

Effect of Music on Reading Comprehension of Junior High School Students

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This quantitative study was an investigation of the effect of lyrical music on reading comprehension by adolescents. Existing research has produced results that range from concluding such distraction may be detrimental to finding it could be helpful. The reading comprehension subtest of the Gates-MacGinitie Reading Tests, 4th edition (MacGinitie, MacGinitie, Maria, & Dryer, 2000) was administered to 334 7th- and 8th-grade students. Testing was conducted under two conditions: a nonmusic environment, and with accompanying music comprising *Billboard Magazine's* (2006) top hit singles. Following the music portion of the test, students completed a survey to assess any preference for or against listening to music while studying. Results of an analysis of variance showed performance declined significantly when listening to music. A point biserial correlation illustrated a pronounced detrimental effect on comprehension for students exhibiting a stronger preference for listening to music while studying. Results are important for understanding influences on study habits, with the goal of helping educators and school psychologists design support systems tailored to the needs of adolescents.

Keywords: reading comprehension, music, popular lyrical music, junior high school students, adolescents

One of the challenges of modern educational reform, as posited in scholarly literature (Luttrell & Parker, 2001; Rothstein & Jacobson, 2006) and the popular press, is to improve the basic literacy of children and adolescents. However, scores on national achievement tests indicate students in recent years did not perform significantly better than did students in past decades (Schneider, 2007). This is the case despite numerous attempts by educators to improve student reading and writing through approaches that have ranged from changing the physical conditions of the classroom (Hong, Milgram, & Rowell, 2004) to increasing students' motivation (Irwin, 2003) or their capacity for self-regulation (Raffaelli, Crockett, & Shen, 2005), to using music to promote adolescent identity development (Boehnke, Münch, & Hoffmann, 2002).

The purpose of the present study was to explore what impact, if any, listening to popular lyrical music while concurrently performing a cognitively complex task might have on students' comprehension of study material, and thus indirectly on basic literacy. Students often claim they can study effectively while listening to music (Patton, Stinard, & Routh, 1983). At the same time, concerned educators and parents intuitively believe listening to music might create a distraction that could interfere with comprehension. In fact, research results are mixed. Oswald, Tremblay, and Jones (2000) found a significant deterioration in reading comprehension when distracters such as music or speech were present, whereas Hallam, Price, and Katsarou (2002) reported a beneficial effect. Boyle and Coltheart (1996) and Pool, Koolstra, and Van Der Voort (2003) claimed no clear effect of music or verbal noise on performance. The present study addressed these issues by testing three hypotheses: (a) a difference exists between reading comprehension scores completed in the environment without music and scores obtained with lyrical music playing in the background; (b) a gender difference exists regarding the reading comprehension scores completed in

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the environment without music and scores obtained with background music; and (c) a relationship exists between degree of preference for studying with music and scores obtained on a reading comprehension test completed in either the environment without music or with music playing in the background.

Background

Researchers who have investigated the effects of sound on comprehension have approached the problem from a variety of perspectives (Weinstein & Weinstein, 1979). A review of relevant literature reveals two opposing theoretical perspectives with respect to the question of whether background music necessarily distracts from cognitive tasks. Although many empirical studies appear to support the position that distraction is likely, at least to some extent, the opposite perspective thus far has not been conclusively discounted.

According to neuropsychological research, when an individual listens to music, the brain processes the lyrics and melodies independently (Besson, Faïta, Peretz, Bonnel, & Requin, 1998). This lends support to the notion that not only are these two types of listening competitive functions, but they are likely to compete with additional demands on the brain, such as those posed by studying. Similarly, the limited capacity model (Broadbent, 1958) has been cited as a framework to explain the negative effects of competitive tasks on concentration. Proponents of the limited capacity model argue that attempting to carry out two tasks that draw on inherently limited cognitive resources will work to the detriment of one or both (Pool et al., 2003). Pool et al. argued that attempting to accomplish two tasks simultaneously exceeds a person's capacity for attention, while others contended that the decisive factor is not whether the cognitive capacity is exceeded, but rather that performance declines when both tasks involve processing the same types of information (Bourke, Duncan, & Nimmo-Smith, 1996).

