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## **Constructivism in Practice: The Potential of Ubiquitous, “Low-Tech” Audio Devices for Literacy Development in the 21<sup>st</sup> Century**

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### **Abstract**

*In this study, four graduate level preservice teachers used inexpensive, MP3 players pre-loaded with audiobooks with the objective of increasing the reading fluency and digital literacy of elementary school children. The data collected included preintervention surveys, pre/post oral reading fluency scores, a log of daily listening experiences, and preservice teacher journals. The findings indicated that student-participants’ oral reading fluency scores improved along with the students’ confidence in reading. Additionally, both the preservice teachers, and the student-participants reported an increased awareness of how technology can be used for literacy development and enjoyment, suggesting an enhancement of digital knowledge and skills.*

The 21st century skills agenda is the latest iteration of recommendations from government, business, and educator consortia, outlining basic competencies such as critical thinking and problem solving, communication and collaboration, creativity and innovation, etc., (Partnership for 21<sup>st</sup> Century Skills, 2000). Some of this framework is familiar to readers of previous reports from as far back as the *Nation at Risk* (U.S. DOE, 1983), or Scans 2000 (U.S. Dept. of Labor, 1991). Unlike the previous skills agendas, the current framework clearly identifies the need for competencies related to information, communication, and technology (ICT) literacy. Demonstrating literacy in ICT means being able to: (a) Use technology as a tool to research, organize, evaluate and communicate information, (b) Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy, and (c) Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies (Partnership for 21<sup>st</sup> Century Skills, 2000).

The cultivation of the aforementioned 21<sup>st</sup> century technology skills should be informed by past research on the so-called “second digital divide”, referring to disparities in online resources and expertise, to accomplish skill development. The “second digital divide” departs from the dichotomous view of the “first digital divide”—having access or not having access to the Internet—and broadens the concept to include disparities in type of use, extent of use, and “the additional resources that allow people to use technology well” (Hargittai, 2001; U.S. Dept. of Commerce, 1983; Warschauer, 2002, p. 4).

This broader view of digital inequity addresses the different experiences students have using digital technologies based on their race, socio-economic status, ability, school location, teacher or other mediating social factors (i.e. friends, family, others). In consideration of new skills and new literacies that all students need for successful lives in this century, teachers are challenged with the need to incorporate various technologies into their classrooms, to further support students' interests and prepare them for their futures, even as school budgets get reduced.

The current study addresses the challenge of resource inequity and ICT skill disparity by

using low-cost, but utilitarian MP3 audio devices with the goal of developing reading fluency in elementary school children. Virtually all students have access to an MP3 device, or other audio player. Between 2004 and 2009 ownership of MP3 players in the 8-18 year old age group has exploded from 18% to 76% and if CD players in homes are included, virtually *all* students have access to some type of audio player (Rideout, Foehr, & Roberts, 2010).

The position here is that re-thinking the uses of this ubiquitous device can foster authentic and personalized learning—two features of 21<sup>st</sup> century learning—and promote multiple literacies. Students (and their teachers) are not only exposed to more literature resources, but by locating free audiobooks on the Internet, downloading them, transferring those files to the audio device, and sharing and managing multiple files over time, they are developing their technological acumen in the digital age.

## Background

### Multiple Literacies in the 21<sup>st</sup> Century

When one typically thinks of literacy, a person's ability to read and write a printed format may be what first comes to mind. However, according to the International Reading Association (2002) “traditional definitions of reading, writing, and viewing, and traditional definitions of best practice instruction—derived from a long tradition of book and other print media—will be insufficient” (p. 3). The dynamic communication technologies of the information age are offering new ways to engage with literacy, “heretofore unseen in the history of literacy” (Tyner, 2003, p. 374). Since modern contexts indicate a shift toward more technological and multimedia forms of communication, the word literacy encompasses a massive amount of knowledge that one must possess in order to be technically termed as “literate.” Sensenbaugh (1990) defines literacy as, “more than just being able to read and write, [literacy] is the ability to comprehend, interpret, analyze, respond, and interact with the growing variety of complex sources of information” (para. 2). In our digital age, acquiring these skills means developing literacy in information and communication technology (ICT), which includes the ability to locate resources, and use them in our everyday lives (Bawden, 2001).

