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# Audio Recording and Production Education: Skills New Hires Have and Where They Reported Learning Them

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To understand how audio recording and production (ARP) programs meet the needs of the audio industry, the New Hires Survey (NHS) study directly asked new hires what skills they have and where they were learned. In this non-experimental approach, a mixed methods collection process was used via the creation of the NHS. The on-line survey asked new hires to rate the level of proficiency of their skills, where they learned these skills, and what skills they need to learn. New hires were between the ages of 21 and 30 and employed as live sound/recording engineers at medium/large businesses located in the Northeast, California, and the Mid-Atlantic regions of the United States. Most attended 3-4 year professional schools, or 4-year music colleges for their formal ARP training. Data was analyzed via descriptive statistics for all quantitative survey questions and utilized a structural coding method for all open-end responses. The new hires reported learning basic technical skills during formal ARP training but learned social and communication skills on their own or on the job. They requested a greater emphasis on career critical areas of live sound and music business. Further curriculum design and research is recommended to understand industry needs, identify best practices for the acquisition of skills, and to determine how educational institutions can keep pace with the ever-changing audio industry.

## 1 INTRODUCTION

The audio recording industry is one of the main suppliers of content to the larger entertainment industry. Many different types of formal audio recording and production (ARP) training programs exist to prepare students for a career in the audio industry [1]. However, only a few researchers and educators have questioned whether these ARP programs are teaching skills that the audio industry needs or wants. Furthermore, no research exists on what skills new hires in the industry actually have, or how and where they learned these skills. Therefore, to better understand the relationship between ARP programs and the needs of the audio industry, the NHS study directly asked new hires what skills they have and where they were learned.

### 1.1 Limited Research

Though research into ARP programs is limited, the conclusions drawn from the 1978 Trends in Audio Education Symposium at the 60th AES Convention urged increased awareness of what goes on day-to-day in the working environment [2] [3] [4] [5] [6]. It was not until the early 1990s that visionaries in ARP research conducted non-experimental research in an attempt to understand the relationship between formal ARP education and the audio recording industry [7] [8] [9].

In 1993 Lightner aimed to define this relationship. Using a non-experimental descriptive research approach, he polled employers in the professional audio industry to identify their perceived value of ARP education as well as the training needs of their employees. His research found that employers complained that many graduates had unrealistic people skills, weak customer service skills, and lacked communication skills [7].

A year later, Sanders similarly sought to understand the relationship between the audio industry and formal ARP education by polling the employers, studio managers, and staff engineers working in the industry. This research was limited to studios in Los Angeles, New York, and Nashville. His research indicated that the ability to work well under stress, be an astute observer, be easy to work with, and have a sense of humor was paramount for aspiring engineers [8].

In 1996 Walsh, too, vied to understand the relationship between the audio industry and formal ARP education. He designed his study to provide a thorough demographic profile of ARP educators at various types of educational institutions throughout the United States. Additionally, he sought

to define the perceived level of importance these educators placed on specific occupational skills and knowledge needed by students pursuing careers in the audio recording industry. His research found that educators and employers agreed that customer relations and studio protocol were most important [9]. Walsh conducted this research to accompany the industry perspective that Lighter and Sanders had identified in their research.

More than 13 years later, Tough asked the contemporary industry what skills recording engineers should have [10]. Using a Delphi method, he created a ranked list of competencies identified by an expert panel of engineers. This research created a ranking of the top 100 essential skills. The top five were communication skills. They included (1) demonstrate the ability to work hard and complete projects, (2) recognize the need for personal responsibility, (3) demonstrate the ability to be an effective listener towards co-workers and clients, (4) demonstrate the ability to communicate clearly and tactfully with clients and co-workers, and (5) develop the ability to be professional around clients.

The focus of the New Hires Survey (NHS) study and this paper was to gain a realistic perspective of what skills new hires in the audio industry actually have and how and where they learned these skills. Therefore, to better understand the relationship between ARP education and the needs of the audio recording industry, I directly asked new hires what skills they had as opposed to the previous research that polled employers and educators.

## 2 METHODOLOGY

### 2.1 Collection Process

The perceptions of skill sets by new hires were collected in the NHS study via an online mixed-methods survey instrument. This research aimed to further understand the relationship between formal ARP training and the audio recording industry by using a non-experimental approach. The use of a non-experimental method focuses on the perspectives of the participants, not the researcher [11]. Visionaries in ARP research all used a non-experimental approach in an attempt to better understand the perspectives of employers in the audio recording industry and educators in ARP programs [7] [8] [9].

Utilizing a purposeful sampling method, new hires were defined as employees hired in the last five years. These participants were identified by utilizing my current professional contacts, audio industry associations, professional list-servers, and recording studio directories. As a member of several professional recording and music associations, I had access to their list-servers and therefore accessed thousands of potential participants. A simple email was constructed that shared the basic information about the research along with links to the online survey instrument. In addition, participants were contacted by phone at their workplace to further persuade them to complete the survey and to verify employment. Over three thousand studios in Canada and the United States were contacted between October 2012 and January 2013 and 52 new hires responded.

