Remix Portal: Connecting Classrooms with Local Music Communities

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ABSTRACT

We present an exploration of the potential benefits of connecting music classrooms with the surrounding music community through the act of music remixing. Inspired by the rise of an online participatory culture involving music remixing, we conducted a study where we transposed these activities from their informal, online context to a formal, classroom context. Our goal was not to make students proficient music remixers, but instead to explore whether remixing could serve as a tool to engage learners in their formal education and increase their desire to participate in both online and local music communities. Qualitative methods were used to gather data before Activity Theory was applied to evaluate the issues surrounding moving remixing activities between contexts. Our contribution is three-fold: (1) A demonstration of the benefits and challenges around connecting classrooms to local music communities through music remixing activities (2) Remix Portal, an easy to use music remixing and sharing application which can help young people move beyond a position of passive consumer of music towards a position of active contributor (3) The identification of key design criteria for growing the remixing application into a sustainable and social platform.

Author Keywords

Music; remixing; music production; education; activity theory

INTRODUCTION

In the influential work ‘Confronting the Challenges of Participatory Culture: Media Education for the 21st Century’ [18] the authors describe a vibrant set of online communities involved in creating, sharing, reshaping and critiquing a whole range of digital media - drawings, videos, writings and music to name but a few. Young people are at the heart of this ‘participatory culture’ and music remixing is one of the activities undertaken [5,20,26]. Whilst the primary motivation for taking part may be entertainment or personal expression [5], participants also gain educationally through informal peer-to-peer learning leading to the development of skills which benefit them in formal education and later when they enter the workplace [18].

Music remixing within online communities is being encouraged by established musicians who are releasing

their music in a format known as *stems* [32] - where separate recordings are provided for each musical component that constitutes the song (e.g. separate recordings for the drums, bass, guitars, vocals etc.). These stems are often released under creative commons license, effectively freeing end users to do with them as they wish [20]. This movement is analogous to the open source computer programming movement: Stems give people access to the musical ‘source code’, a growing range of software tools enables people to manipulate and modify the source material, and creative commons licensing allows people to share their derivative works onwards. Creating a remix may involve, for example, adding sound effects to the vocals, replacing the drums with a drum part from another song, and changing the volume of the backing vocals. This interpretation can then be shared through the author’s social media channels and in turn they will receive feedback and encouragement from their peers.

The engaging and social nature of these online spaces contrasts sharply with the current approach to formal education. Some authors argue that formal education is failing to connect with the lives of learners in a meaningful way [17], and within music education this disconnection may stem from a skew towards Western Classical music which many young people don’t feel an affinity with [13]. A recent government commissioned review by Darren Henley [12] found many children in England receive a sub-standard music education, and this disproportionately affects those from poorer areas. In considering how music education could be improved, Henley sites the need for schools to draw on local resources by forming partnerships with groups, organisations, and individuals in the local area.

Drawing inspiration from a group of influential academics known as the New London Group, in this paper we take the position that the purpose of education is to “*ensure that all students benefit from learning in ways that allow them to participate fully in public, community, and economic life.*” [11]. A music education with a focus on encouraging students to participate in musical activities beyond the school could realize a wide range of benefits including: an increase to young people’s self-esteem and their educational engagement across all subjects [23]; enhancement of their literacy and numeracy skills [10,14,25,27]; an increase to their intellectual, personal,

social and physical development [2,21,28]; a boost to their creativity [19]; a range of health and wellbeing benefits [31]. Moreover, at a community level it is important that we encourage young people to participate in music making activities in order to foster the next generation of musicians who will go on to make an important contribution to our social fabric and the economy [3,12].

