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This study describes the perceptions of students who have attended makerspace workshops at the Kenan Science Library Makerspace at UNC-Chapel Hill. Interviews were conducted with undergraduate students to determine the instructional and technological impact of the makerspace.

A group of five undergraduates who had attended a library session were interviewed. Instruction in the Kenan Science Library Makerspace covers emerging technologies such as 3D printing, 3D scanning, Introduction to Arduino, and Introduction to Tinkercad. The makerspace and its instruction sessions was found to be beneficial to students, increasing their knowledge of emerging technologies.

Headings:

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MAKE-ING THE DIFFERENCE:
MAKERSPACE INSTRUCTION AND THE STUDENT PERSPECTIVE

by
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INTRODUCTION

Academic Libraries in the 21st century have made great strides to accommodate the influx of technology into their traditional library environments. Libraries have always been on the forefront of innovation, and the expansion of technology available in libraries is just the continuation of the trend. Whether it is the introduction of Digital Media Labs, Research Hubs, or Makerspaces, academic libraries are constantly thinking of and implementing new ways to connect their patrons with technology (Michelle Moorefield-Lang, 2014). Demand for these technologies has grown over the last decade as the landscape of academic institutions and scholarly work changed (Moorefield-Lang, 2015). New technologies, sometimes referred to as emerging technologies, have become commonplace in libraries across the country. While the movement to include various types of technology has been accommodated, the specific spaces to house them are new. These spaces are being created to not only allow patrons to use these technologies, but also learn about them. The combination of emerging technologies and instruction is now a critical part of academic libraries.

Library instruction has long been an area of vital importance to the relevance and advancement of libraries, but over the years the definition and scope have continued to change and evolve. This is never more prominent than when emerging technologies became widely embraced by libraries (Patrick Colegrove, 2013). The Makerspace Movement has come to prominence within libraries and is giving new meaning as to what

should be incorporated into library instruction. This is especially true in regards to academic libraries. Traditional information literacy continues to be a focus of academic library instruction, but there has been a growing demand over the past decade to incorporate other types of instruction, particularly workshops involving technology.

While makerspaces are generally seen as very useful tools with which to instruct and engage students, the actual students themselves and their motivations are seldom explored within the area of library learning (John J. Burke, 2014). Academic libraries open and develop makerspaces in order to better serve the students, however the students have not had a definitive voice in why and how they use the space. Scholarship should be developed that looks into why students use the makerspace, how they see the makerspace in conjunction to the library, and what they view as the library's role in developing emerging technologies.

Understanding the motivations of students is extremely important because it can help the library to operate at a more effective level, and improve overall user experience. If the librarians are aware of student motivations and views, then they can tailor their instruction and technology offerings to accommodate those ideas, as opposed to creating a blanket technology information literacy program. Libraries can implement these ideas as a way to fulfill patron expectations, which could lead to overall improvement and participation within the library.

The University of North Carolina at Chapel Hill's Kenan Science Library is an example of the effort to incorporate an active learning space with the technology that is being developed. This paper specifically explores the workings of the makerspace in the

Kenan Science Library Makerspace at UNC Chapel Hill, and how they hold workshops and encourage students to use their technology. The makerspace itself features a wide array of technologies and space. Among the technology featured is 3D printing, 3D scanning, sewing machines and programming devices such as Raspberry Pi and Arduino. The makerspace holds instruction sessions on various technologies, and anyone who is officially affiliated with UNC Chapel Hill is permitted to use the Makerspace. Instruction sessions are held on different topics about twice a week over the course of the academic year. The Makerspace itself reopened in the Spring of 2016 after a remodel of the Kenan Science Library, which is meant to draw in more students and present new opportunities with community engagement. The space both houses an area dedicated to instruction purposes, as well as space in which students can drop in to work on projects.

This paper focuses on how undergraduate students view the Kenan Science Library's role as a learning institution, and how that affects their motivations in wanting to use a makerspace in academic libraries. Exploring the motivations of students will help librarians understand the changing interests and needs of students in regards to makerspaces. This question will look into the students' perspectives on the makerspace and the instruction that academic librarians and assistants provide there. It is important for librarians to understand the needs of their patrons, and sometimes the idea of something exciting, such as incorporating emerging technologies, can be implemented without fully understanding the needs of the student body. Attempting to understand the motivations that students have for taking instruction workshops in a makerspace, as well as how they view the role of the library will be valuable information for future expansions of makerspaces and emerging technologies (Leanne Bowler, 2014).

Undergraduate students have traditionally been introduced to the library through embedded librarians or library instruction, and the Maker Movement is an expansion of this approach. Libraries have long viewed themselves as learning institutions in their own right, as opposed to a knowledge repository. The implementation of makerspaces as learning spaces is a way for academic libraries to reach out to their students and expand the level of instruction that is offered. Understanding the expectations that UNC-Chapel Hill students have with respect to their library is important because it can not only help the library understand the viewpoints of the students, but allow the students to gain the experience that they want out of the library. By determining how students intend to use spaces such as the makerspace, libraries can become better equipped to handle demand and continuing innovation. If students view the library as an essential space where they can go to learn, not just access knowledge, it can lead to a more productive scholarly community.

The primary function of an academic library is to provide information to its patrons. When emerging technologies areas such as makerspaces appeared, it gave libraries the opportunity to exercise more ways of reaching their patrons. By using these new technologies, it also widened the scope of what library instruction could be. The Kenan Science Librarians are in charge of creating content for workshops that are available for students, faculty, and staff at UNC-Chapel Hill. These workshops include: teaching basics for Arduino, how to 3D print, and designing for 3D objects. The technologies and the corresponding skills that are being taught are useful for students who wish to learn new equipment or to make projects for their classes. This paper will

look at why students seek out instruction sessions in makerspaces and how they view those sessions.

There is a distinct need for understanding the motivations behind students when they attend instruction sessions in academic library makerspaces. While this paper is not conclusive as to why students are using makerspaces, it will give those in the library profession some information on how students actually view emerging technologies and their role in libraries.