[1COM] The ability to work hard and complete projects

- ○ I do not possess this skill
- ○ I have a basic proficiency in this skill
- ○ I have an intermediate proficiency in
- ○ I have an advanced proficiency in
- ○ I have mastered this skill

Fig. 1. First Quantitative Modified-Likert Scale Question.

### 2.2. Instrument

The NHS study included five basic parts: consent form, basic info, skills section, open-ended questions, and thank you. The consent form also expressed the purpose of this survey, the optional requirement to fill out the entire survey, and to honestly answer the research questions.

In the basic information section, the participants provided the date and the number of years they have worked in the audio industry. If they answered more than five years, they were immediately disqualified. Additionally, they were asked their age, current zip code of employment, and number of fellow employees. This section also solicited what types of audio industry position the new hire held. Additionally, the new hires indicated the type of formal ARP training they received and their general level of education.

As shown in Fig. 1, the skills section of the NHS study allowed new hires to rate their proficiency of skills via a modified Likert scale.

As shown in Fig. 2, if participants responded that they possessed a particular skill, they were asked to indicate where they learned the skill and give additional clarification in the optional comment box.

If the new hires answered that they do not possess this skill, then they moved on to the next question. The combination of the modified Likert scale and the answer-based follow-up questions allowed the NHS to answer the research question of what new hires in the audio recording industry report as their skill set learned from either a formal ARP program, on the job, during an internship, or on their own. Before thanking the participant for completing the survey, the NHS study asked the participants to answer three opened-ended questions: (a) the skills most challenging to learn, (b) where they learned the majority of their skills, and (c) what skills their ARP program did not focus on.

### 2.3 Data Analysis

Descriptive statistics in conjunction with a structural coding method were used in this mixed-methods study.

The quantitative data was analyzed using basic descriptive statistics. This statistical analysis indicated the

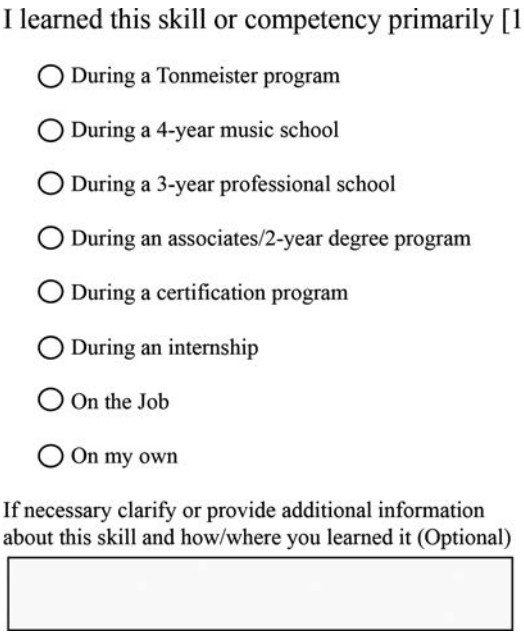


Fig. 2. Follow-up Modified-Likert Scale Question with Optional Clarification Comment Box.

percentage of mastered skills and least mastered skills and where they were learned, as reported by new hires.

This was an initial and broad inspection of the skills new hires have. Though descriptive summaries can form a basis of a more extensive statistical analysis, often they are sufficient in and of themselves for investigation involving social research [12]. For the open-ended questions and optional clarification sections, a structural coding method was used. Structural coding is a first order method and applies a content-based or conceptual phrase representing a topic of inquiry to segment data [13]. The top 40 skills from Tough's research were used as the "conceptual phrases" to identify within the responses the skills new hires found most challenging and those that were lacking from their ARP program [10]. Structural coding is appropriate for those studies employing multiple participants, engaging in exploratory investigations to gather topic lists, and indexing them from open ended survey responses [14].

### 2.4. Validity

The content validity of the NHS study was established by Tough's research [10]. His research ranked what skills were most important for employees entering the audio recording industry by asking a panel of experts to rate a list of skills [10]. Tough's research had a relatively small number of participants; however, a Delphi method was employed to engage the participants in several rounds of inquiry. In a Delphi method, participants are able to revise their earlier answers after reviewing the replies of other members of their panel to create consensus and a greater convergence [15].

The NHS study's construct validity was established by Tough and Sanders [8] [10]. These two ARP experts were asked to evaluate the construct of introversion in the areas of communication, general audio, digital audio, and music business. Moreover, the presence or absence of one or more criteria considered to represent the areas of interest in the NHS study were not detected by the ARP experts. Tough did, however, recommend that the response to each skill be opened up from the simple (a) I have mastered this skill, (b) I'm developing this skill, and (c) I don't have this skill, to five levels of complexity. The final NHS was altered to include the options (a) I do not possess this skill, (b) I have a basic proficiency in this skill, (c) I have an intermediate proficiency in this skill, (d) I have an advanced proficiency in this skill, and (e) I have mastered this skill.

