Communities of Sound: Generative Music Making and Virtual Ensembles

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ABSTRACT
This paper uses a workshop format to demonstrate an emerging theoretical model for observing meaningful engagement in community music making. Three case study examples involving the research and development of the jam2jam ‘family’ of generative software and hardware applications are examined to highlight the evaluation of social and musical outcomes. These case studies demonstrate how the meaningful engagement matrix model feeds back data which informs both software development and experience design for participants. Engagement has been shown to be a key factor in achieving social, health and learning outcomes from creative activities, and we demonstrate how the matrix assists in improving design to maximize these benefits. The presentation will include a demonstration of the software and audiovisual materials that show the projects in context. The paper is primarily about a means of measuring social and musical benefit through correlation with meaningful engagement and provides examples of inclusive ensembles and the specification of musical knowledge through algorithmic and educational experience design.

KEYWORDS
Meaning, engagement, generative, music, virtual, network, ensemble.

INTRODUCTION
In this paper we build on the argument ‘that generative arts tools can support creative participation in the field of community’ music and have the potential to enhance peoples’ capacity for cultural participation.’ (Adkins, Dillon, Brown, Hirche, & Gibbons, 2007). It is difficult to fit this paper neatly into the conference themes because it is simply about increasing access to meaningful music making experience and whilst that is about social capital it is also about community music and well-being. When we increase access to musical experience, we also increase the access to the embedded knowledge within the music itself and the potential for meaning making and personal growth. What has fascinated us in this research has been how we observe and measure meaningful engagement. This paper is essentially a story of research that involves observing meaningful engagement and feeding the analysis of those observations back into the design of generative software instruments, the experience design and the pedagogy for social relationships that form the whole community music experience.
For six years now a team of music educators, software developers, interaction designers and sociologists has been researching virtual ensembles with jam2jam software. The software was initially designed for use in an Afro American community centre in Ohio, USA and has subsequently been developed and researched by the Australasian Collaborative Research Centre for Interaction Design (ACID) in Australia. The majority of this research has been about music education in schools and the development of networked improvisation as virtual music learning environments (Brown & Dillon, 2007). Much of the research has also taken place in community contexts like Libraries, Children’s festivals and museums. Within this process we have examined the development of hybrid methodologies (Brown, 2007) to see how to refine the software design to enhance engagement (S. Dillon, 2004, 2005, 2006) and meaning for players. In this paper, we focus particularly on the social and musical aspects of the research as they relate to the ensemble experience and report on the development of a simple observational tool that we have used to examine meaningful engagement.

THE JAM2JAM PROJECT

The jam2jam project explores how collaborative creativity (such as networked music performances) can enhance learning, wellbeing and social capital. The project focuses particularly on the use of generative systems to increase access to novice users such as children and the disabled. The jam2jam systems are network software systems linked to digital social networks that facilitate the coordination, sharing and communication around collaborative creative activities. There are opportunities for application in community contexts, for enhancing digital creativity, and for advancements in the design of creativity support tools. Embedded within the design of the generative musical styles and the interface is well-defined musical knowledge. This knowledge is ‘encoded’ within the improvisational algorithm and a teacher or music coach can leverage this knowledge by facilitating student participation and reflective practice.

WHAT IS JAM2JAM?

Jam2jam is a suite of software and hardware applications where users manipulate media through a series of simple controllers such as real or virtual sliders or via a computer game like environment where the movement of icons in space effects changes. Jam2jam utilises generative content and uses computer processes to facilitate musical changes based on a stylistic algorithm. Interface gestures facilitate changes in the density or complexity of musical activity, volume and timbre. What is unique about it is that it is collaborative. A small group of players can play in a virtual ensemble easily and without much musical knowledge or experience. It enables groups of players to interact in real time like an ensemble and the music responds to individual changes in gesture. We call this type of activity Networked Improvisation (Brown 2006; Brown & Dillon, 2007; S. Dillon, 2006). It enables children aged from 4 years of age, the disabled, youth and adults with limited musical skills to experience ensemble performance and social meaning. When reflection is built into the experience design players can gain musical knowledge.