LITERATURE REVIEW

Librarian Instruction and Innovation

The role that an academic librarian plays has changed and adapted over the course of the profession. While one of the important aspects of librarianship has been information literacy and instruction, even the perception of this task has changed and evolved as the role of technology has become more present in society (Cheryl Gunselman and Elizabeth Blakesley, 2012). According to Steven Bell, the future library experience will be about extensive learning and an intensive research experience which depends on technology integration (2014). While traditional library literacy continues to be important, the way that this is taught has been influenced by the introduction of technologies that help the teaching process. One study claims that “the role of libraries has not changed, the nature of the service being offered has” in respect to the new influence of technology on patrons and libraries (Partridge, et al., 2010). In a Florida study, the incorporation of new technology skills was “highly recognized” as an essential part of the library’s job (Daniella Smith, 2010). And Mary Popp agrees, saying that “technology knowledge and skills are crucial to our ability to serve our users” (Popp, 2013).

The ongoing changes in library instruction have led librarians to embrace a nontraditional stance on technology and its integration into libraries because the “focus needs to be on how to meet the changing needs of users” (Partridge, et al., 2010). In

academic libraries, this adoption of technology is even more true. Teaching students while incorporating technology that is already prominent in their lives is a way for librarians to connect with students while continuing to prove their worth to the academic community (Elizabeth Marcoux, 2012). Librarians have further embraced the use of technology by being pioneers in adding technologies to their libraries because “the school library should be the hub of this understanding and delivery” (Marcoux, 2012). They have looked for new ways to incorporate these technologies into instruction while also advocating for the importance of using the library as a gateway for learning new technology (Melissa Johnston, 2013).

While makerspaces are just one aspect of how the landscapes of libraries have changed, other types of technologies have been present in libraries for a long time. Melissa Johnston argues that “teacher librarians, through working with teachers and students, have a vital role to play in making certain that students develop the 21st century skills that will enable them to use technology as a tool for learning and for participating in a digital culture”, which is exactly what the Maker Movement is all about (Johnston, 2013). In addition to makerspaces, some libraries have a design or digital media lab that houses core software, as well as technology lending programs. Digital Media Labs were the precursor to makerspaces and were defined by having equipment that allowed original digital content to be created (Amanda Goodman, 2014). Makerspaces were a natural progression of the nontraditional services that libraries continue to offer. The use of technology in libraries helps to maintain their status as the “hub of university life” and make their existence essential for their users (Peter Reed, 2015).

What is a Makerspace?

Makerspace is a buzzword that has been prominent within the library community for the past few years. While more academic libraries embrace the “Maker Movement”, the question has been posed: what exactly is a makerspace? The definition of makerspaces is constantly evolving. Many people consider any type of space with new technology to be a makerspace, while others insist that a makerspace be an area where a physical product can be created (Neelam Bharti, Sara Gonzalez and Amy Buhler, 2015). Still others argue that it is a combination of those elements mixed with the idea of collaboration with fellow user (Burke, 2014). Some librarians believe that makerspaces began with more traditional technologies, such as computers with specialized software, making the beginning of the “Web 2.0 technologies” (Mark Pegrum and Ralph Kiel, 2011). Digital Media or Design labs are available in most academic libraries as a way to incorporate multimodal instruction and the library (Goodman, 2014). This has evolved into the creation of more active spaces, now known as makerspaces. Makerspaces are especially important to academic libraries because they can be considered the hub of innovation amongst their students (Burke, 2014). Makerspaces are a natural extension of the progressive technological view amongst academic libraries (Gurdish Sandhu, 2015).

The first makerspaces which used the term makerspace, contained mostly 3D printers and scanners (Moorefield-Lang, 2014 and Steven Pryor, 2014). These technologies have become increasingly important within the last few years over a variety of academic disciplines. While 3D technology remains a staple in most makerspaces, other technologies such as soldering equipment, laser cutters, and circuitry have also come to be associated with the Maker Movement. As makerspaces have become more

used in libraries, the amount of technology added reflects this, as the types of projects and focuses change.

Makerspaces are also now designed to accommodate active learning. Within the academic community, the emphasis has become more focused on making from start to finish rather than having a space to create an end product (Kimberly M. Sheridan, et al, 2014). Sheridan agrees, and draws the conclusion that the common thread in the design and implementation of makerspaces is the “experience of making” (2014). The design of newer makerspaces reflects this evolution of thought, with some scholars commenting that “A makerspace is an evolutionary step in library facilities’ design and programming” (David Loertscher, Leslie Preddy, and Bill Derry, 2013). Makerspaces in academic libraries are beginning to make these spaces with the intent to use it as an involved area (Sheridan et al., 2014). Building in areas specifically for working and instruction is just another way that the makerspace movement continues to evolve (John J. Burke, 2015). Other makerspaces outside of the academic sphere have similar spaces, but the emphasis on instruction is even more essential to the mission statements of many academic libraries. Sandhu makes note that the library is “not just a book repository” but “a place for learning, a place for teaching...a place for collaboration”. The inclusion of a dedicated space for learning within the makerspace is a way for academic libraries to promote innovation (Jordan Lande, 2014).

Assessing Emerging Technologies

Makerspaces are a smaller subset of what librarians refer to as “emerging technologies”. While the definition of emerging technologies varies amongst librarians,

it can be agreed that makerspaces and the items that are in these are a very important sector of it. Emerging technologies are important to librarianship because they allow librarians to be at the forefront of new technologies as well as help “shape the experience” of the user (Bell, 2014). A true assessment of technology is whether it is simple for the use and improves their overall experience (Bell, 2014). Makerspaces and emerging technologies assist not only patrons in that goal, but librarians as well.

Emerging technologies are not just prevalent in makerspaces. Their impact on library instruction ranges from traditional information literacy to makerspace workshops. While it is acknowledged that emerging technologies are important for the development of education in libraries, there are those who would argue that having these “up to the minute” technologies mean that it is hard to judge their impact before they are universally implemented (Richard Hayman and Erika E. Smith, 2015). Because these technologies are untried, academic libraries have to be cognizant of the ones that they choose to incorporate into their spaces and practices (Hayman and Smith, 2015). According to Gwen Evans, building an educational space for emerging technologies is a way that these newer ideas can be exposed to students while also allowing the staff to measure their impact (2014). She also acknowledges that while the technology is useful, it is difficult to measure how students think about these technologies versus what staff think (Evans, 2014). A study done by Morgan Hynes and Wendy Hynes provided some student feedback about their perceptions of makerspaces, but the responses were limited to a likert scale (2013). By assessing the opinions of students, librarians will be able to make a conjecture of how the makerspace or emerging technologies are adding value to the library and their users (Erin Cassidy et al., 2011). This assessment has previously been

done through measuring variables such as student technology usage within the library and polling students for what emerging technologies that they would like to see more of (Cassidy et al., 2011).