The criterion-related validity as well as the reliability of the NHS study were established by the use of a pilot test conducted from August 15 to September 15, 2012 prior to the administration of the final NHS study. This pilot test allowed a small convenience sample of 20 new hires to validate the format, clarity of directions, and indicate if elements should be added, eliminated, or refined. The participants of this pilot test agreed that the format and the directions were clear and that they were able to accurately indicate their skills and where they learned them. Nevertheless, several new hires indicated a need to include an "additional comments box" to clarify their answers. As a result, an optional open text box was added to each question asking them to provide any clarification or additional information about this skill and how/where they learned it.

### 2.5 Limitations

Though the NHS study included new hires from North America and Canada, findings should not be generalized across the United States or internationally. Markets like New York or Los Angeles would require a specific survey for new hires in each region respectively. The aim of this research was to get a general sense of what skills new hires have and where they learned them. Applying them to any specific formal ARP program would require additional research. This research should be used as a starting point for future research. The recommendations and discussions found in this paper relate to the specific ARP programs that the new hires attended.

## 3. RESULTS

### 3.1 Sample

Most new hires had two years or less experience and were between 21 and 30 years old. They were employed as live sound engineers or recording engineers at medium to larger businesses. These businesses were located primarily in the Northeast, California, and the Mid-Atlantic regions of the United States. Most attended three-to-four-year professional schools, while the next largest group attended four-year music colleges for their formal ARP training. In general, the new hires had a bachelors level of education, and more than half spent over $60,000 on their education (at the very least a combined total of 3.1 million dollars). Of the new hires, 79.5% had formal ARP training; only 20.5% did not.

Table 1. Top Mastered Skills and Where They Were Learned as Reported by New Hires.

| Skill | % | Description | % On Own | % On the Job | % ARP | % Intern |
|---|---|---|---|---|---|---|
| 9COM | 70.7 | Passion for Work | 70.7 | 17.1 | 12.2 | 0.0 |
| 2COM | 1 | Responsibility | 70.8 | 17 | 19.5 | 2.4 |
| 3COM | 61 | Effective Listener | 36.6 | 51.3 | 12.2 | 9.8 |
| 1COM | 56.1 | Completing Projects | 39.8 | 31.0 | 29.2 | 4.9 |
| 5COM | 56.1 | Professional w/Clients | 22 | 56.1 | 21.9 | 4.9 |
| 35GA | 55.3 | Basic Technical Skills | 13.9 | 16.7 | 69.5 | 5.6 |
| 21DA | 55.3 | Organize Session Data | 18.9 | 27 | 54 | 2.7 |
| 15COM | 55 | Self-Starting | 53.8 | 23.1 | 23.1 | 0.0 |
| 14COM | 55 | Patience in Studio | 28.2 | 56.4 | 15.4 | 2.6 |

The NHS study asked new hires to scale their skill level and identify where they gained this proficiency. The top skills and where each was learned are presented in Table 1.

The new hires reported they had mastered or had advanced technical skills as a result of learning them at their ARP programs. In the open clarification sections for these skills, the new hires reported that great teachers and professionals helped them learn these technical skills. However, the new hires reported learning to be effective listeners and professionalism with clients primarily on their own or on the job. In the open clarification section one new hire noted, “Often my fellow interns think they have a skill and then they see the head engineer in action and realize that they have a lot to learn” (see Appendix Table 2). Few new hires reported learning these communication skills during an internship.

In addition to analyzing the mastered skills, Table 2 shows the advanced skills the new hires reported. They reported having an advanced proficiency in some communication skills such as tact and diplomacy and avoiding or resolving conflict, and reported learning them on their own or on the job respectively. In contrast, almost half of the new hires reported learning critical thinking, teamwork, and leadership at their formal ARP program.

### 3.2 Least Mastered

Results for skills least mastered were also identified. As shown in Table 3, the new hires reported communication skills were not learned in their ARP programs.

### 3.3 Communication Skills as a Trait

In the optional clarification sections, the new hires reported that the ability to use tact and diplomacy when dealing with clients was the result of their personal values and character. They responded that good communicators have inherent skills to avoid or resolve potential conflict situations that can arise in the studio environment. One new hire admitted that he learned to address conflicts and handle high-pressure situations "the hard way" while touring with a band as a live-sound engineer (see Appendix Table 2).

### 3.4 Most Challenging

In an open-ended question the new hires were asked what skills they found most challenging to learn (see

Table 2. Top Advanced Skills and Where They Were Learned as Reported by New Hires.

| Skill | % | Description | % On Own | % On Job | % ARP | % Intern |
|---|---|---|---|---|---|---|
| 19COM | 64.1 | Tact and Diplomacy | 46.2 | 28.2 | 18.0 | 7.7 |
| 31COM | 57.9 | Critical Thinking | 31.6 | 23.7 | 42.1 | 2.6 |
| 20COM | 56.4 | Handle High Pressure | 17.9 | 51.3 | 20.5 | 10.3 |
| 6GA | 55.3 | Knowledge of Effects | 7.9 | 15.8 | 76.3 | 0.0 |
| 18COM | 53.8 | Avoid/Resolve Conflict | 46.2 | 38.5 | 7.7 | 7.7 |
| 11COM | 53.7 | Work Effectively on a Team | 22.0 | 24.4 | 48.8 | 4.9 |
| 37COM | 52.6 | Leadership Skills | 27.0 | 32.4 | 40.5 | 0.0 |
| 4COM | 51.2 | Effective Communicator | 26.8 | 53.7 | 19.6 | 0.0 |
| 38COM | 50.0 | Think Outside the Box | 60.5 | 18.4 | 21.1 | 0.0 |
| 13COM | 47.5 | Change and Adapt | 22.5 | 55.0 | 22.5 | 0.0 |

