Psychology of Music in Educating Students from Primary to Secondary Level Through Technology

Shveata Misra[1]
Prof. Ina Shastri[2]

Abstract: *Music originates wherever people have feeling they wish to express or share with others. Improvement of performance skills helps the individual to become more proficient in expressing his thoughts, moods or ideas. The refinements or performance in the concert hall are an extension or an outgrowth of the development of the performer's power of expression. One learns to express by giving spontaneous and uninhibited to one's feelings and ideas – by actually using own creative power.*

Technology has had a tremendous impact on music education in the Western world. In education sector music has even played a very crucial and vital role in student development. Students from primary classes to high level classes are highly motivated and intellectually stimulated by music. In 2012 it was found that amongst the most developed countries in education like Australia and US etc. deeper focus was on arts. In this paper we shall be finding new ways to engage students in education through different musical technologies. In this initial work we'll demonstrate the teaching with music technology like MIDI etc. that provides an affordable point of entry for students to express their music sensibilities as well. Computer based tools have become the standard for the music industry. We situate that music technology classes serve as an excellent environment for creative development, offering self awareness of one's creative process, experiential flow, learning and creative thinking skills. This paper will provide a brief overview of the history, present situation and future possible applications of digital technologies or electronic aids in the education.

Keywords: *Arts, Education, Music, Student development, Technology.*

Technological Keywords: *H.5.5., MIDI, Sound and Music Computing: Methodologies and Techniques.*

I. INTRODUCTION

Music is an art with endless ramification and innumerable psychological and cultural affiliations. When we learn music as we should, we learn a great deal. Firstly we gain a respect for the emotional and aesthetic aspects of life. Secondly we gain a respect, for it is gained by actual participation in such activity. Thirdly, we are brought closely and vitally into contact with a wide range of culture – with art and literature.

Music offers to each individual an opportunity to express his ideas, thoughts and feelings. The charm of music, the purest form of art, lies fundamentally in the fact that it furnishes a medium of self expression for its mere joy without any ulterior purpose whatsoever. It becomes a companion in solitude – a medium through which we can live with the rest of the world. Thought it we express our love, our fear, our sympathy, our aspirations, our feeling of fellowship, our communion with the divine in the freedom of action.

Classrooms across the globe are filled with students who are passionate about various genres of music. Yet, based on data collected by Rick Dammers, only 20% of students are active in their high school's music education classes [1]. In the past five years, school districts have started to address the exclusivity of school music programs, expanding the reach of primary to secondary level music programs by introducing music technology courses. The goals of this educational paradigm shift are two-fold.

1) First, students who are not traditionally trained have the opportunity to participate in music programs.
2) Secondly, exposing students to music technology is important unto itself.

These new technologies play critical role in modern music and have changed the industry in countless ways: recording, editing, mixing, etc.

Under the right guidance and implementation, music technology courses can develop students' self-efficacy for creative tasks and self-awareness of the creative process through experiential learning and authentic assessments. Broadening music classes' accessibility is paramount. Thus, creating learning environments facilitate creativity and moments of creative "flow" for students.

II. CREATIVITY IN THE CLASSROOM

In this section, we will briefly review the relevant creativity research. Here we will discuss the aspects of facilitating creative problem solving in the classroom.

P vs. H Creativity

For the purpose of this research, a working definition of creativity as it applies to the student is imperative. An essential distinction is between P-creativity and H-creativity.

- ***P-creativity*** involves coming up with a surprising, valuable idea that's new to the person who comes up with it.
- If a new idea is ***H-creative***, that means that (so far as we know) no one else has had it before" [1].

[1] Ph.D, Department of Music, Banasthali University, Rajasthan, India, E-mail: shveata@yahoo.com, Tel.: +91-8824024137
[2] Research Supervisor and Head of Department of Music, Banasthali University, Rajasthan, India, E-mail: ina_shastri@yahoo.com

For educational purposes, P-creativity is our focus. This distinction emphasizes individual progress and views creativity as a step-by-step process of building, learning, and fine-tuning one's creative mind.

Key Factors in Facilitating Creative Thought

Highly creative artists and scholars have reported the experience of flow (Flow is the ultimate experience in harnessing emotions while per-forming and learning [2]) when engaged in their best work [3]. Individuals seek to replicate the experiences, satisfaction and positive emotions after working in this elevated, all-consuming mind-state. Through creative-based training, one is experientially introduced to the selective mechanisms that foster creative growth [4]. If one can be aware of the mechanisms necessary to enter flow, then, increased levels of creativity and creative thought should occur. Students should be deeply absorbed in activities that lend themselves to a flow state, and this will lead to the optimal learning experience [5]. For one attempting to in duce this experience, it is important that one's skills should neither be overmatched nor underutilized for an assignment [2,5].This can be done by balancing the divergent and convergent thinking components of a given project, offering broad limitations, but ultimately, allowing students the freedom to make their own decisions through experimentation and improvisation. Additionally, activities should be constructed in a way so the stresses of failing or being judged harshly are not distracters from the work at hand.