The technical development of these applications originally used a Java programming language (Sorensen, 2005) and versions that are more recent use a new development environment called Impromptu (Sorensen & Brown, 2007). The interface and experience design has been influenced directly by two PhD theses. Andrew Brown examined the modes of creative engagement of contemporary composers (Brown, 2000, 2003). (S. Dillon, 2007; S. C. Dillon, 2001) has proposed a model for observing the location of meaning in musical experience. These theories have been merged into matrices that have been applied as an analytical tool for meaningful engagement with the software.
**Figure 1. The Meaningful Engagement Matrix**

<table>
<thead>
<tr>
<th>MEM</th>
<th>Appreciate</th>
<th>Direct</th>
<th>Explore</th>
<th>Participate</th>
<th>Select</th>
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<td>Personal</td>
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**Modes of Creative Engagement**
- Appreciating—listening carefully to music and analysing music representations.
- Selecting—making decisions about musical value and relationships
- Directing—managing music making activities
- Exploring—searching through musical possibilities and assessing their value
- Intuiting—participating in intuitive music making

**Types of Meaning**
- Personal—the activity is intrinsically enjoyable.
- Social—through activity the user develops relationships with others.
- Cultural—by participating (or succeeding) in activities valued by the community, the student achieves a sense that they too are important.

The meaningful engagement matrix (see figure 1: (S. Dillon, 2006, 2007) provides us with a lens to examine how participants interact during music making experiences. It also allows us to identify the location of meaning. In this workshop/paper we would like to simply demonstrate three case study experiences involving separate versions of the jam2jam family focusing in particular on the ensemble experience. We will then show how these ideas from each case have been fed into new software iterations and led to pedagogical insights.

**Figure 2. Jam2jam grey**

Download a copy: http://www.explodingart.com/

The ensemble experience with jam2jam grey has evolved over six years of observations in three countries with children aged four to sixteen. Primarily in short term trials players demonstrated clear personal and social meaning with cultural meaning observed when the improvisation was performed or recorded. Engagement focused primarily around ‘exploring’ and appreciating as the relative complexity of the interface causes activity to swing between these modes of engagement. Selecting and directing appear to be more closely associated with more advanced planned structures and performances while intuiting experiences are facilitated by the teacher or music coach.

This version of jam2jam features a chat box which was originally included to encourage musical discussion while the music is in progress and for Wide Area Network communication between players. What was observed was student activity more like an MSN chat with music in the background.
Students found this messaging function engaging and teachers commented that it had potential for literacy development. The observed students were involved in a multi-tasking shift between social chat and music making. The styles built into this model were based upon players preferences for grunge, hip-hop and dance styles with the broad possibilities of extremes available allowing the discovery of other styles embedded within. For instance, slowing down the hip-hop style resulted in a groove not unlike reggae. Pedagogically, teachers and coaches were able to use the software to teach ensemble skills of listening and performance planning as well as using the generative nature of the software to allow discussions about the music whilst it was playing, thus drawing out the musical knowledge inherent in the style. It was this idea of framing learning around the parameters of style that led us to consider the idea of a networked improvisational musical environment as an interactive listening and ensemble experience. What is suggested here was that the musical knowledge could be embedded within the algorithm, the learning design could revolve around drawing this knowledge out, and developing a language around it’s understanding. It was this idea that has led us to develop a simpler interface that focuses upon two aspects of musical knowledge whilst still facilitating the social ensemble experience. This kind of interface was aimed more squarely at younger children and the disabled.

**Figure 3. Jam2jam blue**

(See examples: http://www.jam2jam.com/)

**MORE LIKE A GAME**

The Jam2jam blue interface grew from analysis of the use of the grey interface and in particular it's use by younger participants - this is what led us to intentionally remove most of the on-screen text labels and the text chat facility, and to give it a simpler more game-like appearance. Vertical movement of the instrument icons affects volume whilst horizontal movement affects the complexity or intensity of the instruments’ activity. Greater activity to the extreme right and less activity or simpler playing to the extreme left.

**METHODOLOGICAL DEVELOPMENT**

With this interface we also observed a strong emphasis on the exploring mode of engagement correlated with personal social and cultural aspects of the matrices. We had also employed the use of ‘Kid-Cam’; a multi-camera set up that recorded the performed sounds and captured the screen activity alongside an overall video camera directed at capturing the group’s activity. These data were then coded using Interact software that allowed us to code and meta-tag multiple instances of audio-visual data. This method provided a breakthrough that enabled us to track detailed observations of interaction and to analyse musical development and interactions (Adkins et al., 2007).

**MULTI AGE ENSEMBLES**

Consistent with this design was the multi age communication that was possible. Parents and young children sat at the computer playing together, as did siblings and children with grandparents. The observation showed how the accessibility of the jam2jam interface facilitated cultural and social meaning. The two dimensional interface of jam2jam blue spawned comments such as, “It’s like I was running around the stage” and triggered friendly user rivalry as two players competed to control the same instrument. The absence of the need for language showed the potential for intercultural and non-speech communication amongst participants.

