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Opening Pandora's Stream: Piping Music into the Information Literacy Classroom

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Abstract

Although it is well known that music can affect cognitive processes, very little research has been conducted examining the influence of background music on students in information literacy classrooms. In 2010, librarians at Western Michigan University investigated the effect of background music on student engagement and retention of information literacy concepts. This article examines the theory and practical applications of background music to improve a classroom atmosphere and its impact on students' learning. Results from this qualitative and quantitative study indicate positive correlations between background music and student comfort, confidence, and retention.

This article has not been published elsewhere, and has not been submitted simultaneously for publication elsewhere.

Running Title: Music in Information Literacy Classrooms

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“Music can affect all of us –
calm us, animate us, comfort us, thrill us,
or serve to organize and synchronize us at work or at play.”

-Oliver Sacks (2007 xii)

Introduction

Librarians sometimes struggle to find effective and meaningful ways to engage students during information literacy sessions. By incorporating teaching techniques that influence the affective domain, that is, impacting students' attitudes and motivations, librarians can, in turn, improve students' overall learning. Learning in the affective domain has been shown to be just as important for student success as learning in the cognitive domain (such as recollection, comprehension, and analysis) (Davies, 2007). Educational psychologist Benjamin Bloom defines the affective domain as “behavior and learning that stem[s] from emotions and feelings, as opposed to physical and intellectual abilities” (Hunger, 2007, p. 34). One way to increase learning through the affective domain is to make improvements in the atmosphere of the library classroom and create an engaging space for optimal learning. It is possible to make many changes to the classroom atmosphere with minimal time and effort, such as adjusting the lighting, reconfiguring classroom furniture, or playing music.

This article outlines the theoretical and practical applications of background music as an aid to improve the classroom atmosphere and its impact on student affective and cognitive learning. It presents the results of a pilot study that employed a control and experiment model to examine the impact of background music on students' comfort, confidence, and retention of information literacy concepts in an academic library instruction classroom. The article concludes by offering recommendations for other

librarians or educators seeking to use background music to enhance their instruction programs. Although this project specifically examined the impact of background music on undergraduate students in an academic library information literacy program, the methodology outlined in this paper has the potential to be applied to any classroom setting, regardless of grade level or discipline.

Theoretical Foundations and Practical Applications

Limited research has been conducted on the use of background music in the information literacy classroom in an academic library. However, it was helpful to turn to the larger body of research on the cognitive impact of music on learning in other settings and disciplines. We examined research on the impact of music in various areas, including early childhood development, cognitive development, task performance and recall, traditional classroom education, student behavior and learning outside the classroom, workplace effectiveness, and the environment of academic libraries. This review of literature on the use of background music provided us with the theoretical foundations, as well as practical applications, for the effective use of background music in an academic library setting. Librarians and other educators can adapt these strategies and methods of implementation and apply them to their own settings.

What is Background Music?

It is necessary to establish a definition of the term “background music” in order to better understand how to appropriately use it in a classroom setting. First, it is important to distinguish between *background music* and *background noise*. Background music is

considered *sound*, not noise (Savan, 2009). In this context, the important distinction is that noise is unwanted by the listener (Leung & Fung, 2005) and, therefore, is not optimal for learning. It is also necessary to emphasize that background music is intended to be heard but not actively listened to. Savan (2009) argues that “music that captures a person’s attention is failing to function as truly ‘background’ music” (p. 1030), and, therefore, non-background music interferes with the learning process (2009). Other types of sound, such as white noise, ocean waves, or falling rain that are played in the background could also potentially produce the desired cognitive effect.

Background Music and the Learning Process

Music has been shown to have both physiological and psychological effects on the cognitive and learning processes. Listening to music “produces an optimal level of adrenalin in the brain, causing high arousal,” which improves mood and overall attitude (Clarke, Dibbin, & Pitts, 2010, p. 94). This *cognitive arousal* prepares the brain for learning (O’Sullivan, 2008). Another study found that background music positively impacted task performance, and significantly improved recall (Sedighian & Sedighian, 2010). Rather than interfere with the learning process, it has been shown “to ‘prime’ ... neural pathways for the subsequent execution of spatial reasoning tasks” (Berk, 2002, p. 68).