In the view of Labbo (2006) “every teacher who lives through technological innovations needs to be prepared to negotiate the multiple realities that shape pedagogical decision-making” (p. 205). Such expectations put a major responsibility on teachers to understand and incorporate the acquisition of multiple literacies using various teaching practices. If our youth are to be prepared to be active and viable citizens of the future they must be able to make meaning from a variety of sources and be able to communicate that knowledge to a variety of audiences. In youth culture, engaging with digital media, including that which is both consumed and created by students, is a major part of life (Rideout, Foehr, & Roberts, 2010).

While some researchers have called for a major overhaul of fundamental teacher beliefs towards instructional strategies to develop literacy fluencies for most youth (Graf, as cited in Sensenbaugh, 1990), other researchers have noted that educators often struggle to integrate the new literacies into their curricula. Teachers perceive limited access to hardware and software, and many feel inadequately prepared to use technology regularly in the classroom (Tierney, Bond, & Bresler, 2006). Some teachers question the legitimacy of using the Internet or other digital tools as literacy activities while literacy standards that are tested emphasize more traditional understanding and application of reading and writing. The current project assumes

that educators have a responsibility to understand (and use) new technologies on behalf of students and that digital fluencies can be developed if educators change their fundamental beliefs toward these alternatives.

### **Reading and Listening in Literacy Development**

Books on tape are often used in classrooms as resources for literacy development, especially at the elementary school level. In one of the earliest examples of research on this practice, Chomsky (1978) demonstrated how listening to stories on tape players broke down students' anxiety about reading. Interesting stories in an audio format were provided for students to listen to repeatedly as they followed along with the text. The repetition of listening as well as following along with the text became a memorization method and not only increased reading fluency scores, but built self-confidence in the students so that later they picked out their own books to read. Books on tape gave students "an access to reading that they had not managed to provide for themselves earlier in the game" (Chomsky, 1978, p. 296). In Chomsky's article, one of the salient features was the high number of repetitions for each read-a-long.

For many years, combining reading and listening has proven to be an effective strategy to improve reading performance, but not without contextual considerations. McMahon (1983) conducted studies with first and third graders as they read along while listening, to determine the children's ability to process information from more than one source at a time. Students performed reasonably well at a rate of 35% faster than their own reading rate, but performance (in detecting discrepancies between the written text and the voice on tape) was found to be associated with grade level.

The rate at which an audio story is played may also be a factor in comprehension as Neville (1975) discovered in studies with middle school children. The best results for coordination of reading and listening were found when the rate of the audiobook matched the child's own oral reading rate. Given three rates of aural reading, comprehension decreased as the rate increased in groups that listened to text while reading, but an interesting finding was that for groups that had no text to read, comprehension remained the same across all three rates. Not only should these results call into question the benefit of tapes that are available commercially, which typically are produced at reading rates above grade levels, but the findings may offer promise for literacy programs using a "listening only" protocol.

The act of following the text while listening to an audiobook has shown benefits beyond improved test scores (Byrom, 1998). Byrom noted that the modeling of good reading can motivate and engage students with its intonation and nuance. For example, students felt that they can read books above their level, or "just like the rest of the class", because they can avoid the burden of decoding text. Audiobooks that have better "listenability" attract students for a variety of reasons, and can be preferred over silent reading in the regular literacy time period (Toppings, 1996).

As digital technologies advance, the use of tape players and even CDs is becoming obsolete. With the invention and standardization of the MP3 format in the mid-1990s (Fraunhofer IIS, 2010), audio files have become more accessible and convenient to use, providing alternatives to tapes and CDs for students and their families. Regarding literacy development, one of the most appealing aspects of MP3 players for students is the exposure to excellent reading styles by "readers" in a classroom setting, e.g., for English language learners (Patten, 2007), or at home where many families can't find time to read together (Vary and

Kervin, 2007). Skouge, Rao, and Boisvert (2007) remarked that the digital format can “provide models for parents of how to read aloud with their own children” (p. 8). These researchers also believe that audiobooks are ideal for diverse learners and provide a resource for immigrant families because books are costly and sometimes difficult to obtain.

Considering the multiple benefits of using MP3 audiobooks helped us shape the purpose of this study: (a) to investigate how elementary public school students might benefit from the availability and use of free audiobooks obtained from various sources on the Internet, focusing in particular on improving reading fluency and developing their ICT skills, and (b) to develop pre-service teachers’ competence to use digital tools to develop literacy, promoting an understanding of how using contemporary digital devices and formats can expand the possibilities for teachers. Just as students are no longer confined to learning via reading the printed text of a book, teachers no longer need to be restricted to teaching within such limitations. Thus, we aimed to broaden teachers’ conceptions of literacy from reading a book to include ‘listening’ to a book, helping them enrich and extend the public school curriculum beyond the classroom walls.