In this research project we sought to explore whether music remixing activities could be utilised within formal music education to enhance students' engagement as well as their desire to participate in musical communities beyond the classroom. Our research was influenced by two complementary theoretical perspectives: Firstly, educational researchers have long understood that young people benefit from 'authentic' learning experiences, such as activities aligned with their personal interests and with the world beyond the classroom [29]. 'Connected Learning' is a contemporary approach to authentic education, which claims that young people learn best when their formal education overlaps with their personal interests, and their educational pursuits are shared with their peer groups and the online communities in which they participate. Similarly, the output of their learning is made more meaningful when it is used to make a positive contribution to their communities, with the young person benefitting from the recognition they receive for their efforts [17]. Secondly, Local Learning Ecologies describe these kinds of authentic, beyond the classroom connections at a local level, with authors Hodgeson and Spours demonstrating how strong inter-organisational connections can help young people (14-19 years of age) transition into further education or the labour market [15]. A key idea is that when schools forge links with organisations in their locality, it can broaden young peoples' experiences and relationships, leading them to develop more positive 'imagined futures', and in time to positive transitions beyond school.

These theoretical perspectives coupled with our ideas around exploring music remixing lead us to formalise two research questions which guide this work: i) *Can music remixing activities be transposed from informal to formal learning contexts without losing what makes the activities appealing and beneficial?* ii) *Can online music remixing communities function at a local scale (as opposed to global) without losing their benefits?*

We explored these research questions during a study at an academy school in England working with two year 8 music classes made up of 12 and 13 year old students. Music was collected from three established local groups and was integrated into Remix Portal - a bespoke music remixing web application created for this project. During two sessions the students learned how to use the web application, produced their own remix of one of the songs, shared it amongst their classmates, and participated in a peer evaluation exercise critiquing each others' remixes. Qualitative data was collected in the form of transcriptions

of the peer evaluations and focus groups with the students, interviews with the teacher and a final focus group with two contributing musicians. Our contribution is three-fold: (1) A demonstration of the benefits and challenges around connecting classrooms to local music communities through music remixing activities (2) Remix Portal, an easy to use music remixing and sharing application which can help young people move beyond a position of passive consumer of music towards a position of active contributor (3) The identification of key design criteria for growing the remixing application into a sustainable and social platform.

RELATED WORK

Despite the benefits of authentic and connected learning, few research projects relating to technology for music education explore this area. Instead, technology is typically used to support the traditional music education paradigm by, for example, replicating traditional musical interactions within a digital device - such is the case with MOGCLASS where authors Zhou et al. simulated a range of musical instruments within a smartphone app [33].

The technology used within music classrooms typically plays a similar role in supporting traditional practices. NoteFlight [22] and Sibelius [30] for example, allow students to create a piece of sheet music on a computer screen. The main advantage of these packages is that they allow the students to hear their creations without requiring the musical competency to play the piece of music themselves which, whilst beneficial for some individuals, is not particularly transformational.

Ironically, projects that use music and technology to explore more transformational educational configurations tend to take place away from the music classroom. For example, both Earsketch [8] and SonicPI [1] attempt to harness young people's musical interests in order to motivate them to learn computer programming, with musical compositions being built through computer programming interfaces.

One study that does apply technology to explore a reconfiguration of music education was conducted by Gall and Breeze [9] who investigated how music students could use pre-recorded musical 'loops' to produce creative, collaborative compositions. This approach is a departure from the traditional ground-up view of music education, where the students build music after gaining instrumental competence. Instead, blocks of pre-composed music can be selected, arranged and manipulated by the students. The process has similarities with creating a remix although the focus is not on creatively reshaping a central piece of music (as is the case with remixing). The authors demonstrate the motivating nature of these activities, and that using pre-composed musical chunks does not negatively impact upon the students' creative outputs. The collaborative aspect of this research derives from the students working in pairs. We aim to expand upon this by exploring how these types of activities could be configured to serve as a gateway

Figure 1. The Remix Portal Application Interface

between the students and the musicians who contributed the original music, specifically when these musicians are from the local community, and what benefits may emerge from such a configuration.