Assessing the impact of these technologies is important because it justifies the libraries use of and development of makerspaces (Hayman and Smith, 2015). Adding a makerspace to an academic library can be invaluable, but without the proper assessment, it is hard to measure the exact usefulness of a makerspace (Evans, 2014). Emerging technologies have great importance to academic libraries, so it is imperative that their use is documented in order to prove their impact on the students.

Makerspaces and Impact

Makerspaces, also sometimes referred to as “hackerspaces” or, a less common but equally important variant, “idea incubation labs”, have been widely sought after for the past 5 years within academic libraries. It has become a focus of librarians to expand and promote makerspace services (Janet Balas, 2012 and David Lang, 2013). Much of the importance of makerspaces hinges on the ability to reach out to patrons and be a useful part of their academic experience. Although makerspaces had origins in the nonacademic community, they have been successfully integrated in a way that makes accessing new technologies easier (EDUCAUSE Learning Initiative (EDI), 2013). Many of the tools that are currently in makerspaces are so new that many have never heard of them before, which piques student curiosity and encourages them to become involved (R. Steven Kurti, Debby Kurti, and Laura Fleming, December 2014) This involvement is also not discipline specific. Incorporating many technologies ensures that makerspaces

have widespread appeal, and are cross-disciplinary (EDI, 2013). By creating workshops and events that bring more notability to the maker movement, academic libraries can entice and inspire their users (Angela Pashia, 2015).

Makerspaces also appeal to students because it allows them to take control of their own learning (EDI, 2013). While most makerspaces have the now traditional 3D printer, they aren't limited to just that type of technology. Makerspaces have a range of offerings from laser cutting, to sewing, to workshops on pottery glazing (Pashia, 2015). While academic libraries generally focus more on the technological aspect, even their services continue to grow as the maker movement gains momentum (Barbara Klipper, 2014). This combination of available technology and skills allows users to “develop a unique package of complementary 21st-century skills and aptitudes such as creativity, innovation, and computational thinking” (Bowler, 2014). Academic libraries have long been advocates of preparing their patrons for any information need that they have. That assertion means that academic libraries are no longer merely book repositories (Sandhu, 2015).

The goal of making is to create a hands on learning experience that can translate to real life innovation and creation (Burke, 2015). Built on the concept of Constructionism, makerspace offer a hands on learning environment that initiates the learning process (Kurti, Kurti, and Fleming, 2014). Although many members of the student body may have excellent ideas, if makerspaces and their uses are not promoted, than those ideas may not be realized (Evans, 2014). By providing a space that allows young creators and researchers to make prototypes and experiment, it allows the library to become part of a larger conversation within the academic community (Margaret Honey

and David E. Kanter, 2013). The makerspaces in libraries can actively influence the creation of new products and services that can have widespread impact. Giving students access to technology that they normally wouldn't be able to use can improve learning and lead to new ideas (Lang, 2013). Lang writes that although it does take a lot of funding, startups have emerged from the makerspace and incubation lab movement (2013). These companies and ideas have led to real life innovation that is becoming more widespread (Silvia Lindtner, Garnet D. Hertz and Paul Dourish, 2014).

Incorporating emerging technologies into traditional library services cements the libraries as an important part of the academic process. By offering expensive equipment that is unavailable elsewhere, makerspaces prove their importance.

METHODS

Data Collection

In order to collect information about makerspace instruction, data was collected through a combination of hourlong, in-person interviews, as well as some quantitative data that has already been collected about the Kenan Science Library Makerspace. I sent out an email to undergraduates who were registered or had been registered within the last academic year for a makerspace instruction session, ie. 3D printing, arduino, or Designing in Tinkercad, and attempted to get respondents after the sessions were over. The interviews occurred after the interviewee has had at least one instruction session, and lasted from 10-15 minutes. The interviewees were compensated with \$10 gift cards.

The quantitative data provided by the Kenan Science Library consisted of:

- Number of workshops within the Makerspace
- average number of people who attend instruction sessions

Interviews were recorded through a handheld audio device, then transcribed. The interview itself consisted of questions that were both open ended and measured by a Likert Scale. The questions themselves were also split into categories in order to help with the coding process. Those categories were:

- Basic Information, which were a few biographical questions, as well as how the student was made aware of the makerspace.
- Instruction, where the student was asked about the content of the instruction session and their feelings about the helpfulness of the information.
- Makerspace in the Library, where students were asked about the relationship between the makerspace and the library.

All questions are available for reference in Appendix A. The sampling plan was limited to the following criteria: respondents to the email call for participants, and students who were personally recruited after a session. The students who participated were thoroughly aware of the scope of the project, and the extent of anonymity that was offered. For the complete consent form, see Appendix C. Although most of the information that was gathered is not sensitive, the participants were informed of any personal data that may be used, as well as had the option of having their identity hidden if they wish it.

Participants

The criteria for eligibility in this study:

- Interviewee must be a current undergraduate student at UNC Chapel Hill.
- Interviewee must have participated in a makerspace workshop/instruction session before the time and date of the interview.
- The interviewee must be over 18 years old.

The basis of this selection is that this study is focusing on the makerspace as a place of learning, so it is necessary that the participants had received instruction and achieved a basic level of knowledge about opportunities available through the makerspace. The study is also restricted to undergraduates because that will take away some of the possible outlier information that is associated with graduate students, such as their focus on research. Five students ultimately volunteered to participate in my study.

Participants were recruited through email as well as through a general announcement within each Makerspace instruction session. For the full recruitment email, see Appendix B. Participation was voluntary, so those who had the time to participate were encouraged to do so. This study was purposefully geared towards interviewing students who had already been involved with the makerspace on a basic level, so the participants were from an established pool.