Table 3. Least Mastered Skills and Where They Were Learned as Reported by New Hires.

| Skill | % | Description | % On Own | % On Job | % Formal ARP |
|---|---|---|---|---|---|
| 19COM | 25.6 | Tact and Diplomacy | 46.2 | 35.9 | 18.0 |
| 18COM | 33.3 | Avoid/resolve Conflict | 46.2 | 46.2 | 7.7 |
| 20COM | 33.3 | Handle High Pressure | 17.9 | 61.6 | 20.5 |
| 38COM | 34.2 | Think Outside the Box | 60.5 | 18.4 | 21.1 |
| 13COM | 37.5 | Adapt and Change | 22.5 | 55.0 | 22.5 |
| 34COM | 39.5 | Client Confidence | 26.3 | 53.5 | 20.1 |

Table 4. The Most Challenging Skills and Where They Were Learned as Reported by New Hires.

| Skills | % | Description | % On own | % On Job | % Formal ARP | % Intern |
|---|---|---|---|---|---|---|
| 4COM | 92.7 | Communicate | 26.8 | 42.3 | 30.9 | 0.0 |
| 13COM | 85.0 | Flexibility | 22.5 | 55.0 | 22.5 | 0.0 |
| 19COM | 89.7 | Tact/Diplomacy | 46.2 | 28.2 | 25.6 | 5.8 |
| 20COM | 89.7 | Handle Pressure | 17.9 | 61.6 | 20.5 | 7.7 |
| 29COM | 84.7 | Humility | 31.6 | 55.3 | 13.1 | 5.8 |

Appendix Table 1). As shown in Table 4 the new hires reported that social and communication skills were some of the most challenging to learn. In the optional clarifications sections, the new hires reported a need for their ARP programs to focus on business and communication that included interactions with clients and co-workers, music marketing, networking, and business ethics. One new hire indicated that these were the skills he needed most at his job.

### 3.5 Learning on Their Own

In another open-ended question, the new hires were asked where they learned their skills (see Appendix Table 2). The new hires reported that on their own they mastered the skills they found most challenging. They reported that they were self-taught in all disciplines by researching, doing, and asking questions online or with people they met. One new hire responded that he learned most of his skills by making his own music: "With each piece I composed, I noticed improvement way beyond the improvement I saw while I was a student." Another new hire commented that one does not know how to apply this information until one has several gigs under his belt. This same new hire added, "After a year of mixing over 200 bands, I finally feel I have a grasp on using all the skills acquired at school." Other new hires reported that they were able to perfect their skills through work and personal drive, trial and error, failing, and developing their ears. However, the new hires did report that during formal ARP training, they learned basic theoretical knowledge, technical skills related to audio production, general audio recording and mixing, DAW software, microphone techniques, audio gear and equipment. Nevertheless, the new hires reported that on the job they learned the ability to be professional yet direct, to be prepared and arrive early, to take risks, and to challenge themselves to learn more. In a third open-ended question, the new hires were asked what skills their formal ARP programs did not cover (see Appendix Table 3). As shown in Table 5, the largest percentage of the new hires reported that there was a lack of focus on skills for live sound.

### 3.6 Skills Not Covered

The new hires stated a need to focus on methods and industry standards for live sound that included proper level setting in a live sound environment as opposed to a studio environment. Specifically this included the operation of standard digital consoles such as the Yamaha ls9. The next largest percentage of new hires reported a need to focus on business and communication skills.

Table 5. Skills the New Hires Reported Their Formal ARP Programs Did Not Cover.

| Area | % |
|---|---|
| Live sound | 17.8 |
| Communications Skills | 15.6 |
| Technical Skills | 11.1 |
| Business | 11.1 |
| Broadcasting | 6.7 |
| Mastering | 6.7 |
| Application | 6.7 |
| Post-Production | 4.4 |
| Analog | 4.4 |
| Music Theory | 4.4 |
| Ear Training | 4.4 |
| Video | 2.2 |
| Production | 2.2 |
| Creativity | 2.2 |

## 4 DISCUSSION

According to the new hires, their ARP programs adequately provided them with technical foundations and skills. The new hires thanked their ARP programs for the equipment and training provided. The ability of programs to train students in these technical skills is consistent with the greater ease by which technical skills are demonstrated and assessed [8]. However, the skills including session procedures, conducting sessions, and technical vocabulary are all technical skills with an inherent social and communication component. Fewer new hires reported mastering these technical skills with social and communication components. Furthermore, more than half of new hires reported that on the job they learned key social and communication skills, including patience in the studio, professionalism with clients, and effective listening. Even though the new hires did report having an advanced proficiency in some communication skills, they reported learning these skills on their own or on the job. In addition, these advanced skills were different from the ones the new hires reported mastering, and these skills had a lower ranking from the expert panel in Tough's research [10]. It should be also noted that in general, all skills (mastered, least mastered, advanced, or most challenging) were not reported by the new hires as learned via internship. However, this could be indicative

of the fact that these new hires did not intern and/or their programs did not require internships.