Psychological and educational research has shown that music and certain other kinds of sounds can reduce stress, increase alertness, and improve retention (Davies, 2000; Campbell, 1997). As Davies (2000) notes, “music pulls the listener into the setting, stimulating interest, creativity, and more complex thinking” (p. 150). Music engages students through kinesthetic, visual, and auditory channels. It builds emotional, and

eventually, academic connections to the scholarly workspace, thought processes, performance, and output (Davies, 2000). In his breakthrough work, “Flow,” Csikszentmihalyi (1990) states that music, “which is organized auditory information, helps organize the mind... and therefore reduces psychic entropy...Listening to music wards off boredom and anxiety... and can induce flow experience” (p. 109). He argues that *flow*, as an optimal state of being, allows for a high degree of concentration, which is necessary for an effective educational experience (1990).

One cannot discuss the impact of music on cognition and learning without mentioning the seminal research by Alfred Tomatis (1991) on the Mozart Effect. The Mozart Effect is defined as the temporary enhancement of spatial-temporal reasoning abilities immediately after listening to a piece of music by Mozart (Ivanov & Geake, 2003; Hetland, 2000). Tomatis (1991) states that after listening to music by Mozart, there is an immediate physical reaction: “les réponses sont immédiates: le sujet s’active, modifie ses références neurovegetatives, voit sa respiration s’amplifier, son pouls accélérer” (p. 157).¹ Tomatis’ work argues that these neurological changes have the potential to impact cognition, and therefore, learning. Other studies on the Mozart Effect found that individuals performing tasks while listening to music experienced reduced distractions, improved moods, and enhanced creativity (Campbell, 1997). The Mozart Effect promotes a simultaneously calming and energizing effect, commonly known as “relaxed alertness,” which allows for improved learning (Morgan & Davies, 2004, p. 7).

Davies (2000) argues that listening to music engages both sides of the brain, which is especially valuable for the learning process. He writes that:

¹ The responses are immediate: the subject is activated, his autonomic nervous system adapts to new cues, the breath speeds up, the pulse accelerates. [authors’ translation]

Optimal learning occurs when the two hemispheres of the brain work together and music taps both hemispheres... Any teaching strategy such as music that integrates the function of both hemispheres uses the natural design of the brain to make learning easier, faster, and more fun (Davies 2000, p. 148).

Referencing earlier studies of the use of music in educational settings, Davies notes that music can help learners become more emotionally engaged with the subject matter, resulting in the creation of stronger neural connections to help in recalling the information at a later date (2000).

Music in Various Environments

Educational research examining the effects of background music on student learning and behavior in the higher education classroom has been limited, though some scholars have explored aspects of the subject. One study that focused on children in the first two years of life with varying educational needs found the children demonstrated improved behavior and cooperation with the use of background music (Savan, 2009). Another study, focusing on primary school students, found that background music in the classroom reduced student stress, increased productivity, and resulted in a more enriched and enlivened classroom (Davies, 2000).

Of the research studies that address the use of music in higher education, the majority of research focuses on its effects on anxiety, retention, and distractibility, often in educational activities that take place outside of the classroom. One article looks at the habits of students using background music while studying. This research looked at students from Japan, the United Kingdom, Greece, and the United States. The researchers found that “overall, there was general agreement that music helped the students to relax” but acknowledged that music could potentially interfere with concentration (Kotsopoulou

& Hallam, 2010, p. 435). Students reported rarely listening to music “while revising for examinations, memorising material or learning a foreign language...” (Kotsopoulou & Hallam, 2010, p. 438). Many believed that music kept them company, alleviated boredom and relaxed them, though some indicated that music could interfere with concentration and learning. Most turned off the music when they felt it was interfering with their concentration and indicated that listening to music while studying was influenced by their mood (2010). While a useful study in exploring the affective domain, this study did not examine the impact of music in a classroom setting. However, the analysis of students’ listening habits proved useful in contextualizing our own study.