Limitations

The limitation of this study is that it is not a comprehensive sample of the undergraduate student body at UNC Chapel Hill. Those who are participating in the interviews have already shown an interest in the makerspace, so the results of the study will be limited to students that are already aware of these services. That fact is not a complete limitation, however, because it means that the sample that was interviewed was more informed about the instruction portion, and therefore spoke to its success.

Additionally, this paper was a case study, so the conclusions are specifically tailored to the UNC-Chapel Hill Kenan Science Makerspace only.

Analysis

The interview data was collected and transcribed. After the transcription, the data was parsed by searching for recurring themes, and focusing on the immediate answers to the structured questions. The data collected was multipurpose; it is a reflection of student perceptions of the makerspace, while also a measurement of how students feel about nontraditional library learning and the library as a whole. Because the nature of interviews means that the data will be subjective, this study is mainly a way to survey the different attitudes of students who use the library and makerspace. The study is also inconclusive about other makerspace instruction programs, because the participants have only used the makerspace at the Kenan Science Library.

Coding the responses was dependent on the framing of the questions and the patterns that emerged in the student's responses. Each time a similar answer came up, it was coded by being given a color, and paired with the code name and the number of the question that the response was to. The responses were then cross referenced in analysis in order to make conclusions. In general, the data will reflect whether students find the makerspace useful, the workshops offered useful, their perception of the libraries and its relationship to these emerging technologies, and what the personal motivations of the interviewee is. Because interview responses are subjective, a lot of the conclusions will be based off of content analysis. As the data was collected, the coding became more natural, with many of the questions on a Likert scale and others grouped by response category (ie. the questions about motivation could have categories such as: exploration, school assignment or creation of a product, etc.). Much of the analysis was content analysis, with qualitative elements stemming from the Likert scale questions.

Also analyzed were some statistics collected by the UNC Libraries that was used to supplement the qualitative responses. This quantitative information had no personal identifiers, including:

- the number of people who attend instruction sessions
- the number of sessions offered each semester

Additionally, information was also given about:

- Which individual taught each workshop (librarian, staff, or graduate student)
- which workshops were offered

By using both types of information, the motivations and perceptions of students will be properly documented. The combination of statistics and interview data will give a more well rounded explanation of the makerspace.

RESULTS

Overall Impressions

The results are derived from the responses of the participants who agreed to be interviewed as well as the instruction statistics provided by the Kenan Science Library. The number of possible participants is not known as the data did not distinguish between individual attendees for each session. During the 2015-2016 academic year, the Kenan Science Library makerspace plans to have 32 instruction sessions. Of the 14 sessions in the Fall 2015 semester, 24 students, faculty and staff attended a 3D printing workshop, 7 people attended the Introduction to Tinkercad workshop, 12 attended an Arduino workshop, and two attended a workshop focused on 3D scanning. The Kenan Science Library instruction sessions had an average of three students attend per session for the Fall 2015. Out of those who attended the workshops, the only people eligible for this study were undergraduates, which drastically lowered the available student pool. Ultimately, five students participated. Participants in this study were given the same set of 23 questions, which were divided into three core sections. The results sections will detail the findings from each section.

Out of a group of five respondents, 100% of them responded favorably to the makerspace as a whole, with 100% saying that they would attend another makerspace session, and 100% rating the content of the makerspace instruction sessions as “strong”. This result was seen through each respondent choosing “Strong” on a Likert scale of very

weak, weak, average, strong, and very strong. Overall, responses were positive, with 100% of the interviewees saying that they plan to return to the makerspace over the course of their academic careers.

Along with the positive overall impression, 100% of respondents wanted to learn the makerspace technologies out of personal interest, with all five taking initiative outside of academic requirements to attend a session. Those who responded to the survey were also primarily from Science, Technology, Engineering and Mathematics backgrounds.

Biographical Information and Background

Five undergraduates agreed to be interviewed for this study. Out of the participants, 40% or 2 out of 5 were first year students, while 60% were third year students. The area of study for each individual were Math, Biology, Biochemistry, Environmental Science, and undecided. All of the participants displayed an interest in STEM as a future career path, indicated by both their focus areas as well as their response to why they chose to attend a makerspace instruction session.

When asked about the amount of time that the participants typically spend in the Kenan Science Library, two reported working in the library twice a week, one replied that they use the library twice a month, and two of the participants claimed that they used the library in order to attend the makerspace workshops only. As a follow-up question, each individual was asked how and why they use the Kenan Science Library. One participant went to the space solely to use the campus printing. Two indicated that they use the library for 3D printing, while three use it as a study space. The two who responded that they only come to the Library for the makerspace workshops, reasserted that fact again.

Interviewees were also asked how they became aware of the Kenan Science Library makerspace. One of the participants was informed about the space in one of their classes, while the others heard about the makerspace through library publicity. Each individual heard about the capabilities of the Kenan Science Library makerspace through the following outreach avenues: UNC Fall Fest, a First Year students event, the library website, and through publicity within the library itself.

Makerspace Instruction

The Kenan Science Library makerspace offers numerous workshop options over the course of a semester. Out of the students that were interviewed, four took the Introduction to 3D Printing workshop, two took the Introduction to Arduino workshop, and one took the 3D Design with Tinkercad workshop. Of the five students interviewed, two took more than one workshop at the Kenan Science Library makerspace.

When asked about who taught their makerspace workshop, one respondent did not know, one was unsure but guessed a librarian, one said a librarian, and two said a staff member. Additionally, out of the sessions taught thus far during the Spring 2016 semester, a staff member taught 2 out of the 12 sessions, a Graduate Student Assistant taught 5 out of 12, and a librarian taught six sessions, including two jointly with the staff member and graduate student. Reflecting on after the session was over, the students were asked whether the workshop gave them confidence to replicate skills that they were taught individually. This question was answered using the Likert scale of very weak, weak, average, strong, and very strong. One student reported that they believed their confidence to replicate 3D printing was “very strong”, while the other three attendees of

the 3D printing workshop indicated that they had “average” confidence in their new skills. One interviewee who took the Introduction to Arduino workshop said that their confidence was “strong”, while the other individual who took that workshop said that their confidence was “average”. The participant who attended the Introduction to Tinkercad workshop felt like their confidence to replicate the project was “strong”. Conversely, when asked about their instruction session as a whole, 100% of the respondents said that it was “strong” for each of the seven total sessions that these participants attended.