### Methodology

The research team consisted of a professor of education and four graduate level pre-service teachers (also referred to as student-teachers) in an action research course. Action research was particularly well-suited as a research methodology because of its practical applications, and its exploratory and reflexive nature. For example, Mills (2011) provides a good working definition for our purposes: Action research is a systematic inquiry that gathers information “with the goals of gaining insight, developing reflective practice, effecting positive changes in the school environment (and on educational practices in general) and improving student outcomes and the lives of those involved” (p. 5). Carr and Kemmis (1986) note that action research is well suited in “reflexive” situations, i.e. the participants and situations have the capacity to change as the knowledge and thinking changes, thus creating a new circumstance. This was an important consideration because the preservice teachers had to work closely with their individual cooperating teachers’ established literacy program, and they adapted their methods according to the student- participants’ experiences and the individual classroom circumstances.

Each preservice teacher recruited up to five student-participants at the elementary schools where he or she was placed for student-teaching. The elementary students were selected in consultation with the classroom cooperating teachers. Different criteria were used at each school because the circumstances varied, but the purposive selection of struggling readers was a project objective. The study occurred in the second half of the year, so all student-participants had experienced the regular reading program since the beginning of the school year.

Various data sources were used to address the two research questions. The first research question addressed the benefit to the student-participants, documenting their gain or loss in reading fluency and the development of ICT skills. To answer this question, we conducted pre/post tests of their oral reading fluency and surveyed both students and parents on the availability of the Internet in the home, and their prior experience with using audiobooks in the MP3 format. Journals kept by the student-teachers recorded how the student-participants were developing their digital skills as their projects unfolded.

The second research question addressed how this project would increase the competence of preservice teachers to use digital tools for literacy development. To answer this question, daily

logs were used by the preservice teachers to document the frequency and patterns of the student-participants using the MP3 players. The journals (mentioned above) were used by the preservice teachers to capture the instructional strategies they employed during the project, their reflections and their 'slice of life' observations of the student-participant experiences.

Each preservice teacher was given five SanDisk Sansa Clip Plus MP3 players to distribute to elementary students. The Sandisk Sansa Clip Plus was specifically chosen because of its low cost (\$40) and numerous features (4 GB, voice recorder, expandable storage, AM/FM radio). The student-teachers loaded the devices with several audiobooks from the public domain or the public library, and helped the student-participants navigate through the player. Audiobooks from the public domain were targeted because they cost nothing and could be shared without violating copyrights.

The team developed a website to provide resource links to websites that host free audiobooks and to provide tutorials on using the MP3 players. For the first several weeks, the student-teachers downloaded the audiobooks for the students and focused on keeping the students comfortable with the new project and resolving any difficulties. The student-teachers showed the student-participants how to use the website they created and, at the appropriate time, they taught the students how to download audiobooks from the Internet themselves. Each student-teacher had different strategies on how to teach about finding books and downloading them. Student-participants were asked to listen to any audiobook for at least 15 minutes a day on a voluntary schedule, which could occur at school or at home depending on the circumstances.

Coached to take the reflexive approach of action research, student-teachers adapted their methods according to boundaries set by their cooperating teachers, and their evolving interactions with their student-participants. Over the course of the project, the student-teachers met with their supervising professor for 2 hours each week to clarify procedures, compare methods and share concerns. Since each project was unfolding in distinctly different ways, the group determined that the most consistent measure was the pre/post reading scores over the length of the project period. Each student-teacher provided a summary report of his/her experience at the end of the project. The summary reports provided some details and reflections based on the daily or weekly journals. The following section draws from those reports to describe 'slice of life' highlights of each student-teacher's unique approach in his /her negotiated classroom circumstance.

## **Student-Teacher Stories**

### **Jessica's Student-Participants and Context**

Jessica worked with five fourth-grade students, two girls and three boys, identified as emerging readers by their previous scores on the Dynamic Indicators of Basic Early Literacy Skills (DIBELS). The students were struggling in reading even with extra support and intervention practices in place each day. Jessica selected six audiobooks that she downloaded from the public library system. She chose the audiobooks to complement the books that were available in the classroom so that the student-participants could occasionally read along.

