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## Introduction

The number of formal educational programmes that include sound reproduction as an area of study can be difficult to deduce due to differences in the use of terminology and the handling of search data through various online course databases. In addition, sound reproduction is typically included in programmes such as Audio Engineering, Sound Technology or Music technology, which further adds to the difficulty in determining the extent of its inclusion.

This paper highlights some of the challenges and considerations in designing and delivering the sound reproduction subject area in a formal educational setting, using the BSc (Hons) Music Technology course at Leeds Beckett University as a case study.

## Background

Performing a search for 'Music Technology' through UCAS returns 80 institutions delivering undergraduate courses related to this title<sup>1</sup>. Searches for 'Sound' and 'Audio' return 58 and 66 providers respectively. In its most recent directory, UKMusic.org lists over 1200 formal music courses at FE and HE level<sup>2</sup> that include elements of sound reproduction. Most notable are the number of Music Technology programmes that include elements of sound reproduction, but two courses sharing the same course title often include differing amounts of sound reproduction content with varying opportunities for technical and practical study or skills development.

Various institutions and organisations view formal education programmes as a route into employment in the 'creative industries'<sup>3</sup> which include the industries of film, video games and music. Recent studies highlighted some of the issues that the creative industries face, for instance the skills shortage of technically proficient young people in the games industry in the UK caused predominantly through: 'A failing of our education system – from schools to universities – and it needs to be tackled urgently if we are to remain globally competitive'<sup>4</sup>

The Skillset Group's Report To the Creative Industries Council in 2012 identifies a number of challenges faced by the creative industries leading to a range of recommendations and guidance. Among these recommendations are that 'industry relevant HE provision genuinely simulates the workplace' and 'within the UK's universities and research institutions, there should be greater synergy and exchange between STEM subjects (science, technology, engineering and maths) and the arts and creative industries. The report also highlights the need to 'develop a skilled technical workforce in music, where a growth in employment is predicted' and a need for technical skills in other areas such as performing arts, television and digital media<sup>5</sup>. Educational programmes in this area are therefore required to be multi-faceted, up-to-date, include established as well as cutting edge content and meet the needs of industry at a given point in time.

## The Case Study

The BSc (Hons) Music Technology degree programme at Leeds Metropolitan University has been established for around 17 years and presently has approximately 300 students across the 3 years of the degree. One of the key challenges for the course is how to provide the breadth of subjects to allow for a range of careers in the creative industries yet still produce graduates with the depth of understanding required for technical careers in sound reproduction.

The curriculum for the course has recently undergone a refocus in which subject themes were created to help provide pathways of development through each academic level. These are Audio Engineering, Acoustics, Recording Practice, Computer Music, Critical Studies and Professional Practice as shown in Figure 1. The course themes represent well established curriculum areas in Music Technology and, as well as providing clear pathways for students, are clearly present to reassure employers that students have been through a well structured programme.

The Audio System Design Module is a key module in the Audio Engineering pathway on the course and is delivered in the second semester of the second year. It has been chosen for discussion as it is indicative of the course ethos particularly with respect to audio engineering and sound reproduction issues. How this module serves both the students needs, the expectations of industry and how it fits in with the wider curriculum are also of interest. The Audio System Design module curriculum considers the audio signal path from source to destination, with a focus on issues of signal quality throughout the signal chain.

The module has the following outcomes, which are intended to both support further study and acknowledge the requirements of industry and therefore students will have:

- Used industry standard handheld sound level meters and analysers
- Measured industry standard metrics for audio performance
- Listened to and measured the output of loudspeakers
- Manipulated audio signal paths and measured the impact of this
- Communicated a complex investigation in writing as a formal report
- Interpreted and evaluated published specification sheets for audio devices