Online participatory communities are shaped and supported by the tools at their disposal. Music remixing communities initially adopted software created for sound engineers working in recording studios, but now a range of online collaborative music production platforms are starting to emerge [16,24,34,35]. These operate at a global scale and are designed around offering opportunities for entertainment and creative expression. We are not aware of any work exploring their configuration to support local community connections or educational advances. Academics have however studied the composition of the communities engaging with these online music remixing tools. Prior [26] describes their emergence, with online digital infrastructures enabling young people to pool knowledge and collectively progress from being passive consumers of music, through intermediary roles providing feedback and commentary, to customisation and dissemination (i.e. remixing) at which point they are effectively demonstrating a new status as active contributors. Benkler [4] finds remixing communities as being composed of groups of loosely connected, widely distributed individuals who work cooperatively, openly sharing resources without managerial commands. He terms this configuration *commons-based peer production*. Cheliotis and Yew [5] studied the ccMixter remixing community and present participants as being motivated to participate through opportunities for i) self-expression through the creation of content, ii) building social relationships during the creative process, iii) furthering

community practices by creating, reusing and sharing content. Furthermore they draw our attention to the role remix contests can play as a catalyst for action. These contests are often organised around musical content supplied by well-known musicians and the ensuing contest can provide an ideal platform for community members to demonstrate their creative and collaborative skills.

REMIX PORTAL - DESIGN CONSIDERATIONS

A bespoke music remixing web application named Remix Portal was created for this project. Much of the functionality parallels that of contemporary online music remixing applications, such as the ability to create, save and share remixes, however our application deviates from typical offerings in a number of ways: i) We limited song choices to those created by local musicians due to our research goal of exploring remixing at a local scale. ii) We modeled the applications interface on a traditional audio mixing desk (and did not include an 'edit view' as found in most other platforms). This was motivated by our desire to support the teacher's curriculum goals and in this case a lesson had been planned around the (often overlooked [23]) mixing stage of the music production process. This maps to the curriculum aim of "*ensuring all pupils understand and explore how music is created, produced and communicated*" [6]. iii) Due to having limited time with our 12-13 year old participants we opted to trade deep functionality for ease of use and thus integrated musical stems that mesh together harmonically and rhythmically, and provided no way for the users to unlock this harmonic and rhythmic fit. We thought this would prevent our novice user group from experiencing the frustrations that can come with encountering advanced software features too early. A further reason for creating Remix Portal was to enable us to

capture user interface interaction data which, whilst not presented in this paper, allows us to study participants' skill acquisition during remixing activities.

Implementation

Remix Portal runs in Google Chrome and Firefox web browsers, and thus participants can easily access it both inside and outside of school. The interface was built using standard web programming languages; HTML, CSS, javascript and jQuery. The audio processing was delivered via the web audio API which allows complex, low-level audio playback and processing code contained within modern web browsers to be controlled via javascript. At the back end a MySQL database stores the interface parameter settings associated with each saved remix.

The interface is organised around a series of vertical 'channel strips' emulating a traditional audio mixing desk (see figure 1a). Each stem (i.e. audio component) is assigned to a separate channel strip where a slider and knobs and buttons enable the user to shape the sonic properties of this stem. Additionally, the drop-down menu at the top of each channel strip (fig 1b) allows the user to swap to an alternative stem. At the right-hand side of the interface global settings such as playback speed (fig 1n) and standard play/pause/save type controls can be accessed. At the top of the page a drop-down menu lists the username associated with each saved mix (fig 1k) and selecting an option reconfigures the whole interface to match the saved state, allowing the user to see, hear, and build upon another user's interpretation of the song.

STUDY DESIGN

Remix Portal was deployed within a music classroom and a range of qualitative data were collected.

Sourcing the music

Local musicians provided three master multi-track studio recordings. Each was processed to create six audio stems per song. We then created a number of 'alternate' stems (e.g. different drum, bass, guitar tracks etc.) ensuring they adhered to the harmonic and rhythmic synchronisation principle. Their purpose was to provide users with creative options by allowing them to switch away from the original stems to these alternatives.