Another recent study looked at the use of background music in educational video games and explored its impact on the retention of facts and working memory in college-aged students. Fassbender, Richards, Bilgin, Thompson, and Heiden (2012) found that there was a significant difference in retention of facts for those students who played the video game with background music than those who did not, thus concluding that music does have a significant impact on memory and recall.

Whether in the classroom or in the workplace, individuals are often asked to recall, analyze, and synthesize information. Furnham and Bradley (1997) examined several studies from the mid-twentieth century. They argue that there was “a flurry of interest as to whether music affected either morale (satisfaction) or productivity at work” (Furnham & Bradley, 1997, p. 446). One notable study indicates that music in the workplace generally increases productivity and improves organization, but the impact of music on workers depends on the type of music, as well as the particular task being performed (Furnham & Bradley, 1997). In 1995, research by Oldham, Cummings, Mischel, Schmidtke, and Zhou

found that there was a significant increase in productivity for those workers who listened to background music. Educators can learn from research on the effects of background music in the workplace and adapt methods and approaches to an education setting.

Library Anxiety

As previously discussed, music can have a powerful positive effect on the atmosphere of an environment that might otherwise be seen as intimidating or confusing, such as a large academic library. A significant amount of research has focused on the phenomenon known as library anxiety which “manifests itself in negative emotions [toward the library], including tension, fear, feelings of uncertainty and helplessness, negative self-defeating thoughts, and mental disorganization, all of which have the propensity to debilitate information literacy” (Jiao & Onwuegbuzie, 2002, p. 71). In her seminal article introducing the idea of library anxiety, Constance Mellon (1986) notes that the primary goal of librarians is “to help students see the library as a great place with fascinating information and warm, friendly people available to help them” (pp. 164-65).

But what do we do to alleviate library anxiety? In her book outlining pedagogical methods for the information literacy classroom, Esther Grassian proposes developing techniques to help alleviate anxiety through the use of technology, visual aids, and teaching tools (Grassian, 72). Referring to affective learning, Nahyun Kwon suggests that “librarians could create a learning environment that encourages intellectual curiosity and emphasizes the value of learning” (Kwon 129). Westbrook and DeDecker specifically focus on the physical environment, arguing that the atmosphere of the library (or the library classroom) can impact library anxiety. They suggest that “the user’s first impression of the library is

that the facility is inviting, or at least not intimidating. Mechanisms include: [t]he use of warm colors, good lighting, and intriguing exhibits”(Westbrook and DeDecker 47).

Some research has been conducted on the use of music in libraries, including academic libraries, though not necessarily in the library instruction classrooms.

Music in the Library

A 2007 article “The Library as Place” suggests that music can help patrons differentiate discrete spaces in the library and associate them with specific purposes (Waxman, Clemons, Banning, & McKelfresh, 2007). The areas with background music, such as in the library café, should not interfere with the quiet spaces of the library (Waxman et al., 2007). Different auditory environments, with different types and levels of sound, can serve as nonverbal cues to promote different activities. For example, spaces intended for socialization, interactive group work, or individual study would all be distinguished from each other by different kinds of music (or no music at all).

There were two notable instances of existing research that combined information literacy and music. Although neither study examined the impact of background music on student retention of concepts in the information literacy classroom, they do provide insight and precedence for the use of background music in information literacy initiatives. Kimball and O’Connor (2010) asked students to listen to different pieces of music and analyze the musical “texts” using information literacy skills. They recognized the extent to which music is an effective means of engaging multiple learning styles. For example, they explored issues of plagiarism and intellectual property by examining the use of mash-ups in hip-hop and rap music. Rather than use music as a learning enhancement tool, they used it as the

learning vehicle that provided “an excellent means of setting up problem-based learning” (Kimball & O’Connor, 2010, p. 319). Another particularly interesting study was a 2004 article by Morgan and Davies. They developed an orientation program to introduce new students to the library. One aspect of this program had students engaging in hands-on training of the library catalog while background music was playing. The majority of students found that the music enhanced their experience of the orientation program (Morgan & Davies, 2004). This study relied exclusively on students’ self-reported opinions of the various instructional methods used, including background music, and did not measure whether or not the methods were effective in promoting student learning.