The overall sessions were positively received, with 100% of the participants saying that they would attend another session, and two of them actually did so. Four of the five participants also agreed that the session was worth their time, while one of the participants indicated that it was “only partially” worth their time for a 3D printing workshop.

When asked about improvements that could be made towards the instruction sessions, the participants had varied responses. One Introduction to Arduino participant wanted to make their session a little longer in order to learn more. Three of the respondents wanted the workshop to take a more “hands-on” approach, providing more examples and increasing time learning the machinery during the 3D printing session. One participant in particular indicated a dissatisfaction with one of the workshops because of the use of theory, and not mechanics when teaching the 3D printing session. With a few suggestions, the instruction sessions were viewed positively overall by each of the five participants.

Makerspace as a Physical Space

A large part of the interview process was to look at how students see the makerspace and the library together. When asked, three out of the five participants said that they viewed the makerspace as a part of the library. The remaining two said that they think of the makerspace as something separate from the Kenan Science Library. Additionally, four out of the five respondents said that they would go to the makerspace even if it was outside of the library, although three of the interviewees said that having it in the library was convenient. One person said that they would only use the makerspace if it was in the library.

As a follow-up, the interviewees were asked who they would contact if they would need any help with the makerspace. One respondent said that they would go straight to a librarian for help. The four remaining students said that they would email the Kenan Science Library makerspace first. Although, two respondents anticipated that their emails would be answered by a librarian, and one even mentioned the Head of the Kenan Science Library Information Services as the person that they thought they should contact. The interviewees were also asked if they had previously met with a librarian before about a makerspace project, of which three said yes, one said no, and the last student said that they planned on scheduling a meeting in the future.

Finally, students were asked which makerspace technology available at the Kenan Science Library that they planned on using. 100% of the participants said that they would use the 3D printers, while four also said that they would use the 3D scanners, as well as design and modeling materials. Three of the participants indicated that they would use the Arduino and Raspberry Pi kits. Only one participant said that they planned

on using the sewing machine. After letting the participants know the kinds of technology that are available in the makerspace, they were asked which technologies they would add, if possible. Two of the five interviewed suggested that they add a laser cutter, while one mentioned a more advanced 3D printer. They wanted to see a 3D printer that can print something other than plastic, maybe metal. One interviewee mentioned more modeling materials.

All five participants said that they considered the Kenan Science Library makerspace “strong” on the Likert scale of very weak, weak, average, strong, and very strong. When asked if they had any suggestions of improvements, the answer was “make it bigger” from two of the five respondents. Three of the five participants also cited publicity as something that could be improved. Two of the participants did not have any suggestions for improving the makerspace.

When asked whether there was anything else that they would like to mention, the interviewees focused on the positive aspects of the makerspace, saying how it is a “cool resource” and “good for creating”. Overall, the response of participants to this open question was a group of compliments for the makerspace.

DISCUSSION

The findings of this study show that of the overall total number of attendees at the Kenan Science Library workshops, the five that were interviewed viewed the makerspace in a positive way. The fact that all five participants rated the makerspace, the instruction, and their confidence in being taught new skills “strong” on the Likert scale indicates that while the services of the makerspace can be improved (to “very strong”), overall reception was positive. The interviewees discussed that they liked the technology, and that the library staff was helpful and informative. The complimentary attitude of the respondents display satisfaction with the makerspace and its services.

While the interviews consisted of five undergraduates, the response rate was acceptable considering that there were only a possible 80 attendees of the workshops. If the limitations of the pool that these interviews required is taken into account, many people represented in that number are either repeat workshop attenders (those who took more than one type of instruction session), or they were faculty and staff. Of that pool, the five undergraduate students who responded represented an acceptable size of the population. A limitation to their responses was mainly because those surveyed were all interested in STEM disciplines. This is not unusual because the makerspace is located within the Kenan Science Library, which specializes in information for those types of students. Because the focus was so much on students, faculty and staff in the STEM fields, a possible suggestion of improvement to the makerspace could be improving

marketing to classes outside of those majors. One of the participants mentioned that they learned about the makerspace and its capabilities from a professor in class. The makerspace could expand their marketing to bring faculty into the fold, which would increase visibility. If the makerspace works to include faculty, those professors could inform more of their classes about the services that the Kenan Science Library offers.

When discussing the instruction portion of the makerspace, the students for the most part had average confidence in replicating the skills that they learned, but thought that the instruction session itself was very strong. The fact that most of the interviewees believed that they could at least partially replicate the skills that were taught to them is a success because many of the students who attend the workshops have never worked with makerspace technology before. Only one out of the five interviewed had had prior working knowledge of any of the topics covered, so even though the majority had “average” confidence in their skills, that could still be considered a good result.

During the interview, after asking the students who taught their makerspace session, most were aware that the teacher was a librarian. The purpose of this question was to get an idea about whether students understand the people who are teaching them, and it became clear through this question as when the participants were asked who they would go to for makerspace help, that the majority recognized that the librarians were the ones to ask. This is important because two of the respondents said that they believed the makerspace and the Kenan Science Library were different entities. Of the two participants who gave that response, one of them said that they would ask a librarian for help and knew that a librarian taught them. This shows that although the Kenan Science Library librarians are visible to their patron base, there are steps that should be taken to

indicate that the makerspace is a part of the library, not just something separate that happens to be housed there. Integrating these ideas will help other students better understand how to get the help they need and from whom.