A basic webpage listing the three song choices was created. Clicking a song link opens up Remix Portal (Figure 1) with the selected song loaded.

Participants

Two classes of 12 and 13 old students (41 total) from a school in England participated. Music is a compulsory subject for these students and they were recruited through their music teacher.

Procedures

Each class participated during their weekly 55-minute music lesson over the course of three weeks. The first week was devoted to teaching the students how to use the features of a mixing desk, with Remix Portal being used to support

this lesson. Further support took the form of an instruction booklet given to each student. The researcher delivered this lesson, explaining the function and demonstrating the sound of each component on Remix Portal's 'virtual mixing desk' interface. After every couple of components had been demonstrated, the researcher gave the students five minutes to work on their individual computers to experiment with applying these features to a remix. During these periods both the researcher and the class teacher were on-hand to offer support. By the end of the lesson the students had experimented with all of the interface controls and had produced a remix of a song by a well-known pop singer. Remix Portal's save and share facilities were disabled during this training phase.

The second week focused on the students applying the remixing skills they had acquired. Each student was given five minutes to select one of the songs created by the local musicians before spending the next twenty minutes creating their own remix version of this song. They then participated in a twenty-minute peer evaluation session where they paired up (some worked in threes), listened to each other's remixes and then gave constructive feedback using the school's *what worked well?* and *even better if* system. Following this they were given five minutes to revise their remixes in light of their peer group's suggestions.

During the third week, each class was split into two groups (giving us four groups in total) and they spent half their time in a focus group session with the researcher and the other half was used to remix one of the two remaining songs.

Following the school deployment a session was held the musicians (two were able to participate) to let them hear the students' remixes, to make a video of them providing feedback on some of the remixes (to be shown to the students next term), and to get their thoughts on the project. The class teacher was interviewed and a further session was held with two additional music teachers who had not been involved in the project thus far, to get their thoughts on where else Remix Portal may be of benefit within the music curriculum.

Analysis

Audio recordings were made of the student peer evaluations and focus groups, interviews with the teachers and a focus group with two of the contributing musicians. These were transcribed and thematically analysed by the lead researcher. An observational diary was also included within this data set. In order to make sense of our data in light of our research questions we drew upon Engström's extended version of Activity Theory [7].

ACTIVITY SYSTEMS IN MUSIC REMIXING

Activity Theory is often represented by a triangular diagram (see figure 3), and can be used to analyse the social setting surrounding an activity from the varying perspectives of the people involved. The basic premise is that activities should

be studied at a community as opposed to an individual level, and analysis can be given structure by considering the ways tools, rules and divisions of labour mediate the interactions between subject (the ‘doer’), object (the item being worked on) and community (the other actors involved in the activity).

Figure 3. Structure of a Human Activity System

In our case we can explore the remixing landscape by considering as ‘subjects’ the students, teacher, contributing musicians and even ourselves as researchers. We can also compare activity systems across informal and formal contexts. Furthermore, Activity Theory considers the way objects (e.g. music) are produced, distributed, exchanged and consumed by the community members. Mapping out the landscapes in this way and then comparing them can draw our attention to contradictions both within and between the activity systems which expose problems for the transposition of remixing activities into formal learning contexts at a local scale – problems that we will need to address in order for remixing to be successful in this new context.

Informal context’s activity system

We can infer the activity systems operating within informal, online remixing communities from descriptions found within academic literature. This literature tells us that young people are motivated to participate for self-expression and the building of social relationships, as well as to support the activities of the community at large [5]. This community comprises “loosely connected, widely distributed individuals” [4] and the object they are working on is a shared pool of musical content. This work is mediated by music production and social networking tools, which are often integrated into a single platform. Benkler [4] informs our understanding of how objects are distributed and exchanged within this system, pointing to minimal firm rules but a set of norms around cooperation and the open sharing of resources. This resource sharing is supported by online file repositories, which are the cornerstones of remixing platforms. Our conception of the division of labour is informed by Cheliotis and Yew [5] who identify remix contests organised around content contributed by well known artists as triggers of activity.