Various studies of reading comprehension in the presence of distractions have focused on understanding the cognitive and/or emotional processes that occur while listening to music. Oswald et al. (2000) studied the disruptive effects of meaningful and meaningless speech on comprehension. Both types of speech were

found to be equally disruptive, suggesting that distraction by speech may have complex elements, leading to a significant difference between distraction resulting from listening and that resulting from merely hearing. In terms of adolescents studying with background music, the findings by Oswald et al. suggest students may attend to lyrics discriminately, varying their attention when listening to familiar versus unfamiliar lyrics, or to preferred musical artists versus those in which they have less interest.

Many of the relevant studies provide only weak support for the idea that music can be distracting to students. For example, Boyle and Coltheart (1996) investigated the degree to which irrelevant sounds disrupted reading comprehension and short-term memory tasks, and found lyrical as well as instrumental music affected performance of both types of tasks negatively, but not significantly. Paulhus, Aks, and Coren (1990) found a clear correlation between visual and auditory distractibility, but no relationship between either type of distractibility and performance. These researchers suggested adolescents' responses to music may reflect the emotions invoked by music, rather than serve as proof music is a direct distraction.

Pool et al. (2003) did not find support for the hypothesis that music interferes with learning when they looked at soap operas as the disruptive variable in a study of 8th-grade reading comprehension. They reported that when students only heard the audio of an episode, they were not distracted, suggesting sound poses less competition than does visual imagery during comprehension tasks. This raises the question of whether the type of music selected influences the extent to which the music itself arouses attention. Furnham and colleagues also failed to support this hypothesis through studies that produced conflicting results. In an early study, TV was found to significantly distract from performance (Furnham, Gunter, & Peterson, 1994), whereas studying with music as the distracting element produced no positive or negative effects on performance when compared with performance in quiet conditions, even when the music varied in complexity (Furnham & Allass, 1999). Participants were college students, who might be expected to be less easily distracted than adolescents. However, in subsequent research, also with college students, Furnham and Strbac (2002) compared the difference in dis-

traction between music and noise in the background while participants attempted a reading comprehension task and found both music and noise were equally distracting.

While most research has focused on determining the disruptive effect of music and other sounds while studying, some educators have explored the potential of music to enhance cognitive performance. Savage (2001) found evidence that listening comprehension and reading comprehension involve similar cognitive processes, and posited this similarity implies the tasks are not necessarily competitive, thus supporting the notion that music could be educationally enhancing. The typical approach of such research has been to introduce different types of music as stimuli under experimental conditions. For example, Hallam et al. (2002) studied students' perceptions of the characteristics of background classical instrumental music—pleasant or unpleasant—while they performed reading and computation tasks in a classroom environment and concluded that music influenced performance through arousal and mood, rather than as a result of distraction. Although the study was conducted in a classroom, the authors acknowledged that the use of music in the home may be even more important to students' learning, and suggested parents take an active role in monitoring music when their children are engaged in learning activities at home. Carlson, Hoffman, Gray, and Thompson (2004) took this premise a step further by using relaxation exercises accompanied by music to determine whether reading performance could be improved in a 3rd-grade classroom. The study, which used a vibroacoustic chair that allowed the student to feel the vibrations of the music, did indeed demonstrate that relaxation with music can improve reading performance.

A body of research on homework sheds light on the students' perspective. Hong et al. (2004) offered a conceptual model of homework organized along dimensions of motivation and preferences, including those related to surroundings, including auditory, visual, tactile, kinesthetic, and mobility qualities, and reported that motivated and persistent students expressed a preference for background sound while doing homework. Students with weaker motivation and a tendency to delay doing homework preferred a quiet, dimly lit environment. Patton et al. (1983) reported somewhat different findings.

These researchers assessed student perceptions of the effects of TV, radio, or stereo on the degree of distraction from reading, writing, and math tasks, and found nearly all participants reported that no matter what the task, they usually had the TV, radio, or stereo playing while they did homework. The students preferred a quiet room for a reading assignment, but not necessarily for a math assignment or assignment involving both reading and writing. Patton et al. found a clear difference between student perceptions of the effects of distractions and the decision to do homework with or without such distractions. Students acknowledged that a quiet room probably would be a better environment, but still preferred doing homework where a TV, radio, or stereo was on, or where others were present. Stålhammar (2003), who studied the spatial distinctions adolescents make during music listening experiences, found students preferred to listen in an individual space (i.e., alone or with headphones, rather than with peers) when they were feeling strongly about something, or when they wanted to relax or think, lending support to the idea that these student view music as enhancing their study habits.