The NHS study data is consistent with the observations and suggestions collected from the visionary research of the early 1990s. The employer participants in Lightner's research complained that many graduates had unrealistic people skills, weak customer service skills, and lacked communication skills [7]. This corresponds to the skills new hires reported not mastering in the NHS study. As shown in Table 3, weak customer service skills can be the result of having a lack of tact and diplomacy (74.4%) and the ability to avoid/resolve conflict (66.7%). In addition, almost half the new hires reported learning these communication skills on their own. A lack of both of these skills does not inspire client confidence (60.5%). "What really makes great recording engineers are their personal skills and presence, which has to do with instilling confidence in the client. Client's confidence in the recording engineer determines that engineer's effectiveness" [16].

Additionally, the employer participants in Sander's research indicated that the ability to work well under stress, be an astute observer, be easy to work with, and have a sense of humor was paramount for aspiring engineers [8]. Though the aforementioned are considered character traits, they are traits of those who are effective communicators. The new hires of the NHS study commented that good communicators have inherent skills to avoid or resolve potential human conflict situations that can arise in the studio environment. Therefore, are these traits Sanders mentions teachable in ARP programs, or the result of observing (or interacting with) practitioners during an internship and on the job?

Correspondingly, the educator participants in Walsh's research agreed that customer relations and studio protocol were most important. Therefore, are these skills being taught in the classroom, and are they focused and/or assessed within ARP courses? The new hires of the NHS study reported that social and communication skills were some of the most challenging to learn, were missing from their curriculum, and learned mostly on their own or on the job. Compounding this, employer participants of Lighter's and Sanders' studies ranked these communication skills as some of the most desired skills [7] [8]. "Of greater importance [than technical skills] are the people skills that set apart the seasoned engineer, producer, or musician from the individual new to the business" [17].

The visionary research of the early 1990s was done almost 20–25 years ago in a recording industry that barely resembles the market, consumers, and technology of the recording and audio industry of today. Nevertheless, communication skills were ranked as the top five desired skills by the expert panel in Tough's 2009 research [10]. Though there were over 100 skills identified, experts placed the ability to be an effective listener towards co-workers and clients over a basic understanding of signal flow or microphone operation. This suggests that while technology and the industry changes, the need for good communication skills has remained a constant in the audio industry. Therefore, it becomes paramount to determine the most effective place(s) and way(s) to acquire these skills.

## 5 RECOMMENDATIONS

### 5.1 Examining Curriculum

Employers of past research have observed that their new hires do not have strong social skills [7] [8] [9] [10]. Furthermore, new hires of the NHS study reported learning these skills on the job or on their own. The argument could be given that most educators teach students to become independent learners and, as such, they would expect them to teach themselves many new skills once employed. In contrast, as shown in Table 3, 65.8% of the new hires of this NHS study reported not mastering the ability to think outside the box, and 64.5% did not master the ability to adapt and change. Of the 35.5% new hires that reported that they mastered these skills, 60.4% reported learning them on the job. In addition, 53.8% of new hires in the NHS study reported mastering the skills of being a self-starter or independent learner on their own. Therefore, the majority of these new hires reported not mastering communication skills and learning to be independent leaners on their own.

The new hires' ARP programs should consider examining their curricula. Important questions arise regarding integrating social and communication skills into their programs and what are the best delivery methods. Two common approaches I would recommend are (1) a course in communication skills and (2) communications skills as learning objectives within pre-existing courses. The first deals with designing a communications course specifically for ARP majors. Even though most universities and four-year programs have courses in communications or public speaking, this ARP specific communications course would focus on the specific modes and means of communication in the audio industry. These audio industry communications take place within the studio, at a live-sound event, or via email/phone text with clients, co-workers, and/or mentors. One drawback of designing a new course is integrating it into a fixed curriculum and its effect on total credit hours. One solution is to replace the common university core communications or public speaking course(s) with this ARP specific communications course. Master engineer/educator Mark Rubel maintained, "Communication is key in a collaborate process. The better you are at listening and expressing yourself . . . the more coherent the directions will be and the better the results and the happier your clients" [18].

Creating communications skills as learning objectives within pre-existing courses is less obtrusive to a program's established curriculum. Instead of designing a new course, adding elements within a pre-existing course at both the class and project level can be substantive for the teaching and assessment of communication skills. At the course level, students can be "graded" on how they conduct themselves in the class and their interactions with peers and mentors by the inclusion of a "professionalism" item in the course grade book. What professionalism means and how students can gain full credit for this grade book item should be clearly defined in the course syllabus. As shown in Fig. 3 professionalism can easily be defined in a course syllabus.