In the first week, many of the student-participants continually showed up early to school to listen to their audiobooks, and would also opt out of recess to sit in the classroom and listen while reading their stories. Student 1 arrived to school each morning with a smile eager to tell Jessica about what was happening in his story. Student 2 would often tell Jessica how "sick"

(awesome) his story was, and how excited he was that he could actually read such a difficult book. Student 3 mentioned that she had always wanted to read some of these books but they had always been above her reading level. Now, Student 3 was excited that she could read any story she wanted because the audiobooks helped her to learn the words that were too hard to read on her own, and she could read the same books as her friends.

Jessica often held whole group morning meetings at which student-participants were able to share with each other their likes and dislikes and learn from each other. At one of the meetings some of the students stated a concern that the narrator read too fast and they were not able to keep up as they turned the page. In answer to this problem one of the students shared his own solution—he found a feature on the MP3 player that allowed the listener to slow down the narration speed. Jessica used the recording function of the MP3 player to record each student reading from his/her book, and then would have the student listen to his/her own recording so that the student was able to reflect upon the read-aloud. By identifying something about their reading that they liked and something that they wanted to improve upon, the students were able to be active participants of their own reading progress.

Over the one month intervention, Jessica's students increased their reading fluency by an average of 34 words per minute, with three students gaining over 40 words per minute. Overall, every student that Jessica worked with stated that listening to audiobooks while reading increased their reading fluency and confidence. They felt audiobooks showed them how certain words should be read, as well as what fluent readers sounded like. They found a new interest in reading because they were able to be in control of the process and they felt like successful readers. Unfortunately, the audiobook websites were blocked on the school computers, so students were unable to receive the support they needed to search and download books on their own. Although a few of the students began browsing online and picking their own books, overall, the difficulties of downloading books at school proved to be an obstacle to the project goal of developing a degree of autonomy. However, each student expressed the desire to continue to listen to audiobooks in the future, and use the research team's website about how to obtain audiobooks at home from various websites, including the public library.

### **Callie's Student-Participants and Context**

In preparation for the project, Callie worked with her cooperating teacher to choose five second-grade students, three boys, and two girls. These young readers, ages seven and eight, were still at the stage of decoding words. All students were below grade level according to their DIBELS scores. Each student had a specific developmental reading obstacle, such as needing better phonemic awareness, reading too fast, adding sounds at the end of word, or being overly anxious.

Callie was particularly interested in developing the student-participants' ICT skills. All five students had computers and the Internet at home, so she planned to use the public library system to download audiobooks. However, most of the audiobooks available were at higher reading levels than the students could comprehend, and the school blocked the public library software, so she switched to finding audiobooks at the website *Lit2Go*.

The students were asked to listen to their audiobooks at least 15 minutes a night and keep a log in their homework folder. Callie met with the students once a day for 10 minutes to discuss their experiences and she kept a personal journal to document these conversations. Callie learned that over one weekend, a student listened to his audiobook for three hours. He was so excited

about the MP3 device that he did his chores around the house while listening to stories. Another student found that her most comfortable place to listen to audiobooks was under her bed. During the first two weeks of the project the students expressed a desire for more stories as they were quickly repeating the stories, so Callie made plans to teach them how to retrieve books themselves.

In the third week Callie showed them how to use the Internet to download the audiobooks onto the MP3 players. She spent time with each student on how to choose, download and store an audiobook. She also showed them how to print off the written story from the *Lit2Go* website. Callie assigned the students to download an audiobook at home over the weekend and draw a picture about the story. Although the students struggled with the downloading task at home, Callie persevered with the instructions at school, so that by the end of the fourth week each student was successful with little guidance from her.

In the final week, Callie interviewed the students about their experience. Student 1 told her how one of the stories made him scared because of the background music, which was a great perspective on the theatric potential of audiobooks. Student 2 commented that listening to the books at home kept her from getting bored; she had more confidence and her "regular" reading was faster. As for Student 3, Callie observed an increase in responsibility in other parts of school, which may be coincidental, but still notable. Student 4 wanted the printed text so she could read along to focus her attention. Student 5 wished he had more time throughout the school day to listen to the stories and practice downloading the books.

The student-participants showed remarkable skills in using the Internet and downloading books onto the MP3 players by the end of the project. In addition, Callie's students increased their reading fluency by an average of 17 words per minute over the one month intervention. All the students Callie worked with showed increased confidence in reading and expressed a desire to continue to use MP3 players for listening to audiobooks. Although Callie met some resistance at her school as she implemented her intervention, she felt she achieved her goal of empowering students to use MP3 devices as a reading alternative to the traditional written texts.