In the section on the makerspace as a whole, there were a few questions that particularly stood out. The students were given a list of the technology that was available to them in the Kenan Science Library makerspace and were asked which ones they had used or were planning on using. Overwhelmingly, the students were interested in the 3D printers. The findings of this study showed that of the five interviewed, the most popular item was the 3D printer, and this was echoed by the much higher attendance rate at Introduction to 3D printer workshops. While the Kenan Science Library makerspace has been adding more technology, the 3D printer remains the most popular element, closely followed by 3D scanning. Those core services make up the majority of the user interest in the makerspace, while other options, such as the Singer sewing machine did not appeal to as many interviewees. Electronics items, specifically the Raspberry Pi and Arduino kits were moderately popular with three out of the five interviewees expressing a desire to work with them. This could signal an upward trend in student interest in microcontrollers, but that is not definitive.

When asked about what types of technology that they would like to see added, the students seemed to be satisfied overall with the assortment currently available. Some suggested laser cutters and another student wanted more advanced 3D printers (ie. ones that can print materials besides plastic, like metal). Many of the suggestions, while good, were heavily dependant upon cost. Although students were free to suggest any type of technological improvement, four of the students said that what was available met their

needs and that any additional technology would just be for fun, rather than necessity. All five respondents said that the makerspace had what they needed.

The students were also asked what they would improve about the makerspace as a whole. While most of the students had positive things to say, four responded with improvements, suggesting that while the makerspace is currently working well, there are areas that could be upgraded. The most common complaint was the size. The Kenan Science Library is restricted by size and the makerspace was recently revamped to include more room. The space is a good size for an academic branch library, but it is understandable that students would want it to be enlarged. The space has an area for instruction, but the interviewees noted that there could be more space to work added. Another complaint centered around the inability of the students to use some of the machines themselves. The Kenan Science Library makerspace runs a mediated 3D printing program, and a couple of those interviewed did not appreciate that aspect of the space. A common issue was that although the technology is great and the instruction sessions are helpful, they don't get into the mechanics of 3D printing. Two of the students wanted a more practical approach to the sessions within the makerspace.

One of the big findings of this study is that the Kenan Science Library should improve its marketing strategy. Four of the students expressed that publicity was an issue and they "only found out because..." and then discussed certain events where the makerspace was represented. One was in class, and as mentioned earlier, reaching out to faculty would be a good way of improving publicity. One participant actually liked that there was not a lot of publicity - they felt like there would be less competition over makerspace resources. Two others mentioned that they just happened to find out about

the makerspace but that their friends and peers were unaware of its existence. One other student noted that they had no idea that 3D printing is currently free for students, and expressed that if more students were aware of that fact, traffic to the makerspace would grow.

Despite a couple of suggestions, the five students who participated in this study had positive things to say about both the makerspace and the instruction that they received there. All participants said they would return for more sessions, and two of the respondents suggested that the Kenan Science Library makerspace add more instruction sessions. The students displayed a strong desire to learn more about what the makerspace has to offer.

CONCLUSIONS AND CONTINUING STUDIES

This study found that the Kenan Science Library makerspace was perceived positively by the students interviewed, and that the instruction given was considered very strong. This study was meant to better understand how undergraduates interact with the makerspace as well as the effectiveness of the makerspace instruction sessions. After speaking to the students, it is apparent that there are areas that could be improved, but that the Kenan Science Library is fulfilling its purpose in educating students and creating programs that help the student body better understand makerspace technology.

The methods used in this study can be replicated on an individual makerspace level, or could be used as a way to compare and contrast other makerspaces. Continuing scholarship could look at different types of makerspaces within academic libraries and compare the results of each study. These studies can be important because they can display the needs of certain student bodies. Students at a large state school with an engineering focus will not have the same user base as a smaller liberal arts school. That said, comparing and contrasting different makerspaces can be useful to determine programming, technology, and other spatial needs. No student body is the same, and what works for students in one academic makerspace might not work for another. Each makerspace is going to be different, but looking at the way that students perceive makerspaces will always be important. While the purpose of this particular study was to

increase awareness of student motivation within the Kenan Science Library Makerspace, the findings of this study could and should be replicated on a wider scale.

Other scholarship surrounding makerspaces that should be improved could talk about the content of instruction sessions across makerspaces and how those differ. Makerspace instruction at the Kenan Science Library would be very different from instruction at a library with a larger makerspace, or one that encouraged unmediated access to the technology. While the Kenan Science Library makerspace has concentrated on background and theory that applies to makerspace technology, by observing the instruction practices of other libraries, those sessions have the capacity to be improved for the students. Looking into the variation of content from those workshops can be used across institutions to improve student experience.

Makerspaces are more popular than ever in libraries, and the trend continues in academic libraries such as the Kenan Science Library at UNC-Chapel Hill. As makerspaces continue to develop and improve, students will continue to utilize them. To quote one of the participants in this study, the makerspace is a great resource and “I just love the idea of it”.

BIBLIOGRAPHY

- Balas, J. L. (2012). Do makerspaces add value to libraries? *Computers in Libraries*, 32(9), 33. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1152078542?accountid=14244>
- Bell, S. J. (2014). Staying true to the core: Designing the future academic library experience. *Portal : Libraries and the Academy*, 14(3), 369-382. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1546003720?accountid=14244>
- Bharti, N., Gonzalez, S., & Buhler, A. (2015). 3D technology in libraries: Applications for teaching and research. *Emerging Trends and Technologies in Libraries and Information Services (ETTLIS), 2015 4th International Symposium On*, 161-166. doi:10.1109/ETTLIS.2015.7048191
- Bowler, L. (2014). Creativity through "maker" experiences and design thinking in the education of librarians. *Knowledge Quest*, 42(5), 58-61. Retrieved from <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=c2f2e677-9db0-4eed-a01d-58e5af0a2a6d%40sessionmgr110&vid=0&hid=116&bdata=JnNpdGU9ZWwhvc3QtbG12ZSZzY29wZT1zaXRl#AN=EJ1041897&db=eric>
- Burke, J. (2015). Making sense: Can makerspaces work in academic libraries? *Computer Workstations*, 73, 67.
- Burke, J. J. (2014). *Makerspaces: A practical guide for librarians* Rowman & Littlefield.
- Cassidy, E. D., Britsch, J., Griffin, G., Manolovitz, T., Shen, L., & Turney, L. (2011). Higher education and emerging technologies: Student usage, preferences, and lessons for library services. *Reference & User Services Quarterly*, 50(4), 380-391. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/873030363?accountid=14244>
- Cassidy, Colmenares, Jones, Manolovitz, Shen, & Vieira. (2014). Higher education and emerging technologies: Shifting trends in student usage. *The Journal of Academic Librarianship*, 40(2), 124-133. Retrieved from <http://linkinghub.elsevier.com/retrieve/pii/S0099133314000147http://api.elsevier.com/content/article/PII:S0099133314000147?httpAccept=text/xmlhttp://api.elsevier.com/content/article/PII:S0099133314000147?httpAccept=text/plain>
- Colegrove, T. (2013). Editorial board thoughts: Libraries as makerspace? *Information Technology & Libraries*, 32(1), 2-5. Retrieved from <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=8cee86e5-b01e-494f-bd70->

