Background Music and E-Learning: A Help or a Hindrance to the Learning Process?

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Abstract

This paper explores the use of music in e-learning and whether it is a help or a hindrance to the learning process. By examining the brain and how our working memory and the phonological loop processes auditory information, researchers have been able to see how music impacts our cognitive abilities. In creating online or distance courses, motivation and attention are key factors to consider when looking at how to use music in an e-learning course. In conclusion we find that Clark & Mayer (2011), suggest not to use background music because it often detracts from the course and adds extraneous cognitive load. However, several aspects are looked at for the proper use of background music and sound effects that could potentially enhance an e-learning course without adding extraneous cognitive load, but rather give the learner attention grabbing cues.

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Throughout our lives we come into contact with all forms of music; whether it is in the form of playing an instrument, listening to our favorite songs on the radio, or having it as background music during a movie to enhance the dramatic effect. Music is a foundation of our culture and has been used throughout history as a way of communicating and spreading knowledge (Abbott, 2002). Music can be seen as an integral part of society that it is played at every sporting event, on every TV show and in commercials, and has taken over the internet with streaming music services like Pandora and Spotify.

Music can be seen as a valued and integral part of today's culture. This research will explore the impact music may have in an educational setting. Taylor and Rowe stated (2012):

> Background music is widely used by individuals personally and is also common in most public arenas: grocery stores, malls, airports, waiting rooms for all types of offices, and a wide variety of other venues. In that background music plays a significant role in an individual's everyday private and public life, it is a natural progression for educational researchers to question whether using background music will stimulate learning in the classroom. (p. 54)

In review of the literature, this paper will take a look into how music impacts the learning process and specifically the use of background music in e-learning. This research will summarize the use of music and the influence it may have on the cognitive abilities of those who play an instrument (Roden, Grube, Bongard, & Kreutz, 2014), how music affects working memory through the phonological loop (Willingham, 2007), and how background music can be both beneficial and detrimental to our cognitive abilities (De Groot & Smedina, 2014). Next the research will look at how motivation and attention can be used to focus the attention of a learner

using a number of attention grabbing strategies such as: cues, contrast, creating emotion, establishing purpose for learning, and organizing for a learner (Banikowski, 1999). Finally, the summary will include an exploration of background music in e-learning, and when and when not to use it, to create effective e-learning courses (Clark & Mayer, 2011).

Music and its Effects on the Brain and Memory

Our ability as humans, to absorb new information and create meaningful mental models of the information is the key component of learning and our ability to gain knowledge and understanding of the world around us. Our brains have the capacity to store an unlimited amount of information about anything and everything we see, hear, touch, feel, and taste (Banikowski, 1999), and our memory is at the center of it all.

Banikowski (1999), talks about three major memory components of our brain: sensory register, working/ short-term memory, and long term memory. Each of these three components is crucial in processing information to be stored in memory. The sensory register is responsible for picking up all the stimuli in our environment, such as the things we see, hear, or touch. However, if we do not focus our attention on the stimuli being picked up by our sensory register, it is quickly lost – this is where working memory comes in. Working memory is where new information is processed and then transferred into long-term memory. For this to take place the information being held must be kept activated by rehearsing the information either in your head or out loud, or by connecting the information with something you already know (making a mental model of the information). The final component of memory is long-term memory; this is where information is permanently stored in the brain for later recall. Each of these components of memory is essential to the learning process, and by understanding how each area of memory works we can begin to see how music influences the way our memory encodes information for later recall.

Music seems to have a direct impact on the way our working memory encodes information getting ready to be stored into our long-term memory. In one study conducted by Roden et al. (2014), they showed that students who played an instrument showed significant increases in cognitive capacities through impacts on auditory processing in the phonological loop and the central executive functions of the brain; two of the components that make up working memory. They were able to show that children who had played an instrument were significantly better at tasks that required the use of auditory recall such as One-Syllable Word Span and Non-word Recall Tests. This can be attributed specifically to the increase in the cognitive abilities of the phonological loop. The phonological loop is comprised of two components: the phonological store and the articulatory control process (Willingham, 2007). The phonological store holds auditory information that is coming in from the environment. For example, if you needed to remember a phone number, someone would tell you the phone number and you would hold it in your phonological store. The articulatory control process is used when you are repeating something in your head, such as the phone number that you were asked to remember. These two processes work together by increasing the encoding capabilities of auditory information into long-term memory. Roden et al. (2014) showed that this increase in the cognitive abilities of the phonological loop, specifically the phonological store and articulatory control process, helped with recall in both auditory and non-auditory tasks.