FINDINGS

The students' activity system within formal education

Our data suggest that some of our students saw opportunities to experience similar outcomes to subjects operating within informal, online remixing contexts, such as opportunities for peer recognition and support. This was most apparent during focus group discussions around whether the students would like to share their remixes with their social networks (even though sharing was not actually possible during the project due to a school-wide ban on social media): “*Not to sound modest at all... [I would share it] so people can see how talented I am*” (group C, student 5 – C5), or “*[I would share it] to get an opinion*” (D4). A small number of students however, appeared to either not recognize these potential outcomes or view them as unattainable: “*There’s no real need [to share my remixes with my social networks] because nobody cares what I do at school*” (C6). This student does not appear to believe that peer recognition can be an outcome for her. We can explore why anticipated outcomes can vary between contexts by identifying differences across the components of the informal and formal activity systems.

Differences between Rules: Even though we imposed no strict rules during the activity, it would appear the students brought with them the norms of school. This would explain the previous quote “*...nobody cares what I do at school*”. Additionally, norms can influence the way subjects view the community within the activity system, with some students finding it hard to grasp that the relationship is not just between students and teachers: “*I thought it was just teachers [who will listen to my remix], ah crumbs*” (A1). However, those who were aware of the extended nature of the community appear to benefit motivationally. “*I think some people might have not worked as hard, but it’s the fact that the people who wrote the songs are going to be listening to it - you want to impress them*” (A5).

Differences between Tools: When comparing the tools dimensions we see a lack of access to social media platforms in the formal classroom context due to the aforementioned school-wide ban. In the informal context these mediate the relationship between the subject and community, however during our sessions sharing only happened class-wide, mediated by functionality built into Remix Portal. The remixes were played to the musicians later by the researcher. Whilst the students did not complain about not being able to share their remixes on social media, when asked how we could improve Remix Portal their answers centered around adding social features such as Facebook-style ‘like’ buttons and comments boxes, confirming that the social dimension is important to them. A further, less significant change to the tool dimension can be attributed to our Remix Portal design decisions. We opted to trade deep functionality for ease of use, judging this to be more beneficial for our novice user group. Some of our more advanced participants suggested we add

complex features to the tool, for example: *“Record what you are doing as it plays along so you can play that to other people”* (D1). This brings to our attention the possibility for these users to get frustrated with the tool as it stands, which might affect their motivation to participate in the activity as a whole.

Differences between Community: Motivated by our desire to encourage greater participation in the local music scene, we decided to restrict the community aspect of the formal activity system to a local scale, as opposed to the global scale commonly found within informal, online contexts. This change created both benefits and problems. On the negative side having a small community means having a smaller pool of musical content, and we received lots of requests to include music that better matched the listening preferences of the participants; a representative comment being: *“make the songs more popular, more modern”* (D5). Had we cast our net wider and pulled in more music we would have had a better chance of offering songs that match the subject’s existing listening preferences, and this in turn may have boosted some of our subjects’ motivation. Having said that, we did see evidence to suggest that our activities may influence listening preferences, with many participants saying the act of remixing made the music interesting to them. Also, keeping the musical choices local helped many of our students deepen their understanding of the local music scene: *“everyone expects it to be the big famous people that you listen to, but we’ve got people living next door to us that are just as good”* (A6). We also saw evidence of it encouraging experimentation, with one student challenging himself to start with a piece he did not like and then remix it into a more contemporary style, although when asked if he had been successful in this endeavor he answered: *“No. It was a really bad failed attempt...It’s just some of the things you hear now just weren’t an option to change it to”* (A3).