To engage in creative thought, there needs to be a combination of the familiar and unfamiliar based on the creator's prior experiences [6].

- Carefully designed school activities and projects should be able to build upon student experiences, while also having clear learning objectives and goals.
- High engagement during tasks in high school classrooms is a significant predictor of continuing motivation and commitment as well as overall performance in college [7].

An environment which promotes and incorporates creative thinking acts on both intrinsic and extrinsic student motivation.

- ✓ Intrinsic motivation, alone, elevates individuals' desire to seize opportunities to learn, read, work with others, and gain feedback in a way that serves as a bridge to more complex tasks [5]. Receiving feedback and evaluating one's work motivates students to seek the information and capacities needed to progress. Such intrinsic motivation leads to lifelong learning, an attitude that must be cultivated to counter general student apathy [8].
- ✓ For adolescents, extrinsic motivation can be greatly influenced by peer approval and social identification [9]. By allowing students to express them-selves and create projects closely tied to their own interests, many of the negative associations of traditional music programs could be alleviated.

III. MUSIC EDUCATION, TEACHERS, AND CURRICULUM

In this section, we will emphasize how schools' philosophies, curricula, and teachers must be reevaluated to meet the needs of music students today.

Developing Creativity in our Schools

Creativity can be cultivated by allotting more resources and time for activities and assignments that require imagination, creativity, and innovation [10]. According to researches many nations like Australia, India, US, etc. are providing a well-rounded curriculum, educating their children deeply in a wide range of subjects including the arts [11]. For schools to keep pace with the rest of the world, out-dated education curricula and teaching philosophies need to change. These changes must start with school districts and teacher training programs. In general, schools have not dedicated themselves to developing creative thought. They have rewarded intellectual abidance rather than complex reasoning and creativity [10]. Ultimately, the assessments of student progress should include creativity. There is a necessity for all students to form novel, coherent performances and original products to face an ever-changing world [12]. These are the types of learners education system must be nurturing. By developing creativity further in K-12 education, every person could realize their potential to do some sort of valuable original work and could curtail many adults' sense of futility about doing something original [13].

Meeting the Needs of Today's Students

McPhersonet al.'s 2010 study of 3,037 students in grades 6-12 revealed that music was the least favored of all school subjects, but it was one of the most preferred activities outside school [9]. Music educators must understand the alternative musical lives and interests of students. Potential music students may not have formal training, but many young people have selective tastes and are familiar with several genres of music. Something that is often overlooked is that core creative skills in music are related to listening experiences. A wide range of listening experiences may lead to more expressive projects and compositions. If teachers understood the listening interests of their students, a common vocabulary and language could be taught and established, so students could effectively analyze, communicate, and replicate aspects of a song that resonate with them, becoming more critical, active listeners [14]. Even in an expressive art such as music, students are stream-lined into only studying the particular rules and structures of classical and/or jazz. Much music exists outside of these realms. Rather than music educators trying to teach adolescents specific composition styles, they should create an environment where adolescents can develop their own strategies for composition and assist as needed [15]. While, traditional music programs do offer valuable knowledge, it cannot be the full extent of music education programs. The current standards for music education are not sufficient, and the formal system of music education inhibits participation [16]. To have integrity as a profession, public school music education must broaden its reach to involve the other 80% [1]. By using current music

technology tools, the very fabric of music education is being challenged. However, a nationwide survey reveals that only 14% of students nationwide have access to technology based music courses [1].

IV. MUSIC TECHNOLOGY

In the Music Technology section, we will explain the accessibility and affordability of music technology. We discuss why music technology serves as an excellent tool for creative development. Lastly, we will contend that music technology's flexibility is valuable and supports creativity for both non-trained and trained musicians.

Western Classical Music and MIDI

Music technology is becoming increasingly accepted as a method of evaluating music performance. In studying piano performances, Musical Instrument Digital Interface (MIDI) allows the "capturing" of pianists performances and the subsequent indexing of precise measurements of all notes (key presses) performed. Not only does MIDI provide the means for assessing technical performance (i.e. accuracy of pitches and rhythms), it also affords immediate access to measures of the expressive features of music, namely loudness, tempo and articulation (relative note duration).