This information on the phonological loop and working memory has a large impact on the way we look at using background music in learning. In a study by De Groot and Smedina (2014), they were able to show that vocal music had a detrimental impact on recall of learned vocabulary words when the lyrics of the songs where in a familiar language as to those they were learning. This is believed to be due to an interference with the operations of the phonological working memory between the words being heard and those being rehearsed in the articulatory

control process. In another study by Taylor and Rowe (2012), they showed that using Mozart as background music during testing in a mathematics class, helped to increase the overall test scores in the class. However, their research was not able to determine the direct link between an increase in retention and the use of background music while testing. They explained that it could be due to a number of different responses to the background music such as: increasing arousal, cortical priming, or through reduced anxiety.

Motivation and Attention

According to Gromley, Colella, & Shell (2012), "Learning online requires more self-regulation, intrinsic motivation, and independence from the student than the traditional classroom education. Building an environment for students that fosters the development of these behaviors is a key to student success" (p. 177). This ability to motivate a learner and grab their attention through an e-learning course is one of the key components to building an effective online course.

Gromley et al. (2012) focused on the ARCS Motivational Model and the models 4 concepts of: attention, relevance, confidence, and satisfaction. Attention is the ability of the course to capture the attention of the learner, relevance is the ability of the course to present the importance of the material being taught, confidence is the ability of the course to build confidence in the student that they can learn the material and use it effectively, and satisfaction is the ability of the course to make the student feel good about completing the course and excelling in all activities, quizzes, and assignments. Each of these are key concepts in motivating learners in distance and e-learning courses, however we are going to focus primarily on the idea of attention. Being able to grab and hold onto a learner's attention is one of the trickiest parts of creating online courses; you have to be able to account for those who may be completing the

course in an environment surrounded by distractions, where their focus can easily be pulled away from the task at hand.

Attention is more than focusing on the teacher in a classroom, having the audio turned on so you can hear a presentation, or pulling up the latest e-learning on your computer to listen to while you do other work. Attention is fully focusing on the material being presented so that you can truly understand and retain the information. A person's attention is constantly shifting from one thing to the next, so it is crucial for a course or teacher to be able to catch the attention of the learner and to get them to focus on the material being taught. Our sensory register can only pick up and pay attention to so much information, everything else is long and forgotten. Banikowski (1999), talks about several strategies to effectively focus a learners attention to the critical moments of instruction; these are: using cues or signals, use of contrast, creating emotion, establishing purpose for learning, and organizing for learning.

The use of cues and signals is the idea of refocusing the learner's attention to alert them to critical information. These can be either verbal or non-verbal cues in the form or verbally telling the class to pay attention, a hand clap, playing a song, or pointing out a specific area in a learners book or focusing in on a specific part of an e-learning course. These cues help to focus the learner onto what is important and what they need to know.

The use of contrast is similar to the use of cues in that when the learners focus is off task you do something that is contrasting to the norm of the presentation to get them refocused onto the topic at hand. These can be things like having everyone stand up and recite what was just learned, having the learner click through various subtopics in an e-learning presentation, or using sound effects to get the learner emotionally charged. This is often used by teachers to redirect the attention of students who are distracted or bored during class.

Creating emotion is when you make the learner vested in the information on an emotional level. Learners who are more emotionally attached to something tend to be more focused on the information and tend to remember it better. Strategies for creating emotion can be storytelling, adding emotional and meaningful music or sound effects to a course, or using visuals that allow the learners to connect the learning. Film makers do a fabulous job of creating emotion by selecting music or images that moves the audience in a way that makes them feel emotionally attached to the character or scene.

Establishing purpose and organizing for learning are both very similar. Establishing purpose is providing learners with the ever popular questions of "Why do we need to learn this?" Once the learners understand the "Why?" they tend to increase their focus, thus increasing learning. Organizing for learning is similar in that you preview for the learners all that is going to be learned. You go over what the course is going to entail so the learners are not left wondering. When the learners have an over-all picture of what they are going to learn, they will know when to focus their attention for optimal learning.

Banikowski (1999) shows how music can be helpful in cueing an audience to pay attention and shift their focus towards a specific event or object. This is something that is often done in movies, during sporting events, at a celebration, or in a classroom as a way of cueing an audience to pay attention and shift their focus when things begin to become dull or as a way to help them create an emotional attachment to the event. This is something that can be done in e-learning as well. Music can be used as a cue to help the learner know when a new topic is starting or it can be used to help a learner know they need to pay attention. It can also be used to create emotional meaning for a specific topic being taught or be used to focus attention when the topic starts to become dull or boring. However, these are only a few examples of how music can be used to help shift a learner's attention and motivate them during an e-learning course.

Background Music and E-Learning

With e-learning becoming a bigger and bigger part of the educational technology field it is important to begin looking at the aspects that make up a meaningful and well-designed e-learning course. Henderson & Nash (2007) stated, "E-Learning is an always-evolving and flexible way of fostering and sharing information. When it is well-designed, e-learning accommodates its participants' multiple learning styles and their constantly shifting geographical locations and updated equipment" (p. 111). With the advent of the internet and software such as Adobe Captivate and Articulate Storyline, that have streamlined the process of creating online courses, e-learning has skyrocketed. With all of the elements that need to be considered in designing a beautiful and effective e-learning course, e.g., graphics, text, narration, activities, etc., it is important to also begin looking at how audio and music effects e-learning.