The teacher’s activity system

The teacher’s activity system looks a little different because she is primarily motivated to work towards educational goals – this is her object - and therefore the remixing activities she is presiding over are viewed as an action aimed at transforming the lesson into desirable educational outcomes. Her motivation to support remixing activities is dependent upon her believing that these actions can transform the lesson into the outcomes she desires, and so it is important that we understand what her desired outcomes are and that we try to support them.

A central concern of hers (shared with many music teachers we believe) is that every lesson should align tightly with the national music curriculum. This led us to co-design the project around the hard-to-reach curriculum aim of *“ensuring all pupils understand and explore how music is created, produced and communicated”* [6].

Upon first demonstrating Remix Portal to her she expressed great enthusiasm for the potential of it to engage and

motivate her students: *“oh they’re going to love this!”*. At the end of the project the students did report enjoying the remixing activities: *“It was fun learning about the different ways you can change music... you know how you added the delays and reverbs and stuff”* (B1). The teacher observed a particularly big improvement in the engagement of students who find the normal keyboard performance classes difficult, stating: *“I think some of the ones who find keyboard difficult were interested in it because it was like an alternative where they didn’t have to perform anything themselves”*. Even the students who did not like the music they were remixing appeared to be engaged in listening, and were noticing features about it: *“Because when you tried to change it you could hear all the bits that were bad so it just stood out more, it was like ‘oh bad’ and it hit me in the face”* (C3). In addition to benefitting engagement we collected evidence of the remixing activities promoting deep, active learning: *“It made you think ‘How did they manage to mix it all together?’ and it made you concentrate on what you were doing so you could do it better into like your way that you wanted to listen to it in”* (D2).

During the course of the project more of the teacher’s values emerged. One aspect related to the skills she believes contemporary musicians require: *“Music is being made so electronically these days that I think it is really important for them to know how to do it if they want to go into that area of life.”* She also saw value in the remixing actions serving as an intermediary to open up other educational opportunities for her students: *“We’ve got this room with ignite [software] and MIDI keyboards with all these settings on which we never use, and now the students know what they are about”*. This statement demonstrates a contradiction within her activity system; she has been unable, up until now, to make use of the tools available to her class to work on educational goals around electronic music. However, by combining efforts with the research project she is able to effectively fill the labour gap and thus her object can be worked on.

The musicians activity system

The musicians we worked with had not participated in remixing communities prior to this study. They were focused on creating, playing and furthering the spread of their music, and as such ‘music’ is the object in their activity system. The two who participated in our focus group informed us that involvement in the project came primarily because they thought it could serve as a vehicle which could benefit their music: Firstly, they believed they would gain from hearing the students’ reimagining’s of their work: *“it is always really interesting hearing how someone else would approach mixing your song, because people are just going to have a different take on it, and that’s really fascinating to see as well”* (musician 1). When we played the remixes to these musicians they expressed great enthusiasm for what they heard, and stated that they would be keen to contribute more music in the future. Secondly, they talked about how they felt indebted to

enthusiastic music teachers who had nurtured their passion for music and how they now wanted to give something back. They thought that contributing stems to the remixing project would support youngsters' musical development and therefore be a worthy contribution. Thirdly, the musicians valued the promotion that they could gain from having their music used within these activities: *"at the end of the day I think it just allows your music to go further"* (musician 2).

The musicians responded very positively to the remixes they heard and the process appeared to excite them creatively with frequent comments like *"That's amazing, that's amazing (laughs)... again great... really, really interesting ideas going on"* (musician 1), and specific comments like *"I think I've only ever flanged drums like maybe once in my life but I think I'm going to do it more - that sounds great"* (musician 2).

The musicians indicated that they would be very keen to be involved in a project like this going forward, sighting benefits including the promotional opportunities that exist through having their work remixed and shared on social media, the creative opportunities that exist from feeding off what the remixers are doing, as well as the chance to help young people develop their love of music.