Some private studio music teachers are using MIDI technology in their work with students. Often this is accomplished by having students practice on a MIDI – compatible acoustic piano, so they may then review detailed information about their performance. It is perhaps lesser known that this type of music technology is also of great use to researchers in cognitive psychology who are interested in getting "beneath" the external performance and investigating the internal processes of musical thinking and learning. Carefully devised research methods and procedures allow external behaviors – like musical performance – to serve as indicators of internal cognitive processes. When coupled with such research approaches, music technology is a powerful tool for studying and describing the "inner workings" of expressive music performance, and not just the performance itself.

Research findings in music cognition can be of tremendous practical value to music education. In fact the technology and methods of study used in this type of research are, in many cases, immediately transferable to music instruction. This is largely due to an important similarity between cognitive research (in music) and music education, namely, the need to assess and evaluate how people produce music, how they interact in musical settings, and what they think about music.

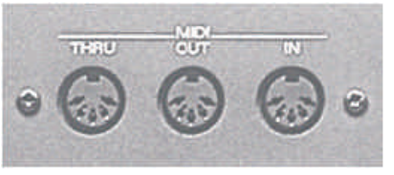
In this section I would put forward a theoretical model of mental representations used in music performance. This model provides the background for the next section of the paper which shares a research study recently conducted by the author. This study serves as an example of how technology can contribute much to investigations into music cognition.

Technology in Studies of Expressive Music Performance

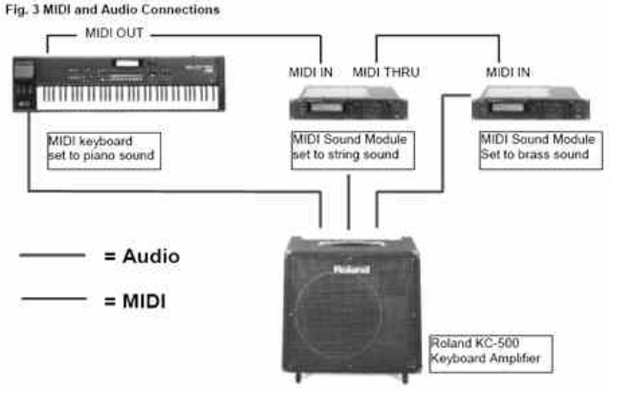
At the present, MIDI is one of the most prevalent forms of music technology used in studies of expressive music performance. However, before MIDI was popular and accessible to musicians and music educators, researchers were using similar antecedent technology to accomplish their research objectives. For example, in their studies of pianist's uses of expressive timing, Shaffer (1981) and Sloboda (1983) used Bechstein grand pianos that were outfitted with photo cell sensors and electronic circuits to detect and code movements of the piano key action. The same capabilities are afforded with MIDI keyboard instruments, including specially equipped acoustic pianos such as the Yamaha Disklavier (eg. Woody,1999). The availability of MIDI technology has resulted in increased research activity in the area of music performance.

More specialized applications of MIDI technology have been utilized effectively in studies of expressive performance. One such example is the 'Instant Pleasure', incorporated into a research study by Johnson (1998). This program allows subjects to replay a MIDI preprogrammed piece of music by clicking a mouse button to indicate the onset of the next note of the piece. In effect, the person determined the basic performance tempo and was able to execute rhythmic nuances (eg. Hesitations, rubato). In his study, Johnson found that the performed expressive timing of music majors improved considerably – to become more like that of experts – after receiving direct instruction on rubato usage, presented graphically and in prose. Other studies in music cognition have used technology that – although not specifically music technology – has been integral to the purposes of the research. The sentograph is a device that measures finger pressure on a push button. At least two teams of researchers have used the sentograph to investigate whether music expressing different broad emotions is related to different basic motional patterns (Clynes and Walker, 1982; Gabrielsson and Lindstrom, 1995). In this research subjects were asked to 'press in a way that fits the music' or 'express the pulses in the music'. Results suggest that there are indeed characteristic pressure patterns for music expressing different broad emotions.

MIDI PORT



MIDI & AUDIO CONNECTIONS



An unusual approach to studying expressive music performance was taken by Davidson (1993). Her study was focused not on the sound but the body movements of musicians engaged in expressive performance. In order to focus solely on body movement, Davidson employed the technology assisted 'point light technique'. Musicians were videotaped while performing with ribbons of glass – bead retroflection tape attached to their major body joints. High powered theatre lights were mounted close to the lens of the video camera. On the play back of the videotape the brightness and the contrast settings of the television monitor were adjusted in order to 'in effect', 'black – out', all visual information except movement of the ribbon spots of light. As might be expected, Davidson concluded that movement is an important source of perceived expression in a live musical performance.