Music is like any other part of a well designed e-learning course - If it fits in and makes the course better, add it. If it doesn't, leave it out (The Rapid E-Learning Blog, 2009). Looking at the second part of this statement, Clark and Mayer (2011) explain that adding unnecessary background music to a course is most detrimental for learners when the material is new to them, when it is presented rapidly, or when they do not have direct control over the course. Meaning that background music can be far more of a problem, then it can be of help, if the music is interfering with the learning process.

Background music can often overload the working memory when you have background music, narration, visuals, and text all on one presentation slide or page. This can begin to overwork your sensory register and working-memory. As mentioned earlier, your sensory register is responsible for picking up and attending to all the stimuli in the environment. When there is an overload of stimuli, it can be hard to focus your attention where it needs to be focused (Banikowski, 1999). When you add narration, sound effects, and background music you become

overloaded with auditory sounds and your sensory register doesn't know what to process and move into working memory for later processing into long-term memory. In addition to this overload of information, background music, when paired with visuals or narration, is often tuned out or unattended to. This is similar to when you are watching TV and your children are yelling in the background (The Rapid E-Learning Blog, 2009).

Cognitive Load Theory suggests that learners will gain a deeper learning experience and will retain information better when the course does not have extraneous sounds or music that detracts from the information being taught. Nguyen & Clark (2005), talk about 3 types of cognitive load: intrinsic, extraneous, and germane. Intrinsic load is the information that needs to be learned during the course. Extraneous load is any irrelevant visuals, audio, text, or animations that detract from the presentation. Germane load is anything that is beneficial to the learning process: practices, quizzes, and activities, which help to engrain the information. Nguyen and Clark suggest that to maximize learning efficiency you want to manage your intrinsic load so that it makes sense to the learner and is well organized, you want to minimize all distracting extraneous loads, and you want to maximize all beneficial germane load. In this case background music could be considered an extraneous load that needs to be minimized. It does not necessarily need to be eliminated, but does need to be used only at appropriate times.

Music has however, can be beneficial for e-learning courses by enhancing the overall learning experience of the learner (The Rapid E-Learning Blog, 2009). As talked about previously, music can be a used as an attention grabber during e-learning courses by being used as a cue or signal, a contrast, or by creating emotion (Banikowski, 1999). However, after seeing how background music and noises can often be detrimental to learning, because of its extraneous cognitive load, it should be considered very carefully when added to an e-learning course. It is

always important to remember – unless it adds to the course and enhances the learning, leave it out.

One way of using music is as a cue or signal to the learner that a new section or topic is coming up. This method lets the learner know when one section ends and when the next one will begin, so if their focus begins to shift they will know when to pay attention and focus. This can be done by starting all sections with a quick musical introduction that then dies off before continuing on to the actual instruction or ending each section with a musical sign off before moving on to the next section. It will enhance the arousal of the user by providing them with a bit of contrast to the narration and will refocus their attention if they start drifting off. However, to prevent cognitive overload it should be noted that the music should stop before any actual instruction begins. If the background music continues into instruction it could end up distracting the learner.

Music can also be used to create emotion for the learner, which in turn will be more impactful and grab the learners' attention. Film makers often do this to get the audience feeling a certain way about a scene or character in the film, whether negative or positive. In e-learning this same principle can be used to for courses that require the learner to be emotionally attached to the material being taught. An example could be an online First Aid course where the importance of saving someone's life can be emotionally cued by playing dramatic music as it introduces a character who is dying and needs First Aid (The Rapid E-Learning Blog, 2009).

Conclusion

Music can have a significant impact on learning through the use of background music, but it has to be carefully considered before being used. This Literature Review has shown how music impacts our brains and memory and how cognitive overload can be detrimental to the learning process. How attention is the key to keeping a learner motivated in distance learning and

e-learning courses and how music can be used to grab the learners' attention. Background music can assist in some situations, yet in other situations detract from a learner, making it harder for them to focus and learn.

In conclusion, it seems as though background music may be helpful in e-learning as long as it is used carefully; adding it in places where it will not detract from the information being taught or take away from the presentation as a whole. Also it is important to note that you should not add music just to "Jazz" up the presentation, if the information is already boring, adding music won't help, it only makes it easier to dance to (The Rapid E-Learning Blog, 2009). Every element of an e-learning course, not just background music, should be considered before being added, if something does not have anything to add to the information or the presentation then it should be left out.

Many of the topics regarding the proper use of background music as being used to create emotions or as a cue and attention grabber are highly speculative. Future research should be done at looking into how background music might be used to enhance the learning experience of learners in online, distance, and e-learning courses. This research could potentially help to guide the creation and design of e-learning courses in the future that better motivate and engage the learner, and assist in the retention of material for later recall.

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