Pilot Study

Background

Prior to beginning this research, we were already aware that extensive research had been conducted on the impact of music on cognitive development, especially the research on the Mozart Effect. At the same time, as actively working librarians, we noticed a large number of students listening to music through their headphones while studying in the library. Tying these two ideas together, we decided to investigate whether the act of listening to music could have a positive impact on students’ learning in a classroom setting. Inspired by the research on library anxiety, our goal was to use background music in the information literacy classroom in order to reduce anxiety and improve student learning.

In the fall of 2010, librarians at Western Michigan University (WMU) conducted a pilot study to examine the impact of background music on students in the information literacy classroom. WMU is a mid-sized research university with approximately 20,000

undergraduate students and 5,000 graduate students. Of those, 88% of the students are Michigan residents and 19% are minorities.

The majority of information literacy instruction takes place in “one-shot” classes at the request of a course instructor. These classes are designed to help students develop the information literacy and research skills that will be needed for a particular assignment. In many of these classes, students have little or no experience with the library and are often intimidated and disengaged.

For this pilot study, we targeted two courses: English 1050 “Thought and Writing” and English 1100 “Literary Interpretation.” Both of these classes fulfill general education requirements and the majority of students at WMU complete one or both of these classes at some point during their education, making the classes a useful sample group. Although the library is not able to provide information literacy instruction sessions for every class, many of these classes still come to the library each semester (42 sections out of 74 in fall 2010). Each session lasts about 75-90 minutes and has approximately 20-25 students.

Methodology

We used the research examined above, especially the articles by Kimball and O’Connor and Morgan and Davies, to inform our methodology. After obtaining permission from each individual instructor, we recruited students from 20 course sections to participate in the pilot study. We each provided instruction for ten sections and followed the same basic lesson plan, consisting of basic research and information literacy concepts appropriate for a beginning audience, with additional section-specific material incorporated as needed. The lesson was divided into two parts: an initial discussion of

information literacy concepts and library resources was followed by a hands-on workshop for the remainder of the class with students working individually or in small groups.

We played background music during eleven of the sections (experiment group) and did not play any music for the other nine sections (control group). Prior to beginning this study, we identified two volume levels for the background music based on our subjective experiences of the acoustics in the classroom. The first, played during the presentation, was quiet enough for students to easily hear the librarian. The second, played as students entered the room and during individual or group workshop periods, was slightly louder (though not so loud as to not be considered true background music). We used Pandora (www.pandora.com), an internet radio service that automatically plays music based on user preferences. Regardless of which librarian was leading the class, the students in the experiment groups listened to a pre-established mix of rock and pop music as they entered the classroom. During the workshop portion, however, each librarian had a different approach when selecting music. One librarian played music from the same rock/pop mix. The other librarian allowed the students to suggest music genres or artists on which the class then voted.

At the end of each session, we asked the students to complete the same anonymous online survey that assessed their opinions of music, their perceptions of the library and classroom atmospheres, and their retention of information literacy concepts (the full survey can be found in Appendix A). We required that students be at least 18 years of age, and we reminded them that their participation was strictly voluntary and would remain anonymous. After eliminating surveys completed by students who accepted the informed

consent form but did not respond to any further questions, we were left with a total of 257 valid survey responses.

Results

The data gathered by the survey was analyzed using R statistical software. Contingency tables were computed, and chi-square tests were conducted at a 5% level of significance to test if background music had an effect on the students' opinions. Furthermore, to investigate the effect of background music when the chi-square test was significant, a residual analysis was performed. Confidence intervals were also computed to analyze the results of four questions designed to measure students' retention of information. This was done by constructing confidence intervals with a 95% level of confidence for the difference of proportion of students who answered the questions correctly in the two groups.

Upon analyzing the valid survey responses, we found no measureable difference between the control or experiment groups based on which librarian was teaching the class or on the sex of the respondents. With these variables accounted for, we focused on the impact of background music on student opinions regarding music in the classroom, student perception of the classroom atmosphere, and student learning.