Little research is available that clarifies possible gender differences in the context of the effects of music on academic performance, although a great deal has been written about the influence of music on adolescent identity development and the role of popular culture in that development (Lowe, 2003), as well as the influence of friends' tastes and other social factors on music preferences (Hurtes, 2002). One area of research in particular, that focused on self-regulation, holds relevance for the present study. Raffaelli et al. (2005) found that girls had better self-regulatory ability than boys, and that this ability persisted from age 4 to 13. Self-regulation in the form of voluntary reading habits has been linked to female socialization practices that support reading and sharing books with others, and to male socialization practices that link mothers, rather than fathers, with reading considered to be a girl's thing, not a boy's thing (Irwin, 2003). Thus, presumably, girls would have a stronger ability than do boys to regulate their study habits and to determine what could distract them and to avoid such distractions. Adolescents of both genders reportedly are more likely to listen to music than to read, although both activities have been

shown to be associated with self-esteem and social identity. Particularly for boys, peer identification is a critical factor often signaled by music preference (Tarrant, 2002).

In sum, while empirical studies of the effects of music as a distracter on reading comprehension performance are limited, a small body of researchers has begun to establish some parameters for the study of this relationship. Most research in this area has proceeded from the assumption that some deterioration in reading performance will occur when distracters are present; however, researchers are beginning to realize that young people may not be distracted to the same degree or in the same way as older adolescents and adults. To clarify this issue, the present study focused on junior high school students. Existing experiential studies have included a variety of variables (i.e., music as well as different types of noise), and performance tasks of varying degrees of difficulty (e.g., homework, preparing for exams, writing, math, visual search, short-term memory, and recall). When music is examined, it is typically instrumental rather than lyrical, and thus not the music popular with today's youth. The present study attempted to use the music most likely sought out and listened to by adolescents today and assessed their preferences for the specific music selections. Moreover, measurements used in most of the research reviewed tended to be subjective in nature (i.e., interviews, diaries, and self-reports). The present study administered a standard test of reading comprehension to determine effects of lyrical music on learning.

Methods

Participants

Data for this study were obtained from 334 7th- and 8th-grade students. Gender was fairly equivalent in representation, and included 172 boys (51.5%) and 162 girls (48.5%), of which 198 (59.3%) were in the 7th grade and 136 (40.7%) were 8th graders. Students were selected from five public junior high schools in southwestern Arizona. Of the participating students, 64.6% were Hispanic, 30.5% were White, 2.8% were Black, 1.0% were American Indian, and 1.0% were Asian; this ethnic distribution reflected the district's student population

at large. All students in the study were regular/general education students and were proficient in speaking, reading, and writing English (according to IDEA Proficiency Test and Arizona English Language Learner Assessment scores) to rule out limitations of English language learners. Students with hearing deficits (as indicated in annual school health examinations) were not included in the study.

Instrumentation and Materials

The students were assessed with the reading comprehension subtest of the Gates-MacGinitie Reading Tests, fourth edition (GMRT-4; MacGinitie et al., 2000). Reading comprehension test scores were chosen as the dependent variable to most closely represent the outcome of interest (i.e., students' ability to acquire and process new information). The reading comprehension subtest is available in alternate but equivalent forms (i.e., S and T). Each form contains 48 questions pertaining to 11 prose texts that vary in length and span a wide range of content chosen from a variety of published sources deemed appropriate for, yet not familiar to students at the grade levels for which the test was developed. Students were asked to read a short narrative or expository text and answer a few multiple-choice questions (with 5 choices per item). The test was administered by the researcher under standard conditions, including a 35-min time limit.

Estimates of the GMRT-4 alternate form's reliability using the Kuder-Richardson Formula 20 (K-R 20) are high for total test scores and range from 0.74 to 0.87 for the reading comprehension subtest. The GMRT-4 has strong internal consistency levels for both the total test and reading comprehension subtest, with coefficient values of 0.90 or higher (Johnson, 2005). Content validity was established through careful item development, including statistical analyses with the Mantel-Haenszel Measure of Differential Item Functioning, and consultation with an expert panel to eliminate gender and ethnic bias (Flippo & Caverly, 2008). Additional technical information can be obtained from the publisher (MacGinitie, MacGinitie, Maria, & Dreyer, 2008).