Cognitive Processes in Expressive Music Performance:

Most of the aforementioned researchers aspired to go beyond merely describing the properties of musicians' expressive performances; their ultimate purposes involved testing theories that explain how musicians produce expressive performances. Of course none of the technologies employed by these researchers allowed them to directly tap into the thought processes of musicians. (It is likely that the development of such technology is still a long way off..!!!). Instead these researchers relied on external performances of musicians to serve as indicators of internal cognitive processes. This was accomplished by incorporating technology into innovative research designs and experimental methods. Also necessary for using external performance to indicate internal cognition is a well established theoretical framework.

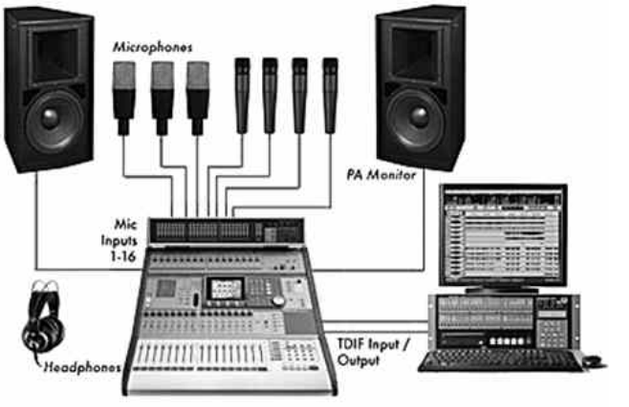
Lehmann (1997) and Ericsson (1997) proposed a model of mental representations used in music performance. This model suggests three component cognitive skills used by musicians when performing a given piece of music:

i. Goal imaging or the ability to formulate a clear idea of what music should sound like.
ii. Action production or the ability to generate the physical movements and fine motor skills required to produce music.
iii. A self monitoring or the ability to accurately hear the true sound properties of one's own performance.

These cognitive skills are interrelated and dependent on one another.

Digital Audio Workstation (DAW)

While music technology is a vague term, we are referring to DAWs such as Garage band, Pro Tools, etc. for this line of research. In figure below there is a screen shot of Garage band. This screen is the arrange window. This is where audio and MIDI data can be recorded, layered and edited. At an introductory level, Garage band's simple inter-face allows for fast learning. Students will not get bogged down by lack of technical know-how, as the software is fairly intuitive. Garage band shares many core features with other DAWs, so as one becomes accustomed to using Garage band, they are gaining global skills that will help them interact with more complicated DAWs in the future. In the arrange window, each row signifies a different layer/instrument in the song. The horizontal axis is time, with identification [9], with the beginning of the song on the left and the end on the right. At the bottom of the window, the basic functions for recording, playing, looping, and adding instruments are displayed. On the far left of the screen, small icons and instrument names appear to quickly identify each musical layer for audition and editing. For each layer, the options to record, solo, pan, and adjust volume exist. By clicking in the arrange window, musicians and composers can hear any section of a song in real-time. The simplicity of the Garage band interface makes it an accessible gateway in to music technology and music creation. At its onset, the price of music technology tools was incredibly high and not a plausible option for most school districts. However, the price of music hardware and software has decreased exponentially over the past twenty years. It is now possible to produce music of extremely high quality in their homes.



DAW (Digital Audio Workstation)

Student Engagement and Music Technology

Student interests should be incorporated in the classroom through real world, authentic problem solving tasks. High engagement takes place when students partake in academic work that intellectually involves them in a process of meaningful inquiry that extends beyond the classroom [17]. Building upon this notion, research suggests that student engagement may be influenced by the relevance of instruction, perceived control, and positive emotion [5]. Creating and collaborating in a music technology classroom inherently appeals to positive emotions. Both academic intensity and a positive emotional response appear to be integral parts of optimal engagement in classrooms [5]. The literature also indicates that when a teacher provides students with the readiness and skills to create their own music, music becomes the property of the students themselves and is intrinsically meaningful. Using music technology, all students, regardless of background can feel ownership over their musical education.