Opinions Regarding Music

The results in table 1 show that students' responses were overwhelmingly positive when asked if they liked or would have liked music playing in the classroom. In the experiment group (students in classes *with* background music), 89.12% of participants

liked the music, while 67.31% of participants in the control group (those in the classes *without* background music) would have liked to have had music playing.

[Table 1]

In order to contextualize our study of the impact of background music on affective learning and the classroom environment, we also wanted to explore students' listening habits *outside* of the classroom setting. We asked students whether or not they typically listened to music when studying (table 2), and what impact they felt music had on their ability to concentrate (table 3). Our goal was to determine if students considered music to be a positive aid to studying, regardless of the setting.

We ran a chi-square test, which indicated that there was a significant difference in the self-reported listening habits of students by music group. For the purposes of analysis, we considered students who reported listening to music only in certain locations to be the same as students who normally listen to music when studying. The residuals of the test show that, in the experiment group, there were fewer students than expected that reported listening to music while studying. In the classes without background music, there were more students than expected who reported listening to music while studying. This difference suggests that the act of listening to music in the classroom, or the lack thereof, may have influenced students' responses regarding their typical studying habits.

[Table 2]

Table 3 is a contingency table of whether or not students feel that music helps them to concentrate when studying. The chi-square test shows that there is only a marginally significant difference in the proportions in the two groups ($p=0.08701$). This indicates that the presence or lack of background music in the classroom did not significantly impact

students' responses. However, the majority of students in both groups did indicate a belief that music helps them concentrate. By incorporating music into the classroom setting, it may be possible to take advantage of this positive perception and improve the classroom atmosphere.

[Table 3]

Perception of Atmosphere

Since a primary goal for using background music in the information literacy classroom was to reduce student anxiety, we were especially interested in students' perception of the atmosphere in the classroom. We gave the participants three adjectives related to noise level – “too loud,” “too quiet,” and “just right.” We asked participants to select which of the adjectives they felt described the atmosphere in the classroom (table 4).

The majority of participants in both groups indicated that the noise level in the classroom was “just right,” though the percentage was slightly higher in the experiment group. It is interesting to note that four students in the experiment group indicated that the noise level was too loud, while five indicated that it was too quiet, virtually cancelling each other out. In contrast, fifteen students in the control group said that the atmosphere in the classroom was “too quiet,” while only one indicated that it was “too loud.”

[Table 4]

In addition to asking about the noise level of the classroom, we also provided the participants with a list of eight qualitative adjectives, of which four were positive (relaxing, motivating, comforting, welcoming) and four were negative (stressful, unmotivating, uninviting, sterile). Students were asked to select as many adjectives as they felt were

applicable to the classroom atmosphere. We categorized students who picked more positive adjectives than negative as “positive.” Students who selected an equal number of positive and negative adjectives were labeled as “uncommitted.” Those who selected more negative than positive adjectives were categorized “negative.” For the purposes of analysis, we combined “uncommitted” and “negative” students into a single category.

An overwhelming majority of respondents had positive perceptions of the classroom atmosphere (91.84% in the experiment group and 76.92% in the control group). However, a chi-square test (table 5) revealed that there was a significant difference in the perceptions of the two groups, indicating that background music positively impacted students’ perception of the classroom atmosphere. The residuals from the test indicate that there were fewer students than expected with negative perception of the classroom atmosphere in the experiment group. On the other hand, there were more students than expected in the control group who had negative perceptions of the classroom atmosphere.

[Table 5]

In order to contextualize students’ perception of the classroom atmosphere, we also asked them to rate their perception of the atmosphere in the rest of the library as a whole (question 15). We found no significant difference between the control and experiment groups in their perception of the library atmosphere. While this survey question was not directly applicable to this study (which focused on the classroom environment), we have found the data to be useful in informing other library initiatives.

Student Learning

In addition to examining the effect of background music on student satisfaction, we were also concerned with the potential impact on student confidence and learning, especially their ability to retain concepts presented in the library instruction session. When asked if they believed that the instruction session would help them to complete class assignments, student confidence in both groups was high, however, there was no significant difference between the two groups. Of the students in the experiment group, 91% agreed that the instruction session would help, compared with 95% of students in the control group.