A brief survey of student study habits and music preferences, developed by the researcher, was administered following the session in

which music was played. Participants were asked to rate the degree to which they appreciated hearing each of the nine songs played, using a Likert-type scale ranging from 5 = *strongly liked* to 1 = *strongly disliked*, as well as to indicate a general preference for studying with (or without) music. A pilot survey was administered to 52 7th- and 8th-grade students prior to the experiment. The students were randomly chosen from two homeroom classes in two different junior high schools and were asked to read and respond to the 11 items on the survey; they did not hear the music selections. Results of the pilot indicated that of the 52 students, 41 (79%) reported they liked to listen to music while studying. When asked about preferences for specific music listed in the survey, a majority (37, or 71%) indicated they did enjoy listening to those music selections (i.e., they chose 5 = *strongly agree* or 4 = *agree*). These findings are consistent with research finding that most adolescents study with music playing in the background (Patton et al., 1983). The fact that most of the students in the pilot reported liking the musical selections listed in the survey supported the supposition that this type of music is typically listened to by these students.

The music that was played in the background during the study sessions consisted of top hit songs listed in *Billboard Magazine* for the week the study was conducted. The top hit 100 singles reflect sales and the number of times songs are played on national radio stations. The decision to use top hit music, rather than a specific genre of music, was based on the assumption that participants most likely would be aware of and familiar with the selections, whether or not they reflected top hits played by local radio stations or the participants' personal tastes for such music. The top songs chosen from the *Billboard* charts were very similar to those listed in other top charts, such as MTV, Rick

Dees Weekly Top 40, and American Top 40 with Ryan Seacrest. The 9 songs chosen for the study (Table 3) were actually from the top 20 on the designated charts. Songs chosen were screened for appropriateness and did not contain fowl language or explicit lyrics.

Data Collection Procedures

Raw scores from the standardized reading comprehension subtest were obtained during study hall periods, under two different environmental conditions: (a) a typical (nonmusic) study hall classroom, and (b) the same room, but with lyrical music playing in the background at a preset volume. Given that the instrumentation included two parallel forms of the reading comprehension subtest and two environmental conditions, the participants were randomly assigned to one of four groups. Each group participated in the study over 2 days, with a mean time of 1 day between study sessions, as a counterbalancing technique. The rationale for conducting the two sessions a day apart was to reduce any effects caused by differences in students' mood, anxiety level, or response to other factors in the environment. Table 1 presents the schedule for all four groups, showing which environment they experienced and which form of the reading comprehension subtest they took on each day.

During the study session in which music was played in the background, nine songs were played over the duration (35 min). The music, previously recorded on a single disk by a professional disk jockey, was played via a Bose Wave Radio/CD unit over the school's public address system at a preset volume of approximately 75 decibels. This volume was selected after careful consideration of prior research, which intimated that more intense noise was associated with greater difficulty in the completion of a task. The purpose of the study was not

Table 1
Schedule of Experimental Sessions

Day	Group 1	Group 2	Group 3	Group 4
1	Form S No music	Form S With music	Form T No music	Form T With music
2	Form T With music	Form T No music	Form S With music	Form S No music

to test the loudness effect, but to examine the content effect of lyrical music; hence, the selection of the moderate playback level of 75 decibels. The volume was monitored with a sound level meter.

The instrument was administered by a certified school psychologist with 20 years of experience as a teacher and school psychologist, working on a doctoral degree. The evaluator obtained training with the GMRT-4 via a workshop, and was familiar with the GMRT since its second edition. Informed consent was obtained from all participants' parents. The consent introduced the study and examiner, provided background information and procedures, explained that the study was voluntary, listed any potential risks or benefits, stated that no compensation would be given, clarified confidentiality, gave contact information for questions, and was signed by each student and his or her parent(s) prior to the study. The teachers and evaluator also provided students with information prior to testing, and explained the outcomes of the study afterward.

Results

A within-subjects analysis of variance (ANOVA) was used to compare how students performed in the two environmental conditions. A one-way ANOVA was used to compare difference in reading comprehension scores between males and females under both study conditions. Finally, a series of point biserial correlations was performed to address the relationship between students' preferences and reading comprehension performance.

