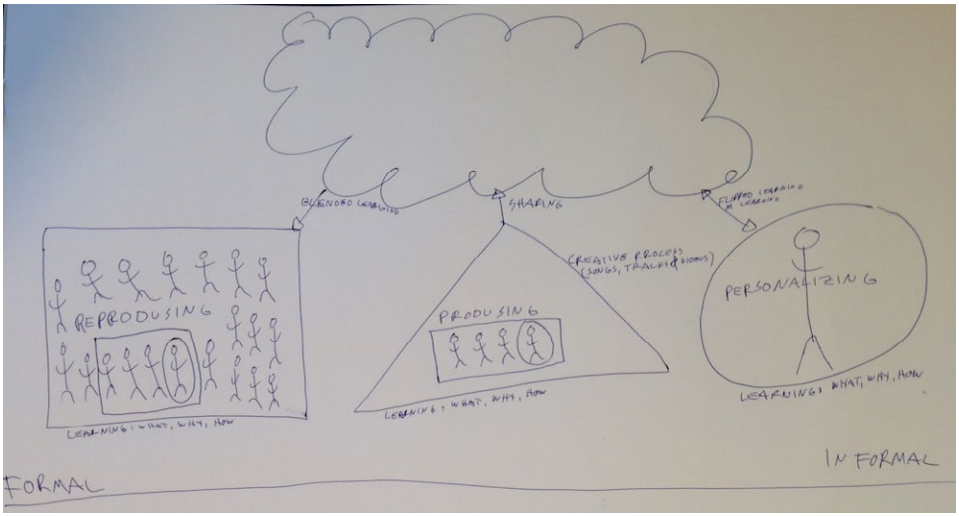
The role of the mobile devices

Interaction

Sharing

Appendix K: Examples of the network displays (3rd research cycle)





Appendix L: Participant Information Sheet (Teachers)

Hi

As part of my doctoral studies I have been developing two sets of e-learning materials that facilitate musical learning through composing, recording, mixing and sharing in the context of a Finnish general upper secondary school's compulsory music course. I have already tested these e-learning materials with my own students. The goal now would be to develop both of these sets of e-learning materials in co-operation with other schools.

Instead of being the objects of this study, teachers and students will be working in co-operation with me. I am mostly interested in the experiences of the students, but the teachers' experiences are of course also welcome. In practice, this means using the students' course diaries as research material, and interviewing a few students. The student participants would also be asked to respond to surveys before and after the course. Permissions for the study would also be acquired from the students and their guardians.

How does this sound? It would be wonderful to have you and your students become part of this. Both sets of e-learning materials would be available to you and your students free of charge.

Kind regards,
Aleksi Ojala

Appendix M: Informed Consent Form (School)

Hi

xxxx, music teacher in xxxx General Upper Secondary School, has agreed to participate in a study which aims at developing an upper secondary schools' music course suitable for digital natives. The participating schools will be situated all over Finland. I am asking for an authorisation to distribute the following requests for permission to participate in the study, both to the students and to their guardians.

Kind regards,
Aleksi Ojala
Music teacher/XXXX General Upper Secondary School

Appendix N: Participant Information Sheet (Students & Guardians)

Hi.

You / your dependant will soon participate in a music course called "Music and Me" as part of her/his studies in general upper secondary school. The course looks into developing new ways to learn music through creative working methods (composing, adapting and writing the lyrics). In practise this means that the students create their own music using traditional instruments and music applications designed for tablets. The students will have access to the digital Tablet School material and to the online music school Rockway lessons, both free of charge. The students can also bring their own devices to the course.

I am studying for my doctorate degree in the faculty of music education in the Sibelius Academy, and I am developing this music course as part of my studies. The course focuses on piloting new methods, and because of that I would like to record a group interview of the students to be analysed. I will also ask the students to keep a shared learning diary where they can link the materials produced during the course. The materials and course diaries will not be accessible by anyone outside this course, unless specifically agreed otherwise. The students also have the option to keep a private learning diary if they wish. The student participants will also be asked to respond to surveys before and after the course. The final study report will analyse the experiences of several students, and individual students cannot be identified from the report.

I am requesting permission for recording the group interview, and to use this recording, the course diaries, and the survey answers as research material. Participation in this study can be cancelled at any time, and the decision to participate or not to participate in this study will have no effect on the actual course or on the grade for the course.

Kind regards,
Aleksi Ojala
Music teacher/XXXX General Upper Secondary School

Appendix O: Informed Consent Form (Students & Guardians)

I give permission to Aleksi Ojala to use my course diary, the recording of the group interview, and my survey answers as research material.

Student's name and signature:

Date

Signature _____

Name _____

I give permission to Aleksi Ojala to use my dependant's course diary, the recording of the group interview, and his / her survey answers as research material.

Guardian's name and signature:

Date

Signature _____

Name _____

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