### **Jay's Student-Participants and Context**

Jay consulted with his cooperating teacher and the school's reading interventionist to select five 3<sup>rd</sup> grade students who were all below benchmark on their DIBELS reading fluency scores. The following criteria was set forth for students to be a part of Jay's project: (a) they must listen at least fifteen minutes every day (with the weekends being optional) and must keep track of their time on a listening/reading log to be signed by a parent/guardian verifying the time, (b) they must write a two-three sentence summary after listening (reading along was optional), and (c) they must bring the folder containing the log sheet and the summary sheet as well as the MP3 player to school every day. It was decided that all of the MP3 players would have the same audiobook downloaded on them, *Alice in Wonderland*, available in the public domain, which was approximately three hours in length. The students were also given a printed copy of the book to read along as they listened.

During the first week, all the students were enthusiastically reporting positive experiences listening and reading along. Students reported listening for 45-70 minutes a day. However, as the weeks wore on, student accountability waned, with students not recording times, forgetting their folders, or not summarizing their reading. At the end of week two Jay sensed the students were becoming somewhat disinterested, so listening to the students' suggestions, he prepared all the

MP3 devices with fairy tales—five of Aesop’s fables—ranging in lengths of 15-45 minutes. The students showed a renewed interest in listening to/reading the stories, indicated by the lively discussions in the group meetings. However, the recording of times and written summaries declined dramatically. Examples of the students’ excuses were “I forgot”, “I didn’t have time”, “I lost my folder”, and “my parents were too busy”.

In week four, the students were given instructions in using the computer to locate audiobooks. The school’s Internet security prevented access to our project’s website, so the students were provided a printed version of the tutorial for downloading the MP3 files, as well as a written list of sites where they could find audiobooks. Following the tutorials was difficult for the student-participants, but each student ultimately had success and expressed great satisfaction. The weekly recorded times once again slipped as all student-participants except one recorded lower listening times. However, all the students listened to their respective stories regularly and were able to provide a verbal summary of the story.

Over the six-week period Jay experienced several disappointments. The students didn’t keep accurate logs or bring their folders to school. Students would not (or could not) summarize their stories. In retrospect, Jay concluded that students’ interest in listening/reading began to drop with the longer audiobooks (e.g., three hours long). Over the six-week time period, Jay’s students increased their reading fluency by an average of over 10 words per minute, the smallest average gain of the four projects described in this study. Jay learned the importance of selecting appropriate level of audiobooks, and maintaining a consistent instructional program. All things considered, the student-participants showed a genuine enthusiasm throughout the project, being very eager to learn new aspects regarding technology, such as locating websites and downloading an audiobook. The level of computer literacy and the ease at which they were able to grasp the mechanics of downloading and sharing files was far above what Jay expected, and was the highlight for Jay in his intervention.

### **Danielle’s Student-Participants and Context**

Of the four student-teacher projects included in this report, Danielle’s methodology was the most structured and controlled, and as such, may also preview the most promising future research agenda. Danielle’s project was comprised of eight students in a second and third grade blended classroom. All of the students were involved in reading interventions and were considered to be reading below grade level. Four second-grade students (one boy, three girls) were the participant group and four third-grade students (three boys, one girl) were the comparison group. Prior to this project’s intervention, the normal routine was that all of the students in the class spent approximately 15 minutes a day in a teacher-directed reading center, in addition to the regular whole class literacy instruction.

Students in the participant group were given their own MP3 player preloaded with an audiobook, selected by Danielle in collaboration with her cooperating teacher. The participant group listened to the audiobooks during their normal reading center time for approximately 15 minutes a day, which allowed them to listen to the entire story during the designated reading period. Replicating the methodology of Samuels’ (1979) repeated readings research, in which participants read the same story at least four times to increase students’ fluency and decrease their errors, Danielle employed a method of “repeated listening” to each audiobook. Thus, the participant group listened to each story at least 4 times over a one-week period. The students were not given books to follow along with and were just asked to listen. Every week for four

weeks, a new audiobook was given to the students to listen to. The comparison group continued with their normal teacher-directed reading time and never used MP3s with audiobooks.