Across all four experimental groups, the music environment score was lower than the non-music environment score ($M = 26.49$ vs. $M = 30.56$; Table 2), and this difference was

significant, $F(1, 332) = 193.60, p = .001$ (Table 3). Overall, nearly three-quarters of the students (74.5%) did less well on the reading comprehension test while listening to lyrical music in the background ($M = -4.07, SD = 5.35$), compared with students in the quiet environment. Therefore, the hypothesis that a difference exists between reading comprehension scores in the environments with and without music was accepted.

Girls had a greater decline in scores under the music environment compared with the nonmusic environment ($M = -5.01$) than did boys ($M = -3.20$; Table 2), and this difference was significant, $F(1, 332) = 9.72, p = .002$ (Table 4). Therefore, the hypothesis that a gender difference exists regarding reading comprehension scores in the environments with and without music was accepted.

The students' total music preference score was negatively related to reading comprehension in the nonmusic environment, $r(332) = -.12, p = .03$ (Table 5). However, the total music preference score was not correlated with the reading comprehension difference score (music vs. no music), $r(332) = .05, p = .34$, or with the reading comprehension score in the music environment, $r(332) = -.09, p = .10$. Therefore, the hypothesis that a relationship exists between degree of preference for studying with music and reading comprehension scores in environments with and without music was partially accepted. Females had a greater preference for listening to music when studying than did males ($r_{pb} = .28, p = .001$). Females also had significantly higher ratings for 7 of the 10 individual music preference items, compared with the ratings by males. In addition, students who were in more agreement with a statement asking if they liked to listen to music while studying had lower reading comprehen-

Table 2
Difference in Comprehension Based on Presence of Music, Descriptive Statistics

Variable	Gender	<i>n</i>	<i>M</i>	<i>SD</i>
No Music Score	Male	172	29.70	11.00
	Female	162	31.47	9.24
	Total	334	30.56	10.21
Music Score	Male	172	26.50	11.14
	Female	162	26.46	10.26
	Total	334	26.49	10.70

Table 3
*Difference in Reading Comprehension Scores, Based on Presence of Music,
 Within-Subjects Analysis of Variance (ANOVA) Test*

Source	SS	df	MS	F	p	η^2
Condition	2772.94	1	2772.94	193.60	.001	.61
Error	4769.56	332	14.32			
Total	7542.50	333				

sion scores in the nonmusic environment, $r(332) = -.19$, $p = .001$, as well as in the music environment, $r(332) = -.13$, $p = .01$, than did students who reported that they typically preferred not to listen to music while studying.

Discussion

Results of the present study support the assumption that studying while listening to music detracts from the reading performance of adolescents. As such, the findings contribute to the body of existing research, which has produced inconclusive results about whether listening to music interferes with students' study habits. This study was notable because the focus was on adolescents, who have been underrepresented in related empirical studies. It also stands out in that gender differences were included, and the music was deliberately selected to reflect the musical genres popular with the target age group and what they would most likely listen to independently or with friends.

The reading comprehension of three-quarters of the students in this study declined significantly when listening to music, compared with their performance in a quiet setting. The detrimental effect on comprehension of material was more pronounced for students who had a stronger preference for the music used in this study and for listening to music while studying. A striking implication is that these students were unaware of the amount of attention they were

deflecting from the test or of the impact the music had on their mental activities. These students may be so accustomed to reading and studying with music that it does not occur to them they might comprehend better without the background distraction.

Most students who reported a preference for studying with music performed more poorly with and without background music than did those who preferred to study in quiet surroundings. The presence of a small group of students who read at least as effectively while listening to music helps explain why research findings to date have been inconsistent. It is possible these students have developed cognitive strategies that enable them to focus on study tasks despite competing background stimuli. Most students, however, require an intervention to achieve this aim. For example, capitalizing on activities that are popular with adolescents, such as journal keeping, can offer a channel for raising awareness about study habits and monitoring change over time. The powerful influence of the peer group can be harnessed in group interventions to enhance study skills and techniques.