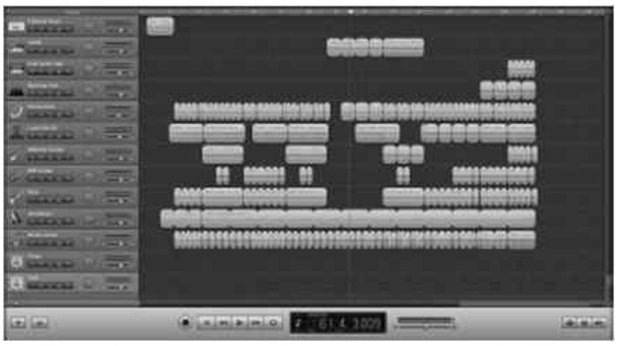
Music Technology as Support for Creativity

The creative thinking process in music is driven by a product intention or goal that is observable through music improvisation, composition, and analysis activities.

It has been made clear that these modes of learning, which focus on creative output, are distinct from instrumental or theoretical training. Therefore, a creativity-based approach to teaching music is needed, at minimum, as a supplement to traditional training. However, without any music knowledge, composition and improvisational tasks are nearly impossible. To help bridge this gap, computers are particularly well-suited to facilitate this type of learning because computer software and tasks can be matched to students' needs [18].Music technology is not enough to produce creativity. Rather, we are reminded frequently that technology is a means, not an end, in supporting the quest for genuinely musical activities. We do not want to use technology for its own sake, but rather, utilize it to enhance musical expression and creativity [19]. Current music technologies, specifically the DAW, are designed in a way so one can easily perform basic functions; however, the depth, available options, and ability to manipulate audio are vast. These new composing environments al-low for a more experimental process by which students "assimilate a vocabulary of music expression, hand-in-hand with their creative imagination" [20]. But, to truly become a master of the software, one must commit the same time and dedication as one would to a musical instrument.

Music Technology for Non-Traditional Music Students:

We can use technology to help unlock the creative potential of both the novice and experienced musician. People, who would never consider they to be musicians in the traditional sense, can create and communicate musically using their computers. By increasing the accessibility of music programs through technology, traditional skills and conceptual understanding are no longer prerequisites to engage with music on a deeply intellectual and creative level [21]. This is not to belittle the skills of the virtuoso instrumentalist; however it is important to acknowledge that just as an advanced instrumentalist is able to mold an instrument's sound through highly technical abilities, students could also manipulate the very core of sonic material and its structure through music technology software [20]. Non-traditional Music students are becoming more involved in high school music programs where music technology courses are offered. In 2011, survey data from 35 music technology/production high school teachers was collected. Some of the most common characteristics for Non-traditional music students were: "non-participating traditional performing ensembles, having a music life in-dependent of school, play an instrument (likely drums, guitar, or sing), may or may not be able to read traditional music notation, unmotivated academically or having a history of discipline problems"[22]. Therefore, the necessity of providing academic music opportunities for students that would not be included in a traditional music setting. Furthermore, we must look to the current state of the music industry. The roles of the producer and engineer have completely revolutionized popular music with the widespread acceptance and utilization of current music technology. Non-traditional music students may find their own musical niche by experimenting and interacting with technology.



Garage-Band is included for free with the purchase of Mac OS X

Teachers in William's survey reported that non-traditional music students are often artists in areas of music production. Some move into traditional programs over time, and others excel in a studio as a jack-of-all-trades. One teacher reported that approximately 35% of his most advanced students were accepted into college for music recording, tech, and composition. This point reiterates the fact that non-traditional music students might possess great musical ideas, but are limited in expressing them. Music technology can aid their expression. Some will argue that simple music activities like putting together a playlist, remixing a track, composing a loop-based piece, or generating a harmonic backing to a song will not advance pupils' music theory, performance or ensemble skills [21]. While these ideas hold merit, the music producers, engineers, and composers of today often do not have a formal training background. Those who are not musicians in the traditional sense are utilizing technology to create novel and valuable music that impacts the lives of millions of people. Some introductory activities and lessons for non-traditional music students will be somewhat derivative, but as students create in this way, they build a vocabulary of compositional devices and add to their own intuitive ideas about songwriting, composing, and arranging [14].

V. CONCLUSION

Offering music technology courses in our schools leaves little room for debate. Not only would we be making music education accessible to a greater percentage of the student population, but these classes would also be an environment to spawn creative development and thought. Students have a strong desire to compose music. All students can be creative, and well-implemented music technology courses can facilitate and give students' confidence in their creative abilities. We posit that music technology programs will make music education more accessible, help develop creative thought in an academic environment, and allow students to gain self efficacy in their creative abilities. Through future studies, we hope to better understand what these programs offer their students. While music technology courses can serve as an excel-lent environment for creative development, we seek to better understand the specific details of these classes and curriculums. Upcoming projects include developing a music technology curriculum and conducting quantitative studies that can evaluate creative development after participating in a music technology program.

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