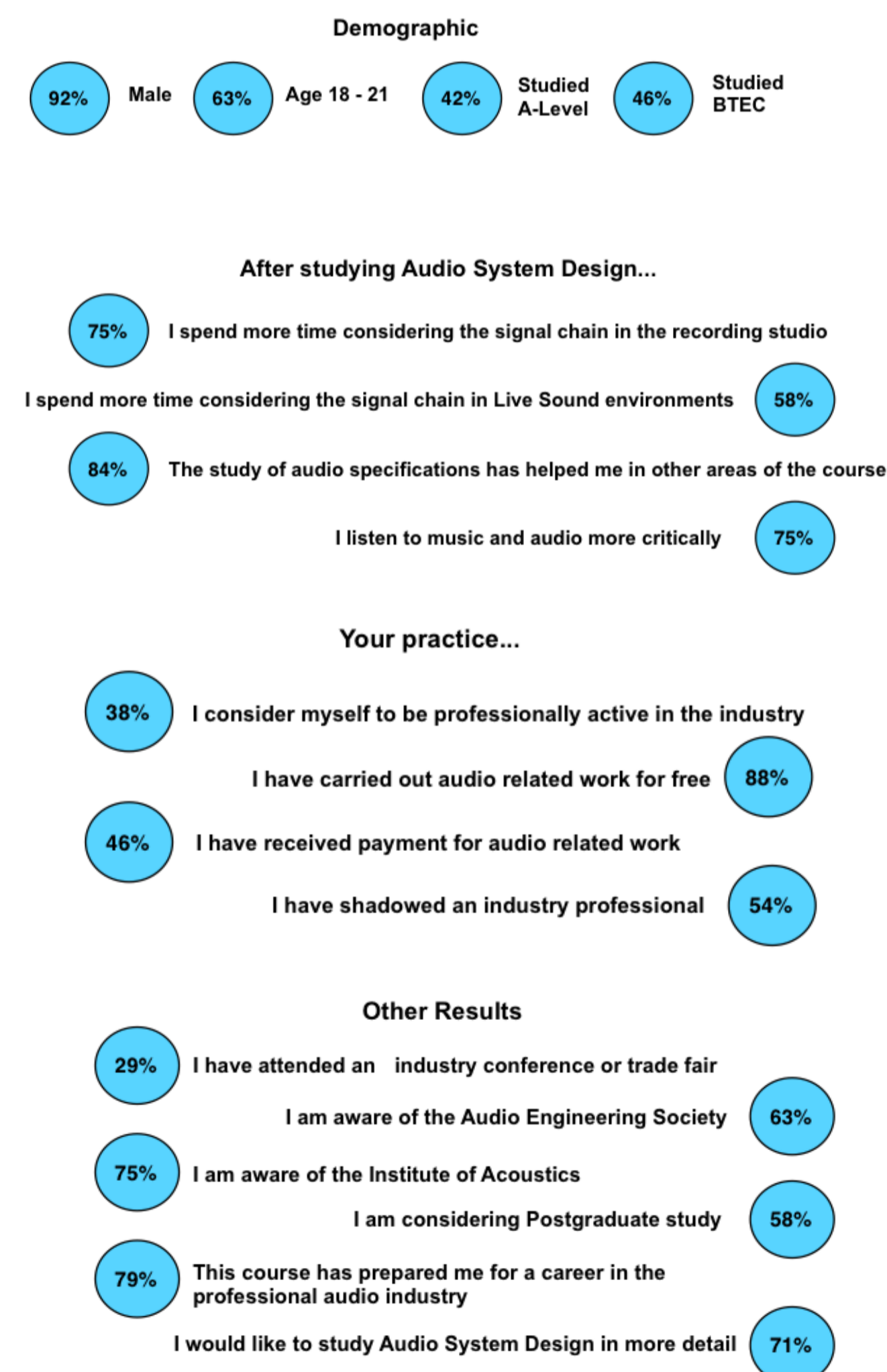
The module features a weekly lecture that covers underpinning theory and a weekly laboratory-style session. The module begins by considering the end of the signal chain in the form of loudspeaker design (drivers, enclosures and amplification) and sound reproduction issues. As well as being a key industry expectation, the topic of sound reproduction is also one of the most accessible as all students have experiences of sound reproduction that can be directly applied to it study and this is used as a means to engage students in critical discussion from the outset. The middle part of the module considers audio specifications in the electrical domain and the final section of the module considers more specific topics such as impedance, valve electronics, interfacing and compression. Student activities take the form of a series of structured practical laboratory tasks, which explore key theories and practices, and students are required to write up two of these laboratory investigations as formal reports. The module concludes with a multiple-choice test in which students are encouraged to apply rather than recall their skills and knowledge. Listening is encouraged throughout the module and helps to reinforce the idea that sound reproduction principles can be studied using scientific methods of prediction, testing and measurement alongside subjective methods of listening.

## Methodology

The educational experiences of students studying the 'Audio System Design' module at Leeds Beckett University were captured through a structured questionnaire distributed and administered using Google forms. The questionnaire was divided into three distinct sections in an attempt to capture three core themes identified in the previous discussion, that of personal experience, educational impact and professional impact.

The data was collected in the final week of the module. 24 responses were received from a possible 72 students and these were used to derive the data in the results shown below.

## Results



## Discussion

The responses largely show that students acknowledge the significance of audio system design as an essential element within the broader Music Technology course. Students also generally recognise the impact of studying audio system design as it relates to further study, which is a useful outcome as it demonstrates an awareness of creating necessary links between other modules within the course such as acoustics and psychoacoustics. There were also positive responses from students who felt that the module would benefit them in the study of studio recording. This indicates that the content of the module has been adequately contextualized in order to support both the technical and creative areas of the music technology curriculum and students felt they could usefully implement what they had learnt on the module in other areas of their study.

In relation to the impact the module has had on students' personal development the results demonstrated positive indications that students spent more time considering the audio signal chain and listened to music and audio more critically. Nearly three quarters of students also felt motivated to study sound reproduction in more depth indicating a positive and engaging educational experience on the module. Of great interest to the module team were the overwhelming number of students that had previously undertaken professional audio work outside of their course, paid and unpaid. This further highlighted the necessity for the curriculum to prepare students for employment in the creative industries, however, rather than at the end of the course as Skillset suggest<sup>5</sup>, this would be most useful throughout the duration of their studies.

## Conclusions and Further Recommendations

This paper has highlighted the need for HE courses that include the area of sound reproduction to have a clear eye on the needs of industry and feature learning activities that engage students in realistic and industry-relevant ways. If the evidence from this study is representative of other students in HE institutions then it could be surmised that many students on these types of courses are already engaging with their chosen area of industry. Course providers will therefore need to consider ways of enhancing this sort of activity both within the curriculum and methods of teaching, which could include a requirement to undertake shadowing of professionals or location work which could also prove useful for students who are not currently engaged with industry work.

## References and Further Reading

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