The researchers activity system

Our own motivations as researchers should be made clear as they influenced the design of Remix Portal and were influential when co-designing the lesson activities with the class teacher. We are trying to work with two objects: i) the strength of the relationships between the students and the local musicians, and ii) the students' engagement with their formal music education. The rules within our activity system were essentially inherited from the contexts we were working in, in order to keep community members onside; e.g. adhering to school policy by not attempting to link Remix Portal to social media.

The division of labour aspect was important because this dictates the configuration of the relationships between the students and local musicians, with the local musicians supplying the stems and the young people remixing them. The tool's design was intended to support this division of labour and where the tool had to be restricted (due to school rules) the researcher was able to make up for this by, for example, playing the remixes to the musicians in person.

We collected some evidence that the act of remixing may be able to increase the students' interest in local music. In group D, although few students really liked the song they remixed to begin with, half agreed that the process of remixing made it interesting to them. Similarly, most students reported not looking up or caring about the band they were remixing, however when asked if they thought it was cool that bands like this are coming from their local area, all students responded that they did think it was cool: *"I think it's good that... everyone expects it to be the big*

famous people that you listen to but we've got people living next door to us that are just as good" (A6), *"I think it's cool because it's not like well known people. You can discover different people and different music and you might like it"* (B1). Some students even thought that by sharing their remixes on social media they could help their local musicians: *"because if other people liked it they might share it on and then it might get somewhere instead of being just like low music"* (D1).

There was also evidence that connecting the participants to the musicians via Remix Portal improved their engagement, as the following exchange within group A demonstrates: *"I think some people might have not worked as hard, but it's the fact that the people who wrote the songs are going to be listening to it - you want to impress them"* (A5), participant A1 then interjected: *"Really?... I thought it was just teachers, ah crumbs"* [Researcher] *"Do you wish you'd worked harder now?"*, [same student] *"Yes... crumbs"*.

DISCUSSION

Looking at our data through the lens of activity theory and from the differing perspectives of the stakeholders involved brought to our attention the importance of supporting each party's desired outcomes. We gathered strong evidence to suggest that these outcomes can be achieved: evidence of students being entertained, teachers seeing the educational benefits, musicians appreciating the creative ideas returned within the remixes, and in our own case, evidence of the potential to establish a local learning ecology through the activity. However, when comparing each stakeholder's activity system, tensions emerged which may impact upon the ability to grow Remix Portal into a sustainable and social platform. For example, the positive motivation demonstrated by the musicians, researchers and students appears dependent on a strong and visible connection between students and musicians emerging from the production and consumption of the musical stems, as depicted in figure 4.

Figure 4. Strong connections linking subject, object and community and are vital to the health of an activity

The ability to create this strong connection faces challenges due to the imposition of school rules (figure 5) which prevent the use of social media within the classroom and therefore remove a channel that could facilitate the

development of this strong connection at the subject/community juncture. This issue was circumvented during the project by the researcher acting as a go-between (taking the remixes to the musicians and gathering their responses), however an alternative will need to be found once the researcher withdraws from the project.

Figure 5. Strong rules can impact the flow between subject and community

Another tension relates to the teacher's desire to align lessons with the music curriculum. This places an emphasis on: *"vocal and/or instrumental fluency, accuracy and expressiveness"* [6] and so it is perhaps unsurprising that her main recommendation for improvements to Remix Portal is to enable students to record their own performances into the software. Offering this facility may encourage her to use Remix Portal within more of her lessons, however it is possible that this change to the activity would demotivate some of the students who had appeared to engaged because, as the teacher put it: *"it was like an alternative where they didn't have to perform anything themselves"*.