With this model the experience design focused on the ability for users to describe what was happening with the two focused activities of volume and note density. Initial analysis suggests that recognition of ‘density’ rather than tempo increase was recognizable around
ten years of age. This model allowed us to focus experience design around two simple musical concepts and then develop language and musical knowledge around ensemble experience.

After one session we observed participants spontaneously playing with the Apple computer Photo-Booth software and wondered at how we might also employ visual aspects to the learning experiences. This led us to design a new application called AV Jam.

**Figure 4. V Jam**

(See examples: [http://www.jam2jam.com/](http://www.jam2jam.com/))

AV-Jam consists of an Apple iMac Computer, 5 USB controllers, speakers and Impromptu software. Andrew Sorensen of the MOSO CORPORATION wrote the AV Jam software for us. It is a collaborative music-video environment that generates music in real time so that users can jam/improvise with bass, drums, harmony and solo synthesizer sounds and they can simultaneously process video using the built in web-camera. The improvisations can then be captured and stored for replaying. This software has been aimed at adolescent age group and field trials have worked with disaffected and disengaged youth in multicultural and Indigenous Australian urban communities.

The ensemble experience with this software is, firstly, more complex in appearance. Typically adults seemed reticent to use it despite its relative simple use of gestures. The physical sliders and more professional sound engine perhaps reinforcing the ‘I’m not good at music’ or technology frightens me’ stereotypes. Youth involvement with the software varied from creative use primarily involving intuiting and exploring modes of engagement across personal and social domains of meaning. In some contexts there was a fear of public performance perhaps due to the reinforcement of their ‘failure’ with other learning experiences. It was only when we incorporated the AV capturing capacity to record a video clip of the performance that we observed stronger cultural meaning that emphasised appreciating and directing. This function allowed the capacity to jam and review the jam and then collaborate on producing a more refined product.

Pedagogically, experience design was able to focus around musical structures in time, texture, density and volume. The visual function, which pulses with the music, stimulated interesting live visual input such as using Indigenous dot paintings as source material for the vision, colorful shirt designs, and book covers from the library shelf. It facilitated a kind of found object visual improvisation. Because the recorded product can be exhibited on sites such as YouTube we were able to tap into an even more interesting public performance outcome that has wider implications for cultural meaning. This iteration of jam2jam software development marked a new kind of product, which has both audio and visual materials in its design. AV Jam can be both a virtual ensemble and an audio-visual installation (see installation: Sydney Powerhouse: beta_space February-March 2008: [http://www.jam2jam.com/](http://www.jam2jam.com/)). One only has to consider the replacement of USB controllers with wireless controllers and the thought of a player controlled dance party or user controlled musical environment is possible and imminent.

**Figure 5. Jam2jam 2008**
JAM2JAM IN ROME 2008

At the Community Music Commission in Rome we were able to show the next iteration of the network jamming project and how the previous research could influence both design and pedagogy. The presentation focused on demonstrating the new interface that combined both video transformations with musical generative processes. The Meaningful Engagement Matrix was demonstrated as an embedded design within the software and practice. The affordances that were derived from the previous iterations were that users could:

• collaborate and play like an ensemble in real time.
• make music that is not loops but generative/improvisations at the note/phrase level.
• explore a range of styles/scenes made with simple midi files and sound sample library that generate professional sounding music from Hip Hop to Xenakis or Reich.
• construct learning environments that help users make sense of electronic media in the 21st century (a kind of ‘Switched on Orff’).

The jam2jam experience designs or curriculum tasks:

• Are based upon relevant and recognisable real world task as art or function.
• Aim to be personally, socially and culturally engaging and meaningful.
• Involve reflection or assessment where music is present in the conversation about music.
• Utilise digital social networks and ePortfolios for each user, groups and teachers to extend learning and musical understandings and relationships by sharing artifacts and conversations
• Usually draw upon ‘local’ community musical styles and visual images so that the values of the community can be reflected in collaborative performances

MOVING BEYOND SHORT TERM ENGAGEMENT

The idea of co-development of software design and pedagogy has brought our research through many years of research described here. Nevertheless despite the long period of engagement with the design process and the large quantity of users of all ages in four countries we have not been able to evaluated long-term effects. As you can see we have tested a variety of virtual and physical interfaces in school and community settings. In our current trials with the new model presented in Rome we intend to involve intensive long term testing in six locations over a 6-12 month period of iterative development of software and pedagogy (See: Figure 6).

