Chapter 13
A Sound Design and Electronic Music Production STEAM Course for Secondary Education

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ABSTRACT

In this chapter, a music-centered STEAM course implemented in the European School (Schola Europaea) Brussels III is presented. This course, driven by constructivist conversation pedagogy, aims at students in secondary grade and is independent of their prior involvement in music. In the Sound Design module of the course, which is presented in detail, students explore the world of electronic, software-based instruments through the use of software synthesizers and subtractive synthesis. Visual programming with Max/MSP is applied for the design and implementation of basic synthesizers although dedicated software synthesizers are also used. In this chapter, a brief overview on the composition, arrangement, production, mastering, and development modules of the course is also provided.

INTRODUCTION

As hardware virtualization and simulation become increasingly efficient and accessible, it is possible to emulate electronic devices within the hardware limitations of personal computers. One of the areas where hardware emulation has become successful during the last two decades is sound design and music production. It is now possible to assemble a virtual production studio capable of operating nearly identically to an actual studio even with common laptop multicore processors. Software cost can be controlled even with medium budget, due to the existence of alongside free applications, while many professional platforms offer special educational discounts. Moreover, all inclusive, subscription-based platforms, offer integrated suites of software and sample libraries at accessible prices to anyone who seeks to develop skills in the field. Interestingly enough, the technical learning curve seems to be manageable due to the existence of a plethora of online learning resources that can cover almost every demand.

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As the accessibility threshold of sound and music production technologies reaches school level, a STEAM course on sound design and music production can be implemented. Such a course can offer a genuine blend of technology, science and art that can motivate students to explore, engage and take on further challenges. Creating electronic music on software-based platforms can become a very creative form of self-expression and can serve as an entry point to the world of art. On some occasions it can open the gate for professional development in related areas.

MAIN FOCUS OF THE CHAPTER

As technology advances and redefines areas of human activity, it is important that at school level, STEAM courses are designed to serve as entry points to this emerging and evolving ecosystem. With musical sound as the central theme, the proposed course blends science, mathematics and ICT to develop intuition in the world of synthetic sounds and virtual instruments of modern electronic music soundscapes. The scope of this chapter is to propose STEAM tools that can drive the exploration and establish skills in computational, algorithmic, physical and mathematical aspects of synthesized sound.

Issues, Controversies, Problems

The biggest issue in creating a STEAM course in synthesized sound is the amount of complexity attenuation required to adapt a professional course to school level. If complexity attenuation is too high, learning is mechanized to heuristics and rules of thumb, and students' interest may retreat. If complexity attenuation is limited, students might get overwhelmed and eventually abandon. Obtaining the right balance is challenging and requires proprietary tools and methodologies. Furthermore, music is generally considered an artistic form of expression driven mainly by talent. It is really challenging to reveal the strict mathematical, computational and physical principles that govern the generation of electronic music and at the same time preserve its artistic character. It is also challenging to design a STEAM course that can engage students with no musical background alongside students with experience in music.

BACKGROUND

STEAM was initially perceived as an attempt to enhance STEM with the involvement of art. According to this viewpoint, the infusion of art can make STEM more acceptable and appealing to students but as Bequette & Bequette (2012) point out, more interesting STEAM curricula can be developed if art can be also seen as an end goal. As the typical music consumer transforms to a prosumer (producer + consumer), classroom activities that focus on the production part of the music can foster both creativity and collaboration (Clauhs et al., 2019). Student interaction with music and digital content in general has evolved and this gives the opportunity to explore additional possibilities in student engagement with music at the school level (Tobias, 2013), thus making the STEAM approach an additional source of differentiation.

STEM has fueled the maker movement in education. Incorporating pedagogical strategies informed by arts in the maker movement expands the creativity process and extends STEM projects and artifacts (Lindberg et al., 2020). Orchestrating a balanced synergy between STEM and Arts can potentially in-