Over the course of the study both the participant group and the comparison group were tested on a weekly basis by the school’s reading specialist using the AIMS tests. The AIMS test is designed to test oral reading fluency and is considered the standard at Danielle’s school. Over the four-week period, Danielle’s students increased their reading fluency by an average of over 16 words per minute. Additionally, the average number of errors by the participant group decreased by nearly 50%, from an average of nearly eight errors per minute to an average of four errors per minute. Danielle’s goals did not include teaching students how to download audiobooks from the Internet. Instead, she focused on what benefits could be attained by employing a “listening only” method during the tightly controlled 15 minute reading period. She reported that all the students in the participant group were enthusiastic. The participating students said they would be more likely to “listen to literature” in their free time if they had an MP3 player. Although they preferred listening to a book rather than reading a book, they would enjoy the option of reading along with a text. Thus, the motivation to read became evident in these readers, who typically would not be interested in reading.

### Student-Teachers’ Collective Results

The individual preservice teacher stories in the above section emphasize the qualitative results, while this section will present test score data in the tables that follow. Prior to the intervention, in order to gauge the students’ technology resources at home, a survey of student-participants indicated that most of the students’ households had access to a computer as well as the Internet. However, of the 19 student-participants, only 8 (42%) owned an MP3 device. Nearly all of the student-participants (17 out of 19, 90%) had used audiobooks in the past, but only 2 of 19 (11%) of the students used an MP3 player to listen to audiobooks. Students were not asked specifically *by what means* they had previously listened to audiobooks, but we can reasonably assume that their prior experience came from a classroom listening station typical of many school reading programs, i.e., books on tape. The majority of parents had heard an audiobook previously, but only 4 of 19 (21%) reported that they knew any websites where they could download an audiobook. Furthermore, only 1 of the 19 (5%) of the parents had ever downloaded an MP3 audiobook.

Three preservice teachers (Jessica, Callie, and Jay) used pre- and post-intervention DIBELS scores as indicators of reading fluency (see Table 1). All of the students improved their scores, including three students in Jessica’s group who improved by over 40 words per minute. These scores cannot be attributed solely to the MP3 intervention, but it’s encouraging that the intervention was not a disruptive element, which could have hindered reading improvement, resulting in scores that might have decreased.

The scores of Danielle’s four student-participants are compared to a comparison group of four students in Table 2. The results show that the student-participants (second-grade) improved much more than the comparison group (third-grade), but because they were a grade lower, and their pre-intervention scores were much lower at the beginnings, they had more “room for growth” so to speak. However, one notable comparison is in the number of errors. The average errors for the participant group decreased, while the average errors for the comparison group stayed the same.

Table 1

*Students' Pre-/Post-DIBELS Fluency Scores (in words per minute)*

	Jessica's			Callie's			Jay's		
	Before	After	Gain	Before	After	Gain	Before	After	Gain
Student 1	38	64	26	52	72	20	83	96	13
Student 2	52	94	42	58	71	13	45	51	6
Student 3	62	109	47	35	52	17	105	119	14
Student 4	83	94	11	29	49	20	102	113	11
Student 5	84	125	43	54	69	15	90	99	9
Average	63.8	97.2	33.8	45.6	62.6	17	85	95.6	10.6

Table 2

*Danielle's Students' Pre-/Post-Fluency and Error Scores (AIMS)*

Participant Group	Fluency			Errors		
	Pre	Post	Gain	Pre	Post	*Diff.
Student 1	31	53	22	11	4	-7
Student 2	17	42	25	9	2	-7
Student 3	46	50	4	6	5	-1
Student 4	47	62	15	5	5	0
Average	35.25	51.75	16.5	7.75	4	-3.75
Comparison Group	Pre	Post	Gain	Pre	Post	*Diff.
Student 1	96	104	8	3	4	1
Student 2	84	85	1	2	2	0
Student 3	59	65	6	9	5	-4
Student 4	67	78	11	4	5	1
Average	76.5	83	6.5	4.5	4	-5

\* A negative value indicates improvement

## Discussion

This study included four different settings, in four different schools, and spanned three grade levels (Grades 2, 3, 4). Over the course of the project period, the student-teachers met with their supervising professor for two hours each week to clarify procedures, address concerns and share successes. In the last of the weekly meetings, the student-teachers were asked reflect on their experience, notes and summaries, and to identify some commonalities among their projects. Several broad themes emerged from the discussion, which included the following: (a) an overall improvement in student-participants' confidence in reading, (b) student-participants reported numerous positive experiences listening to audiobooks, often exceeding the minimum daily target, (c) both student-participants and pre-service teachers increased their awareness of the

opportunities available through the use of technology for literacy, developing their 21<sup>st</sup> century skills in digital literacy. These optimistic results were countered by the difficulties the student-teachers had using their school computers for this intervention, because for Jessica, Callie and Jay, the schools blocked websites and the downloading of files, even from the public library system.