This iteration of the software is able to operate as software on an individual computer and connect to an internet collaborative social network (http://www.jam2jam.com/). Jams can be local or internet based. For example a school in Malmo, Sweden could jam with one in Manchester, UK.

Participants use a digital social network to store and share ‘movie captures of their jams, to evaluate them and reflect on their progress and to share them with the community.

APPLYING THE THEORY OF MEANINGFUL ENGAGEMENT

As described above throughout this research we have attended to what music means to children and how they engage with the technology and the musical experience. The development of the Meaningful Engagement Matrix has emerged from our first iterations of software and then became a useful
observational tool that allowed us to document what changes needed to be made to software design and what ways experience could be designed alongside examining how a teacher might construct such experience. It also identified a different role for teachers and community music leaders as managers of cultural lives. This has generated a number of new questions about the role of the teacher and the focus of education or community experience in the light of the new software instruments ease of access and range of expression and the role of teachers when the experience is so engaging as to require little direction from teachers.

New Questions that arise from this research are:

- How the technology can allow music to be present in the conversation about music?
- Identifying the affordances of generative technology in schools and community settings?
- The opportunities for expression and meaningful engagement.
- The opportunities for understanding how humanly organised society expresses itself in sound and visual media?
- What are the qualities of musical improvisation that promote relationships between individuals groups, a culture and the domain?

Most interestingly jam2jam is distinctly a multimedia instrument. The implications for music educators and community musicians are that it bridges audiovisual domains in a way that gives access to collaborative media performance. For children it potentially provides a way of making sense of the complex world of media that they are immersed in through collaborative improvisational performance.

**DISCUSSION**

What we have learnt through these experiences are a number of things that refer primarily to the observation and facilitation of meaningful engagement. Firstly, that for the full range of engagement to unfold ensemble experiences needs to be pursued over longer periods of time – typically several sessions. Methodologically we have dealt with this recently by refocusing our attention on the group experience rather than the individual’s engagement with the interface, which now seems to be well established. Long-term engagement will be dependent upon experience design that highlights the development of ensemble skills as a social outcome and the development of associated language to draw out and make musical language more conscious. Engagement is highly related to challenge and flow experience and the experiences with the software seem to provide an abundance of this kind of effect. With adolescent and disaffected youth we noted that the ‘sound’ - as a feature of a recognisable style - was particularly important and seemed to resonate with personal identity and ensemble relationships. The directing mode of engagement emanated from those with leadership roles, this was particularly noticeable amongst adolescent players but also noted amongst multi-aged groups where older siblings took on leadership responsibilities.

Furthermore the ‘disengaged’ adolescent group drew attention to cultural meaning or performance as a potential problem even with ‘fail safe’ equipment. It was suggested by social workers involved with the projects that the player’s history of perceived failure compounded by adolescent identity issues affected the willingness to perform even within the relative safety of a community setting. Recorded work was preferred in this context as it allowed the expressive product to be monitored and edited, appreciated and selected. This poses a question about what and for whom performance serves in this context. For example, public outcomes may serve as indicators of institutional prestige but may be detrimental to participant’s self-esteem. The capacity for the jam2jam software to record and review was an important addition to the experience design that enhanced opportunities for cultural meaning. Our more recent work with the simultaneous development of software alongside pedagogy has led us to more serious questions about how we can most effectively utilize meaningful
engagement in schools and communities. We suggest it has potential to make sense of the complex world of media in our lives through collaborative performance.

What has been presented here is an overview of research rather than a detailed analysis. What emerges from this research is an understanding that we can build engaging and meaningful networked environments where players of all ages can experience creative ensemble performance with relatively little artistic expertise. It is simply suggesting that when we give access to musical experience we also provide access to the embedded knowledge and social/cultural experiences that music making affords. The meaningful engagement matrix has enabled us to observe and describe the nature of the activity and feed these data back into the software and experience design and to validate various teaching approaches. Using jam2jam we have observed a consistent and continuous social engagement across age groups and demographics that contributed to players experience of ‘flow’ (Csikszentmihalyi, 1994). We believe that this suite of software has real potential to facilitate clear benefits for social, health and learning, outcomes through providing access whilst presenting challenging, meaningful and engaging educative experience. Applications in both community and school settings need now to be conducted over a more sustained and longer timeframe in diverse contexts. The benefits for community music are becoming visible: the system can provide a flexible and fluid cultural playground where users can interact wordlessly with each other through media improvisation. The question raised at the Commission presentation was simply: here is a new instrument-how would you use it in your context?

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