**PROFESSIONALISM**

Because your communication skills are as important to develop as your technical skills, you will also be graded on your professionalism during class, during sessions, and your interactions with me via, phone, Email, or otherwise. (**like you would be by any future employer**.)

Professionalism definition – people who are professional arrive early, are ready to work, take it upon themselves to be responsible for their own education, realize that grades are earned and are not a negotiation, and in general are productive and easy to work with.

Fig. 3. Professionalism Definition for an ARP Course.

Additionally, adding communication components to individual projects can be done by defining points within a project rubric. These points can focus on the student's ability to work within a group, with a client, and/or how they responded to instructor and peer feedback. The addition of a single or multiple loop feedback system for the evaluation of projects can help students learn how to receive criticism, make changes based on feedback, and ask clarifying questions.

### 5.2 Business and Communication Skills

In addition, the new hires of the NHS study desired a better foundational education in music business, networking, and music marketing to meet the needs of today's demanding audio industry. Nationally, ARP programs are often located in media and communication colleges or music colleges [19]. Research should explore the prevalence of business and entertainment industry courses in these two types of formal ARP training.

### 5.3 Live Sound

Finally, the largest group of new hires reported that live-sound skills were not a part of their formal education. This is important considering the largest percentage (27.9%) of new hires in the NHS study reported having jobs in the live sound segment of the audio industry. Initially, it would prove useful to examine ARP curricula to determine how many or what types of programs include these live sound skills. Additionally, a survey determining the importance of live sound at ARP programs should be conducted to learn if the NHS study's discovery is part of a larger lack of focus in live sound. This new survey could be administered to both students and educators.

ARP programs should be including courses that focus on skills new hires need in the audio industry beyond the studio. Therefore, it is critical for educational institutions to keep pace with the changing industry. Educational cultures should foster a community that stays relevant and reflects the industry.

## 6 CONCLUSION

The ARP programs of the NHS study are providing graduates with technical skills; however, a greater emphasis should be placed on social and communication skills. Furthermore, new hires of this survey requested curricula focusing on live sound and music business. Meeting the needs of the audio industry is imperative for the success of these programs and their graduates.

## 7 ACKNOWLEDGMENTS

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## 9 APPENDIX

Appendix Table 1. Skills the New Hires Reported as Most Challenging to Learn.

| Code | Response |
|---|---|
| OEQ 1 | Accounting, taxes, and payroll |
| OEQ 2 | Continuing work passion |
| OEQ 3 | Elastic audio and using patching to the outboard gear |
| OEQ 4 | Finding and working with clients that inspire my creativity |
| OEQ 5 | I found music theory to be challenging in the beginning |
| OEQ 6 | Learning a variety of workflows dependent on where and/or with whom I am working |
| OEQ 7 | MIDI and Mastering |
| OEQ 8 | Mastering |
| OEQ 9 | Music industry politics |
| OEQ 10 | NA |
| OEQ 11 | Recording and mixing music to sound radio ready |
| OEQ 12 | Signal flow!!!! I felt like a retard trying to fully grasp this depending on the set up |
| OEQ 13 | The effective management of people has been the most challenging skill to learn |
| OEQ 14 | Time management |
| OEQ 15 | Working with difficult clients |
| OEQ 16 | Climbing truss safely |
| OEQ 17 | Digital editing |
| OEQ 18 | Golden ears |
| OEQ 19 | Patience and tact with difficult clients |
| OEQ 20 | Time management: juggling several projects at the same time is difficult and causes stress |
| OEQ 21 | Constant updating and maintaining of software is a pain. Also, the idea that there is only one software that can record audio and midi data. Workflow is individual and there are several capable sequencers to work with. |
| OEQ 22 | Signal flow. . .I get it. . . but for some reason it is hard to maintain especially when a session is in full swing |
| OEQ 23 | Microphone techniques is my biggest challenge. Really capturing something perfectly in focus is incredibly challenging—it's easy to sound "good" and so hard to sound "great" |
| OEQ 24 | Recording/signal flow in a professional studio and outboard gear. This is what I had the least interest and practice in. |
| OEQ 25 | Mixing and mastering. I will never understand it, and I do not care to. I enjoy being a 2nd engineer, recording, and microphone skills. |
| OEQ 26 | Learning to swallow my ego and be the scapegoat when things go wrong. The mixing engineer is almost always blamed regardless of the cause, especially in a live sound application. |
| OEQ 27 | Just the sheer learning of technology and the curve that comes with its application and vast selection of materials, techniques, etc. This is normal, I believe, and a necessary task for learning my trade. |
| OEQ 28 | Electrical engineering aspects of audio work. I'm definitely more of a "music" guy than a "science/engineering" guy. But I'm working on it every day. |
| OEQ 29 | The signal flow at the [ ] in Studio A and the routing of the lexicon and the other reverb unit. . . The TC electronic. It was crucial to get in there and get familiar yet studio time was very scarce! |
| OEQ 30 | Music Theory has long been by toughest challenge. I am strong with basics, but things that I do not use regularly slowly fade and don't always return. |
| OEQ 31 | The most challenging skill to learn for me was to know when to stop, finish, and complete a project. Sometimes I would over-do or over work on a project. |
| OEQ 32 | Learning how to keep calm when everything is going wrong. The best engineers I've seen stay cool no matter what the situation is. This I believe comes with confidence in your craft. |
| OEQ 33 | Mastering. I'm trying to get better at mastering, for the sake of my smaller budget clients—since they won't be sending my mixes out to get mastered, I usually master them. I know this is my weak link. |
| OEQ 35 | Mixing and mastering have taken the most time to have a style and process where everything sounds right and professional |