Each preservice teacher received student-participant feedback that indicated an overall increase in each student's confidence in their reading capabilities. For example, one of Callie's students responded when asked about her favorite part of the project, "I can read quicker and easier now." This student's parents also remarked on their daughter's experiencing an easier time with reading at home. Many student-participants felt more comfortable reading books above their typical reading level. In addition, all students increased their DIBELS/AIMS scores, although we are not making the claim that the increase was a direct result of using MP3 players.

In all cases the student-participants viewed using MP3 players as exciting and fun, and by increasing their reading levels the students felt empowered. Some students remarked on the enjoyment of listening to a story rather than listening to music on the players, or expressed their preference for listening over reading. Clearly, the use of technology was a motivational factor from beginning to end, and must be considered as a factor contributing to the student-participants' willingness to participate and improve. Most students were successful at using technology to download the audiobooks and put them onto MP3 players, and seemed eager to use their new knowledge to access and download audiobooks on their own.

Action research allowed the preservice teachers a degree of flexibility to adapt their research according to events unfolding within the classroom. This reflexivity was necessary because of the sensitive nature of literacy development (e.g., veteran teachers have developed "tried and true" methods they are sometimes reluctant to relinquish). In addition to developing their research skills, the preservice teachers increased their capacity and understanding of what it takes to incorporate technology into their own teaching programs. Selecting the level of audiobooks, estimating the time needed to teach the skill of obtaining audiobooks, and developing the support (by teachers, parents, social network, etc.) to help younger students use technology effectively were capacity-building lessons for the student-teachers. As previous literature has suggested, having access to technology is insufficient without technical know-how (Tierney, Bond, & Bresler, 2006).

Teachers can develop an arsenal of digital literature options with the first step being to accumulate a classroom library of MP3 audiobooks, and investigate the MP3 audiobook resources at the public library. Audiobooks can be leveled according difficulty as well as reading speed. Whole groups of students can listen or read-a-long instead of small numbers of students being limited to a classroom reading station. Stories from a text could be read by the teacher at school, and students could take the audio version home to be shared with their parents. Distribution is easily handled by means of file sharing from a computer to an MP3 device. Audio files can be distributed to students' own MP3 devices or smartphones, or made available on a classroom webpage for parents to download. Space limitations for storage of scores of books is a non-issue. These few suggestions are elegant solutions for cash strapped schools and backpacks laden with textbooks. To scale up this approach to include whole classrooms, and to track its specific effect on reading scores will involve a collaborative approach, a reorganization of curriculum, and some modest funding.

The mechanics of reading are well understood, but what potential is there to improve and support reading with a robust audiobooks program that emphasizes listening? For example, not

only can higher levels of literature be experienced, but in some circumstances, comprehension while listening (only) may be nearly equivalent to listening while reading (Neville, 1975) or listening might be preferred to reading (Topping, 1997). Danielle's well-controlled project using repetition in "listening only" offers interesting future research possibilities. Her students made substantial gains in fluency, and reduced their errors just by listening 15 minutes a day. Nonetheless, a listening only method such as the one employed by Danielle has to be seen as enrichment rather than a replacement of typical reading programs.

The use of MP3 players to listen while reading along replicates past methodologies in reading research, but it personalizes the access to literature in a 21<sup>st</sup> century manner. The mobility of an MP3 device can provide more contact time with literature, at higher levels, and be accessed or used 'anytime', 'anywhere'. An MP3 audiobook is easily replicable and sharable, especially using texts from the public domain. Teachers, who (understandably) are oriented to the printed world of books, need to allot a "space" in their curriculum for virtual books as well. Most importantly, if teachers teach their students how to access resources by themselves, the source of knowledge becomes decentralized and decoupled from a singular teacher or school (Johnson, Adams, & Haywood, 2011). By employing creative instructional strategies, teachers can leverage the potential of the MP3 audio format and the ubiquity of audio players to develop literacy and skills that are reflective of ICT expectations in a 21<sup>st</sup> century education.

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