- [25512dd0262f%40sessionmgr113&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtG12ZSZzY29wZT1zaXRl#AN=89093605&db=aph](http://www.educase.edu/library/resources/7-things-you-should-know-about-makerspaces)
- EDUCAUSE Learning Initiative (ELI). (2013). 7 things you should know about makerspaces. *ELI 7 Things You should Know*, Retrieved from <http://www.educase.edu/library/resources/7-things-you-should-know-about-makerspaces>
- Evans, G. (2012). Emerging technologies: How do we know what's happening “on the ground”? *Public Services Quarterly*, 8(2), 164-170. doi:10.1080/15228959.2012.675284
- Goodman, A. L. (2014). The library context for digital media labs. *Library Technology Reports*, 50(6), 5-15,2. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1613425109?accountid=14244>
- Gunselman, C., & Blakesley, E. (2012). Enduring visions of instruction in academic libraries: A review of a spirited early twentieth-century discussion. *Portal : Libraries and the Academy*, 12(3), 259-281. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1029935451?accountid=14244>
- Hayman, R., & Erika, E. S. (2015). Sustainable decision making for emerging educational technologies in libraries. *Reference Services Review*, 43(1), 7-18. doi:10.1108/RSR-08-2014-0037
- Honey, M., & Kanter, D. E. (2013). *Design, make, play: Growing the next generation of STEM innovators* Taylor and Francis.
- Hynes, M. M., & Hynes, W. J. (2014). Appearances matter: The perceived complexity, coherence, mystery, and legibility of makerspace labs. *Frontiers in Education Conference (FIE), 2014 IEEE*, 1-7. doi:10.1109/FIE.2014.7044473
- Johnston, M. P. 1. (2012). Connecting teacher librarians for technology integration leadership. *School Libraries Worldwide*, 18(1), 18-33. Retrieved from <http://web.b.ebscohost.com/libproxy.lib.unc.edu/ehost/detail/detail?sid=b9ad1ca5-5b65-4c74-b12c-8b8ff1a0c6b3%40sessionmgr115&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtG12ZSZzY29wZT1zaXRl#AN=70862329&db=eft>
- Klipper, B. (2014). Making makerspaces work for everyone. *Children & Libraries*, 12(3), 5-6. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1615274484?accountid=14244>
- Kurti, R. S., Kurti, D. L., & Fleming, L. (2014a). The philosophy of educational makerspaces part 1 of making an educational makerspace. *Teacher Librarian*, 41(5), 8-11. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1548230083?accountid=14244>
- Kurti, R. S., Kurti, D., & Fleming, L. (2014b). Practical implementation of an educational makerspace. *Teacher Librarian*, 42(2), 20-24. Retrieved from <http://web.b.ebscohost.com/libproxy.lib.unc.edu/ehost/detail/detail?sid=931b1c37-6bdb-479a-a065->

- [d18174eb60f0%40sessionmgr112&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=100092123&db=lls](http://dx.doi.org/10.1109/FIE.2014.7044394)
- Lande, M., & Jordan, S. (2014). Making it together, locally: A making community learning ecology in the southwest USA. *Frontiers in Education Conference (FIE), 2014 IEEE*, 1-7. doi:10.1109/FIE.2014.7044394
- Lang, D. (2013). *Zero to maker*. Beijing: Maker Media, Inc.
- Lindtner, S., Hertz, G. D., & Dourish, P. Emerging sites of HCI innovation. *CHI '14 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Retrieved from <http://dl.acm.org.libproxy.lib.unc.edu/citation.cfm?id=2557132>
- Loertscher, D. V., Preddy, L., & Derry, B. (2013). Makerspaces in the school library learning commons and the uTEC maker model. *Teacher Librarian*, 41(2), 48-51. Retrieved from <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=6f16d630-6045-4d07-ba76-154e7b68833a%40sessionmgr112&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=92991119&db=lls>
- Marcoux, E. ". (2012). Leadership & technology. *Teacher Librarian*, 39(5), 74-74. Retrieved from <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=95542eca-52b5-46bf-8e2b-4324be6a72af%40sessionmgr111&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=77053524&db=aph>
- Michele Moorefield-Lang, H. (2014). Makers in the library: Case studies of 3D printers and maker spaces in library settings. *Library Hi Tech*, 32(4), 583. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1633970834?accountid=14244>
- Moorefield-Lang, H. (2015). Change in the making: Makerspaces and the ever-changing landscape of libraries. *TechTrends: Linking Research & Practice to Improve Learning*, 59(3), 107-112. Retrieved from <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=4eca9687-7af3-4f8a-aab2-c9c4164773bb%40sessionmgr113&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=102276165&db=eft>
- Partridge, H., Menzies, V., Lee, J., & Munro, C. (2010). The contemporary librarian: Skills, knowledge and attributes required in a world of emerging technologies. *Library & Information Science Research*, 32(4), 265-271. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/853213521?accountid=14244>
- Pashia, A. (2015). Empty bowls in the library: Makerspaces meet service. *College & Research Libraries News*, 76(2), 79-82. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1708522204?accountid=14244>
- Pegrum, M., & Kiel, R. (2011). "Changing the way we talk": Developing librarians' competence in emerging technologies through a structured program. *College & Research Libraries*, 72(6), 583-598. Retrieved from