The survey also contained a set of questions designed to test students' retention of facts and concepts introduced in the instruction session. For the purpose of analysis, we chose not to include questions 16 and 17. All students but one in each group answered question 16 correctly. This demonstrated that the question was not an effective measurement tool, since we were not able to determine whether or not the background music would have improved student performance. Question 17 asked students to list the search tools discussed in the research instruction session. However, the variation in the assignments required by each instructor necessitated the use of different search tools in different course sections. Consequently, the responses to question 17 were too varied for useful analysis. **For future iterations of this study, we will revise these questions.**

The results of the remaining four questions can be seen in table 6. We calculated 95% confidence intervals for the difference of percentage of those who answered each question correctly in the two groups. We found no significant difference between the groups for questions 18, 20, and 21 (all of which were multiple choice questions). We did, however, find a significant difference between the two groups in question 19 (an open-

ended question), with students in the experiment group performing better than their counterparts in the control group. It is possible that the nature of the measurement – open-ended versus multiple-choice questions – caused the disparity. Open-ended questions typically require a deeper understanding than multiple-choice questions (Birenbaum and Tatsuoka 1987). In future research, we will use more open-ended questions to measure students' retention of concepts in order to gain a more complete picture of the impact of background music on student performance.

[Table 6]

Conclusions and Recommendations

As previously discussed, library anxiety is an important issue for librarians to alleviate in order to allow students to learn to the best of their ability. This study has explored the use of background music as one technique to reduce library anxiety, and overall, the results of this study suggest that background music is an effective tool in promoting student satisfaction and learning. However, several factors came to light in the course of conducting this study, which librarians interested in incorporating background music into their curricula should keep in mind.

Internet radio: Internet radio services such as Pandora, Last FM, and Spotify are available for free but may have a limit on the number of hours of music that can be played per month. They also typically play short advertisements between songs and can be distracting. An instructor may want to purchase a subscription in order to play unlimited and uninterrupted music.

Copyright: Some instructors may choose to play music from library- or personally-owned collections. Copyright and public performance laws may prohibit the playing of certain pieces of music or certain formats. We strongly recommend that any instructor choosing to do so consult the relevant copyright code or his or her institution's legal counsel.

Music type: For several classes in this study, the students were asked if they had a preference in music during the workshop period. In general, they were uninterested in classical music, despite the much-lauded Mozart Effect previously discussed. The students indicated a preference for a generic rock/pop style of music. Since Pandora requires that users enter the name of a favorite musician or group, we selected the artists Michael Jackson and R.E.M. as seed artists (or bands and artists that are representative of a certain style of music). Pandora then played music by other artists who exhibited similar musical characteristics. Some librarians may choose to allow a class to vote on a favorite artist or, if the musical tastes vary among the students, alternate between multiple selections based on the different preferences. Allowing students to vote on the type of music can also be an opportunity to increase student engagement and involvement in the development of the classroom environment.

Dissenting opinions: A few students who participated in this study indicated that they found the music to be distracting. This could be due to disagreements over the type of music that was played or to differences in learning styles and study needs. It is possible that, for these students, the music was not truly functioning *in the background*, and was therefore interpreted as "noise," as defined by Savan (2009). For these students, the music

may have caught their attention, therefore preventing the development of an optimal learning environment.

However, the majority of students in this study enjoyed the background music, and showed improved retention of information literacy concepts. Therefore, we plan to continue to use background music in these introductory classes. It is possible that, as the learning goals of information literacy classes become more complex in more advanced classes, the potential for distraction will come to outweigh the benefits of reducing student anxiety. Further investigation is needed to determine what impact background music has on students in upper-level, discipline-specific, or even graduate classes.

Sound technology: The classrooms where this study was conducted are wired for sound, with speakers integrated throughout the room. Librarians who do not have such a sound system could substitute external speakers that plug directly into a computer. However, instructors should experiment to determine how the sound changes at different points throughout the classroom. The volume should not be so loud that students sitting near the speakers are overwhelmed, nor should it be so quiet that students sitting far away from the speakers cannot hear it.