Appendix Table 2. Where the New Hires Reported Learning their Skills.

| Code | Response |
|---|---|
| OEQ 36 | [Institution name] |
| OEQ 37 | Audio Production Program |
| OEQ 38 | From a combination of on-the-job training, school, and on my own through experience. |
| OEQ 39 | From everywhere. I have a choice two mentors that have taught me more than anything though |
| OEQ 40 | I learned most of my audio knowledge when I went to college for Audio Production. |
| OEQ 41 | I've learned most of them from school and watch tutorials on YouTube |
| OEQ 42 | Most of the skills I use on the job I have acquired through my years in college. |
| OEQ 43 | Most skills were learned on the job. |
| OEQ 44 | NA |
| OEQ 45 | Interning at a studio, teaching myself how to edit and become useful for the studio. |
| OEQ 46 | Mainly on the job but a lot at school |
| OEQ 47 | On the job |
| OEQ 48 | Real |
| OEQ 49 | School and doing it on my own time. In a setting where time was of no consequence. |
| OEQ 50 | I've been performing live and recording since I was 6, but I credit most of my learning from vocational school during high school, then to college, then to internship, then job. It was all a process. |
| OEQ 51 | Most of my personality traits were developed, school expanded my knowledge for audio skills, and then work and my personal drive expanded, and fine-tuned those skills. |
| OEQ 52 | In general I learned most of my skill by making my own music. Which each piece I composed, I noticed improvement way beyond the improvement I saw while I was a student. |
| OEQ 53 | Almost all the technical skills related to audio production, I learned at [ ] (3-year professional school). The internet and on-the-job experience have helped to supplement the basic foundation I got from professional training. |
| OEQ 54 | I learned majority of my audio skills from [ ] from 2007 to 2011. Then I am sound engineer at my church. |
| OEQ 55 | The skills of arts of the audio industry I learned throughout high school and college. The skills to produce, compose, and the drive to succeed in a highly competitive music industry I gained from my passion towards music creation. |
| OEQ 56 | I learned many technical skills on the job and in a 4-year college program. Business skills were learned in graduate school and on the job. Most professionalism and networking skills were learned on my own and on the job. |
| OEQ 57 | I am unique in that I have a combination of learning sources being simultaneously a student, intern, and employee in my given field. In all of these and different ways are where I learn the bulk of my knowledge. |
| OEQ 58 | I learned the basics and mechanics of audio production and recording at [ ]. I relearned and adapted much of the information for the live audio environment on the job. |
| OEQ 59 | Most audio related theory and concrete information (compressors, EQ's, attack times, pro tools I/O, etc.) was learned from school. The problem is that you don't know how to truly apply this information until you have several gigs under your belt. After a year and over 200 bands that I've mixed I finally feel that I have a grasp on using all the skills I've acquired at school. |
| OEQ 60 | General audio recording and mixing- Undergraduate and graduate electronic music and recording technology programs. Live engineering learned on the job with a production company. Client relations learned on the job with a not-for-profit arts organization. |
| OEQ 61 | I learned how to use my ears on my own time. I learned how to eventually get what I was hearing in my mind. I was able to organize my thoughts and advance to a professional mindset through school enrichment. |
| OEQ 62 | I learned how to be technical at [ ], I learned how to be a business professional, in the business world. This is primarily due to my age and previous professional experience before going back to college. |
| OEQ 63 | All basic theoretical knowledge (what are compressors, EQ's, attack times, etc.) came from my education in Audio Production. My jobs expected me to have that understanding already - what they taught me is EVERYTHING else you need to know if you want to actually get hired. This meant being professional yet direct, coming prepared and early, learning to take risks and challenge yourself to learn more. |
| OEQ 64 | Audio specific skills I learned through schooling, such as DAW software, microphone techniques, audio gear and equipment. |
| OEQ 65 | I learned skills at my 4-year music program, my masters level recording program, on the job, and through my own continuing education process. |
| OEQ 66 | I was already an electronics tech prior to opening my studio. My prior work was more sophisticated than that in a pro recording studio. My knowledge as a trained musician was also invaluable when designing and building this studio. |
| OEQ 67 | Skills came from personal interest and experimentation. You haven't asked in this survey if the respondent is an educator, but the ability to teach this subject matter comes from on the job success and failure to reach the students. Experience is the best way to gain the skills of teaching. |
| OEQ 68 | I'm usually self taught in all my disciplines. I learn things but researching, doing, and asking questions. Online or with people I meet. |
| OEQ 69 | Studied music from a young age in piano lessons, took a couple of years at college in performance piano before I switched to record. Studied music production & technology with [ ] and [ ] at [ ]. Interned at [ ]; and then [ ]. I started working at [ ] immediately after my internship ended, in June 2010. Have been there since. |
| OEQ 70 | My dad taught me a lot about construction design and carpentry. I started music lessons in the first grade, and received almost all of my music theory while in grade schools, although at certain points I did have private teachers. I received a couple MCP windows certifications while in high school, and learned enough to pass A+ certification on my own. Much of my etiquette, general attitude and problem solving came from my parents. My audio degree taught me a lot about DAWs, signal flow, mixing techniques, and other technical aspects of audio. I learned how to run efficient sessions by diving in and formulating my own process through trial and error. Every session that failed was a huge learning experience, and the vast majority of the time I was engineering alone and had to figure things out for myself. My live sound I learned from another engineer at the job I currently have. |