These results support the idea that lyrical music and written text are competing stimuli, as stated by Pool et al. (2003), as well as the theory that people discriminately attend to sounds (Oswald et al., 2000). In the current study, it is possible students discriminately attended to the lyrics, varying their attention depending on whether they were listening to songs and artists they liked or did not like. Further study would

Table 4
Comparison of Music Difference Score, by Gender

Source	SS	df	MS	F	p	η^2
Gender	271.10	1	271.10	9.72	.002	.17
Error	9264.87	332	27.91			
Total	9535.98	333				

Note. Difference = Music environment score versus no music environment score.

Table 5
Point Biserial Correlations for Selected Variables

	No music score	Music score	Gender ^a
Total music preference	-.12*	-.09	.28****
Q1. When I study, I like to listen to music	-.19****	-.13**	.16***
Q2. SOS (Rescue Me), by Rihanna	-.13*	-.13*	.36****
Q3. Bad Day, by Daniel Powter	-.03	.02	.20****
Q4. Unwritten, by Natasha Bedingfield	-.03	-.02	.36****
Q5. What Hurts the Most, by Rascal Flatts	-.02	.02	.24****
Q6. Walk Away, by Kelly Clarkson	-.09	-.08	.39****
Q7. Move Along, by The All-American Rejects	.01	.05	.07
Q8. Grillz, by Nelly	-.30****	-.28****	.05
Q9. Savin Me, by Nickleback	-.06	-.03	.05
Q10. Over My Head (Cable Car), by the Fray	-.03	-.03	.11*

^a Gender: 1 = male, 2 = female.

* $p = .05$. ** $p = .01$. *** $p = .005$. **** $p = .001$.

be needed to determine the differential effects of various potential sources of distraction, such as whether students would have been less distracted by other genres of music (e.g., jazz, country, alternative, classical, rap) than by popular lyrical music. Another possible explanation for the results of this study is that, rather than the music distracting students from reading, they might rely on background music because they are already disengaged from the material. In that case, further research could look at the correlations between students' perception of the relevance of educational content and their tendency to become distracted.

Self-efficacy theory may explain the gender difference, given that sources have suggested girls have higher self-efficacy for reading than do boys (Horner & Shwery, 2002; Pajares, 2002). Because high self-efficacy sometimes results in an overestimation of one's abilities, it is possible that girls overestimated their ability to read or study successfully while listening to music. Studies also have suggested that adolescents typically prefer listening to music they view as being socially accepted within a group of peers (Hurtes, 2002; Tarrant, 2002). This trend appears to be gender related. Tarrant found 81% of 14- and 15-year-old girls reported they listened to music as a leisure activity with a peer group, compared with only 48% of boys who did so. The detrimental effect of music on the girls' reading performance in the current study implies that educators need to be aware of adolescent girls' potentially greater distractibility and plan interventions accordingly. At the

same time, they can take advantage of adolescent girls' propensity for social interaction, which suggest that group sessions and peer coaching may be among the techniques that could prove effective with this group.

The results of this study raise practical issues with respect to student's awareness of their individual study habits. Educators and parents may need to help a sizable group of students, specifically those who prefer to study while listening to music and are unaware of the extent to which they are distracted, develop a repertoire of cognitive skills and strategies to reduce distractibility and improve concentration and attention. To expect that adolescents will alter study habits without interventions that consider individual developmental level and social and personal preferences is unrealistic. Thus, a first remedial step would be for educators and parents to assist students in becoming aware of their habits, and of the effect those habits have on academic performance. School psychologists can be alert to students who may have issues in this area, and can consult with teachers and parents to make sure students hone their study and homework habits.

One limitation of the study is that the reading ability and possible attentional deficits of students, which could have influenced their comprehension scores, were not assessed. In addition, various environmental factors (e.g., time of day, volume of the music) and individual factors (e.g., students' moods) were assumed not to have a significant influence on the results. Finally, this study used only one experimental

condition of music, and students in other settings or of different ages might react differently to different music selections, thus limiting the generalizability of the findings.

In conclusion, the association between music and intellectual performance is clearly a topic that merits further investigation, particularly among adolescents. This study focused specifically on reading comprehension. Other studies could explore different aspects of literacy, such as mathematics and writing tasks. All these activities involve different cognitive processes, which in turn could differentially affect the impact of background music on students' learning. Obtaining further clarification should be a priority for educational researchers concerned with helping adolescents gain skills that will benefit them in academic endeavors as well as in other activities in an environment where multitasking prevails.

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