“One shot” instruction: This pilot study used participants from typical “one shot” information literacy classes. It is likely that the impact of background music on students is greater in the “one shot” environment than in more traditional semester-long courses. This is because students are in an unfamiliar and temporary environment, different from their regular “home” classroom. They may consequently experience greater levels of discomfort and intimidation. Returning to the issues of library anxiety, it is important to use every

possible tool to help the students to relax – whether that be the use of background music or other ways to improve the classroom atmosphere.

Future research: In conducting this pilot study, we discovered several issues which we will address in our future research. One challenge we faced was the need for variation among the curricula in order to meet the needs of each individual course instructor. Naturally, the subject matter and assignments of a particular course will, to some extent, dictate the curriculum of each information literacy session, often leading to some topics being addressed more fully than others. We will continue to use background music in our information literacy instruction, and will use this opportunity to conduct a multi-year assessment of its impact. This will provide us with a larger sample of participants to help us control for the inevitable variability among the curricula.

We also hope to determine whether or not our results are consistent across different academic disciplines and academic levels. We will continue to assess the impact of background music using a larger and more diverse sample of participants. This larger sample size will allow us to obtain more statistically significant results from our data.

The results of the pilot study informed the development of a modified version of the survey which we administered to participants. Most notably, we are replacing many of the simple, multiple choice questions (questions 16-18, 20-21) with more difficult or open-ended questions. This will insure that the questions are a better gauge of student retention of conceptual information.

The impact of classroom environment on student comfort and learning is an area rich with possibilities for future research. Educators seeking to expand on this study could consider other environmental factors such as lighting, furniture layout and sightlines,

comfort of furniture, classroom décor, or temperature. In addition to surveys administered during class, future research could include other methods of data gathering, such as the use of screen-capture software to analyze the specific steps each participant takes when attempting to complete a task, or conducting small focus group discussions. Future research could also look more closely at how background music impacts the learning experience for those students with specific learning styles. Though we focused predominantly on research in education and social science literature to develop this study, librarians and educators could also learn more about the impact of music on the learning process through an examination of biomedical literature. This could be especially relevant for exploring the effect of background music on individuals with learning disabilities such as ADHD.

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Appendix A

1. I understand the study and agree to participate.

Yes

No

2. Are you:

Male

Female

3. I am a:

Freshman

Sophomore

Junior

Senior

Grad Student

Other (please specify)

4. For which class did you come to the library? (course number or name)

5. What is your course instructor's name?

6. Who is your librarian instructor?

Dianna Sachs

Kate Langan

Other (please specify)

7. Was there music playing in the background during all or part of your Library Research Instruction session?

Yes

No

8. Would you have liked to have music playing in the background?

Yes

No

9. Did you like having music playing in the background?

Yes

No

10. Do you normally listen to music while studying?

Yes

No

Only in certain locations (please specify)

11. Does music help you concentrate better when studying?

Yes

No

12. Was the atmosphere in the classroom better or worse compared to the rest of the library?

Better

Worse

13. Do you think the Library Research Instruction session will make it easier for you to complete your assignments?

Yes

No

14. What words best describe the atmosphere in the library CLASSROOM? (select as many as apply)

Relaxing

Stressful

Motivating

Unmotivating

Sterile

Comforting

Welcoming

Uninviting

Too loud

Too quiet

Just right

Other (please specify)

15. What words describe the OVERALL atmosphere in the library outside of the classroom?

Relaxing

Stressful

Motivating
Unmotivating
Sterile
Comforting
Welcoming
Uninviting
Too loud
Too quiet
Just right
Other (please specify)

16. What can you find using "Power Search"

Books Only
Articles Only
Both Books and Articles

17. What search tools OTHER than "Power Search" did you learn about today that can help you find materials for your assignment?

18. Is it possible to e-mail a copy of a full-text article to yourself?

Yes
No
Some of the time

19. What is interlibrary loan?

20. How can you access electronic databases when you are off-campus?

You can't
With your Bronconet Id and password
You do not need to sign in

21. How many books can you check out at one time?

25
50
100