Appendix Table 3. What Skills the New Hires Reported Their Formal ARP Programs Did Not Cover.

| Code | Response |
|---|---|
| OEQ 71 | Audio production and engineering |
| OEQ 72 | Audio for video post-production |
| OEQ 73 | Broadcasting elements and terms that are actually used in that environment |
| OEQ 74 | Communication, networking, professionalism, business |
| OEQ 75 | I learned the basics of EQ, compression, reverb, routing, mic techniques, etc. |
| OEQ 76 | I think mastering was left a vague area that I learned on my own |
| OEQ 77 | I was not formally trained. I do have a certification in low-voltage wiring and electronics. |
| OEQ 78 | Live Audio Engineering. School could have had a focus on that. |
| OEQ 79 | Live sound |
| OEQ 80 | Live sound |
| OEQ 81 | Most of the application of the skills only focused on knowledge. |
| OEQ 82 | NA |
| OEQ 83 | Not sure. |
| OEQ 84 | [ ] Studios and [ ] neither particularly covered mastering. . .I had to learn that on my own |
| OEQ 85 | Other DAW outside of Logic, Pro Tools, and Reason. Would have liked to been trained in Reason more |
| OEQ 86 | Production (only a couple classes) |
| OEQ 87 | Studio politics |
| OEQ 88 | Acoustics, patching |
| OEQ 89 | Audiovisual, extensive post production, television broadcasting |
| OEQ 90 | Business relations with clients |
| OEQ 91 | Out of the studio stuff |
| OEQ 92 | Recording techniques, DAW software, production techniques, business |
| OEQ 93 | Studio performance |
| OEQ 94 | Unsure. |
| OEQ 95 | Did not cover more specific requirements/regulations to deliver audio for video/broadcasting. Newer industry developments like BS.1770. Did not cover tape machines. Did not go into mastering. |
| OEQ 96 | 1. Live Sound Reinforcement (no training) 2. Music Theory (10 weeks isn't enough) 3. Ear Training (pitch rather than just frequency) 4. Marketing your music (10 weeks not enough) |
| OEQ 97 | I was trained on the craft of recording and mixing, but not being creative. Creativity I had to learn on my own. |
| OEQ 98 | Theory and technical music knowledge outside of the absolute basics. DAWs outside of Pro Tools and Logic on platforms other than Apple. Any sort of practical implementations for live sound. Integrating our audio work with other essential project departments, such as programming. General rules for yourself, outside of etiquette. How to get what you need out of coworkers or artists that are unwilling to do what you need. |
| OEQ 99 | Not enough Live audio and on location recording training. . .ironically these are the skills i need most on the job. |
| OEQ 100 | Live Sound, Marketing your music, and Pitch training and/or music theory. There was a little bit, but only scratched the surface of these concepts. |
| OEQ 101 | Performer psychology, analog recording media and machines, and all recording software aside from Pro Tools and Logic Pro. |
| OEQ 102 | Tactile and Practical applications and "real-world" experience in the scholastic/academic program |
| OEQ 103 | Live sound methods and industry standards like proper level setting in a live sound environment as opposed to a studio environment and operation of standard digital consoles such as the ls9 |

## THE AUTHOR

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Doug is an Assistant Professor in music and arts production, at the Purdue School of Engineering—IUPUI. Doug was formerly a freelance engineer in Nashville, TN, at Noisy Buffalo Productions specializing in Indie and start-up artists. After earning dual-bachelors in sound recording technology and music composition from the Hartt School of Music at the University of Hartford and a Master's degree in music and computer composition from Bowling Green State University, Doug moved to the Washington, DC area. For seven years Doug was a staff engineer at District Entertainment Studios and an honored faculty member at the Art Institute of Washington all while completing his Doctorate in education. Doug's live sound work has included working at the Lincoln Theater and sound for Vice President Joe Biden.

As a researcher, Doug strives to understand what skills and competencies aspiring engineers need to develop to be successful in the audio industry.