- <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=60b282ff-35d5-4925-9ed7-7bcfed9d0662%40sessionmgr111&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZZY29wZT1zaXRl#AN=527624515&db=lls>
- Popp, M. P. (2013). Technology, lifelong learning and I (or we). *Reference & User Services Quarterly*, 52(3), 179-181. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/1372766130?accountid=14244>
- Pryor, S. (2014). Implementing a 3D printing service in an academic library. *Journal of Library Administration*, 54(1), 1-10. doi:10.1080/01930826.2014.893110
- Reed, P. (2015). Technology and the contemporary library. *Insights: The UKSG Journal*, 28(2), 81-86. Retrieved from <http://web.b.ebscohost.com.libproxy.lib.unc.edu/ehost/detail/detail?sid=58fb53fd-feff-4380-a9b2-47b179b19b2b%40sessionmgr112&vid=0&hid=116&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZZY29wZT1zaXRl#AN=108469953&db=lls>
- Sandhu, G. (2015). Re-envisioning library and information services in the wake of emerging trends and technologies. *Emerging Trends and Technologies in Libraries and Information Services (ETTLIS), 2015 4th International Symposium On*, 153-160. doi:10.1109/ETTLIS.2015.7048190
- Sheridan, K. M., Halverson, E. R., Litts, B. K., Brahms, L., Jacobs-Priebe, L., & Owens, T. (2014). Learning in the making: A comparative case study of three makerspaces. *Harvard Educational Review*, 84(4), 531.
- Smith, D. (2010). Making the case for the leadership role of school librarians in technology integration. *Library Hi Tech*, 28(4), 617-631. Retrieved from <http://libproxy.lib.unc.edu/login?url=http://search.proquest.com/docview/853213849?accountid=14244>

Appendix A

Interview Questions

Basic Information

What is your major and year (first year, sophomore, junior, or senior)?

How often do you visit the Kenan Science Library? (Once a week, month, semester, year)

Why do you visit the library primarily? (study space, information needs, reference help, collaborative environment)

Where did you hear about the Makerspace and its services?

Social Media?

Library website?

Class instruction?

In-building awareness?

Some other way?

Instruction

What session(s) have you attended at the Kenan Science Makerspace?

Why did you choose to attend a session?

Did you want to learn a new skill?

Did you attend because of a class or project?

Why did you want to learn [instruction session subject]?

Who taught your instruction session? (a librarian, graduate student, unknown, etc.)

How confident do you feel about the skills that you were taught at the instruction session?

Very strong	Strong	Average	Weak
Very Weak			

Would you be able to recreate the process on your own?

How often do you plan to use the Makerspace in the future?

How would you rate the instruction session as a whole?

Very strong Strong Average Weak
Very Weak

How likely are you to attend another Makerspace workshop?

Was this session a valuable use of your time?

How would you improve the instruction sessions?

Makerspace within the Library

Did you come to the Makerspace because it is located in the library? Would you have come if it was located elsewhere?

Do you think of the Makerspace as a part of the library? Or separate?

If you have a question about the Makerspace, who would you ask for help?

Have you ever met with a librarian about a Makerspace project?

What technology have you used or are planning on using in the Makerspace?

Check all that apply:

- 3D Printing
- 3D Scanning
- Arduino
- Raspberry Pi
- Singer Sewing Machine
- Design and Modeling materials

Does the Makerspace have all of the technology that you want to use? If not, what would you like to see added?

How would you rate the Kenan Science Makerspace as a whole?

Very strong Strong Average Weak Very
Weak

How would you improve the Makerspace?

Do you have any last thoughts about the Makerspace?

Appendix B

Dear Makerspace User,

My name is Hannah Pope, and I am a master's student in the School of Information and Library Science. You are receiving this email because you have recently attended a workshop session at the Kenan Science Library Makerspace. I invite you to participate in my Master's research regarding your experience.

This interview will be used to help to evaluate the Makerspace program, it's role in your academic and personal study, and let the library know how it can make improvements. It should take about **10 minutes**.

All who complete the interview will be compensated with one **\$10 Amazon gift card**.

If you are interested in participating, please contact me at hlpope@live.unc.edu.

Interviews can be set up at your convenience, and all responses will be anonymous. You are only eligible if you are an undergraduate and over 18 years of age.

Thank you for your time and consideration!

Hannah Pope
School of Information and Library Science
Master's of Science in Library Science, 2016

Appendix C

Kenan Science Makerspace Consent Form

You are being asked to take part in a research study of how undergraduate students use and perceive the Kenan Science Makerspace. I am asking you to take part because you replied to the inquiring email or in person at a workshop for this study. Please read this form carefully and ask any questions you may have before agreeing to take part in the study.

What the study is about: The purpose of this study is to learn how students perceive the Kenan Science Makerspace and its services. This study pays special attention to how students perceived and learned from the workshops within the Makerspace.

What we will ask you to do: If you agree to be in this study, we will conduct an interview with you. The interview will include questions about your major, your year, why you use the makerspace, what workshops you have attended, your views on the Makerspace, and your views on the Kenan Science Library. The interview will take about 1 hour to complete. With your permission, we would also like to tape-record the interview.

Risks and benefits:

I do not anticipate any risks to you participating in this study other than those encountered in day-to-day life.

There are no benefits to you. We hope to learn more about students who attend makerspace workshops to improve for the future.

Compensation: You will receive one \$10 Amazon gift card for your time and participation.

Your answers will be confidential. The records of this study will be kept private. In any sort of report we make public we will not include any information that will make it possible to identify you. Research records will be kept in a lockbox whose key will only be with the researcher. Those records will be destroyed after the paper has been completed. If we tape-record the interview, we will destroy the tape after it has been transcribed, which we anticipate will be within three months of its taping.

Taking part is voluntary: Taking part in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researcher conducting this study Hannah Pope. Please ask any questions you have now. If you have questions later, you may contact Hannah Pope at hlpope@live.unc.edu. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) at 919-966-3113 or access their website at <http://research.unc.edu/offices/human-research-ethics/>.

You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date

Your Name (printed)

In addition to agreeing to participate, I also consent to having the interview tape-recorded.

Your Signature _____ Date

Signature of person obtaining consent _____ Date

Printed name of person obtaining consent _____ Date

This consent form will not be kept by the researcher beyond the end of the study.