Such tensions present a design challenge. How can we configure remixing activities to accommodate all of the stakeholders activity systems and their implicit motivations and constraints? In the long term however, it may be the case that the stakeholders motivations could change to align with the central activity. For example, at the start of the project our musicians were motivated to participate in order to further their own musical activities, and this project provided an opportunity for them to benefit from the creative ideas returned in the remixes and as a way to promote themselves. At the end of the project however, both the musicians who participated in our focus group expressed an interest in creating music specifically for the remix project as opposed to donating existing music. Similarly, lots of the students asked us to get music which matched their current musical tastes, yet we saw evidence of the local music becoming interesting to them through the act of remixing, giving rise to the possibility that these activities may shape their musical tastes over time and thus the tension would be reduced.

In the short term, ways to mitigate problems incurred as the researcher withdraws from active participation within the activity system should be investigated. For example, we should address the issue of the researcher teaching the lesson. The class teacher had expressed that music technology is a weaker side of her teaching, yet she believes it is an important topic for her students to know about. Her motivation to participate in the project was likely influenced by the researchers ability to help her address this shortcoming, and whilst we were primarily focused on the learning her students would take from the activities, she reported learning from the activity as well: *"I have learned about what some of the things did because I didn't know. Like the Lo-fi one. And I think that will help me teach the students."* She reported plans to use Remix Portal with her classes next year. So perhaps the incidental development of the stakeholders through their involvement in the activities could 'fill in the gap' left by a withdrawing researcher.

A step back for the researcher could allow them to continue co-designing lessons and tools but no longer acting as a force to mitigate the tensions within the system. And through a co-design process, as the stakeholders come to appreciate the positions of the other parties involved in the activities, it may be possible to configure the activities and their supporting tools to further reduce the tensions. For example, it may be possible to co-design social media-type features with the teachers, to address their concerns whilst still providing the required connectivity between the subject and community. These could then be integrated directly into Remix Portal, circumventing the need for third party social media tools or a go-between. Such a step back could also free the researcher to think about designing additional activities that could support their agenda, for example, working on building upon the relationships between the students and established musicians by e.g. having them visit the class and feed back on the remixes in person, or getting the students involved in playing concerts with the musicians or helping with their recordings.

LIMITATIONS AND FUTURE WORK

We did empirical work within formal learning environments, however as previously stated we used secondary data sources to inform our understandings of informal, online communities [4,5]. Secondly, we were only able to offer three musical song choices to our students, and had we been able to offer a wider variety of music to choose from then we anticipate many more students would have been able to find something appealing to work with, and we may have seen even greater enthusiasm for the project.

Currently Remix Portal does not provide a direct connection between the students and the musicians – this connection went via the researcher. As discussed elsewhere

in this paper this may have lessened the level of 'connectedness' the students felt and in turn, their motivation to participate.

In future work we aim to explore how we can enhance each party's motivations to participate. For example, we will explore whether producing analytics from user interface data could help the teacher evidence learning, and identify struggling students and lead to her enhanced motivation to use our system. We also plan to expand the study and work in non-formal contexts such as afterschool clubs. Our ultimate aim is to learn how we can design pathways that support and encourage young people to make the transition from novice music remixer to active musical contributor to their local music community.

CONCLUSIONS

The goal of this study was to explore the potential benefits of connecting music classrooms with the surrounding music community through the act of music remixing. A bespoke music remixing tool was deployed during a three-week study which resulted in us finding evidence of many potential benefits to students. Some of these benefits map to the music curriculum, such as gaining an enhanced appreciation of how music is created and produced, or the development of critical listening skills; others point to the emergence of a local learning ecology, with the students starting to develop a sense of the musical landscape that exists within their local area; others relate to enhanced engagement with their music education.

Despite these potential benefits, we identified challenges for the sustained use of music remixing activities within formal education. The application of activity theory exposed tensions between the teachers, contributing musicians, students and researchers. Careful configuration of the activities will be required to ensure the motivations of all these parties can be sustained going forward. Design challenges emerge from these tensions such as how to facilitate strong connections between students and the musical community when strong rules imposed by the school restrict the use of social media tools which would usually mediate this type of interaction. In the long term some of these tensions may resolve themselves as the stakeholders motivations naturally come into alignment.

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