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From the Editor

Welcome to the inaugural issue of The Excellence in Education Journal. The Excellence in Education Journal (www.excellenceineducationjournal.org) is an open access, refereed, online journal that promotes and disseminates international scholarly writing about excellent practices in all aspects of education. The goal is to share these excellent practices to benefit the education of children and adults worldwide**.** For this reason, there are no publications fees and the journal is available free of charge on the internet. Typeset and graphics are intentionally simple in order that the journal can be more easily accessed worldwide to fulfill the mission of the journal.

We were pleased to have received many submissions for this first issue. I would like to thank those who submitted manuscripts for this journal, the review team for their work in reviewing these submissions, and the authors whose writing is published herein. Additionally, I would like to thank Anna Patrick for assisting in the editorial process

This issue contains four articles. Dr. Graziano discusses the benefits and challenges revealed in a study of student-generated multimedia movies with teacher education students. Dr. Parke provides a study that illustrates how school districts can go beyond identifying achievement gaps to examine more closely and address more effectively the achievement differences within subgroups. Dr. Myer discusses how a school leader can create a powerful, high-performing school by focusing on the target, the team, and the tactics. Finally, Professor Gulling provides a review of the literature relating to the problems and proposed solutions to low mathematics achievement among indigenous populations in Western Australia.

I hope that the excellent practices discussed in this journal will be helpful to those who are involved with education of children and adults worldwide.

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Creating Student-Generated Multimedia: Benefits and Challenges for Teacher Education

Kevin J. Graziano

Abstract

Schools of education across the United States are increasingly required to integrate, support, and enhance technology into teacher preparation programs. This article examines the benefits and challenges of using student-generated multimedia with teacher education students. In lieu of a traditional examination or research paper, students enrolled in two undergraduate teacher education courses were required to create multimedia movies on selected course content. Results of this study are discussed in relation to six key themes of Mayer's (2001) cognitive theory of multimedia learning: *integration, parsimony, narration, personalization, individual differences, and interactivity*. Recommendations for further research are provided.

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Introduction

In response to the requirements of national accreditation groups such as the International Society for Technology in Education (ISTE) and the National Council for Accreditation of Teacher Education (NCATE), schools of education are increasingly required to integrate, support, and enhance technology into teacher preparation programs (Vermillion, Young, & Hannafin, 2007). Many schools, colleges, and departments of education across the United States are rethinking how they prepare tomorrow's teachers to use technology (Rowley, Dysard, & Arnold, 2005). Those who prepare teachers in the current information age are nearly unanimous in their recognition of the need to incorporate technology in some fashion that requires preservice teachers to acquire both confidence and competence in this area (Beasley & Wang, 2001). Research suggests that increased use of technology enhanced learning practices in PK-12 teaching is more likely when prospective teachers experience a variety of computer uses in the majority of their undergraduate courses (Wheatly, 2003).

Many teachers, however, lack the knowledge, preparation, and training to integrate technology in the classroom (Grunwald and Associates, 2010). A recent study commissioned by the Richard W. Riley College of Education and Leadership found that teachers who have completed their initial certification or licensure since 2000 do not believe that their preservice programs taught them how to teach 21st century skills or how to effectively incorporate technology into instruction (Grunwald and Associates, 2010). Initial efforts to integrate technology into teacher preparation typically focus on a single, standalone course on educational technology (Gronseth et al., 2010; Hofer, 2005) with an emphasis on personal productivity and information presentation (Gronseth et al., 2010). It has been noted that standalone information

technology coursework does not correlate well with technology skills and the ability to integrate technology into teaching (Milken Exchange on Education Technology, 1999).

New teachers often struggle in building student-centered environments with technology in their own classroom after graduation because they do not know how to merge the technology and instruction (Kurz-McDowell, & Hannafin, 2004). Lei (2009), who researched preservice teachers' beliefs, attitudes, and experiences and expertise with technology, reports preservice teachers use technology extensively related to social-communication activities and learning activities as students but lack the knowledge, skills, and experiences to integrate technology into the classroom to help them teach and to help their students learn.

Ertmer (1999) believes education faculty face multiple barriers in their efforts to integrate technology across the preservice curriculum. Ertmer (1999) identified first-order and second-order barriers that prevent effective technology integration in K-12 classrooms. First-order barriers, according to Ertmer (1999), relate to issues of access. Second-order barriers relate to teaching pedagogy, strategy, and skill. While Ertmer's (1999) research focuses on K-12 classrooms, there is no reason to believe that the same barriers are not present in preservice education programs to some degree (Vermillion, Young, & Hannafin, 2007). If teachers can practice using technology in the classroom, they may be more likely to overcome barriers when using technology in their own classroom (Gronseth et al., 2010).

Teachers' use of technology for classroom instruction can make significant differences in improving perceived student outcomes (Grunwald and Associates, 2010). Research has shown that the effective use of technology in the classroom can provide motivation, relevance, and a deeper understanding of information for students (Johnston & Cooley, 2001), reduce anxiety and promote confidence (Ertner, 2005), and foster an effective, constructivist learning environment

(Seo, Templeton, & Pellegrino, 2008). When teachers do not effectively integrate all aspects of technology in the educational process, students miss out on authentic learning experiences emphasizing collaboration, creativity, and innovation. This leads to students who are unprepared to be productive digital-age citizens in a highly competitive digital workplace (Beglau, et al., 2011).

A powerful approach to integrate technology into the teaching and learning process is with multimedia productions (Seo, Templeton, & Pellegrino, 2008). Multimedia, according to Mayer (2008), involves learning from words and pictures. The words can be printed or spoken text. The pictures can be in static form, such as illustrations, photos, diagrams, charts, or maps, or dynamic form, such as animation or video. Multimedia can provide opportunities for students to demonstrate their learning in more authentic ways (Seo, Templeton, & Pellegrino, 2008) and has the potential of promoting meaningful learning (Moreno & Valdez, 2005).

Purpose

The purpose of this exploratory study was to investigate multimedia learning (Mayer, 2001) among teacher education students who developed multimedia movies as final projects in an undergraduate language acquisition course and an undergraduate secondary pedagogy course. The following two questions frame this study.

1. What are the benefits of using student-generated multimedia instruction with teacher education students?
2. What are the challenges of using student-generated multimedia instruction with teacher education students?

Theoretical framework

Mayer's (2001) cognitive theory of multimedia learning guided this study. According to Mayer's (2001) cognitive theory, the learner possesses and uses a variety of cognitive processes to make sense out of presented information (Moreno & Valdez, 2005). The cognitive processes that lead to meaningful learning includes three assumptions about how people learn words and pictures. They include the dual channel assumption, the limited channel assumption, and the active processing assumption. The dual channel assumption states there are two separate channels (auditory and visual) for processing, representing, and manipulating information and knowledge. Researchers argue that teaching students about causal system in both verbal and non-verbal codes results in stronger encoding than with verbal or nonverbal codes alone (Moreno & Valdez, 2005). The limited channel assumption states each channel has a limited, finite capacity for holding and manipulating knowledge. Overload occurs when too many pictures or too many words presented at one time. When this occurs the processing demands required by interactive multimedia may exceed the processing capacity of the cognitive system and prevent learning from occurring (Mayer & Moreno, 2003). The active processing assumption states meaningful learning occurs when learners are engaged in active processing within the channels, organizing them into coherent pictorial and verbal models, and integrating them with each other and prior knowledge (Mayer 2001). Researchers argue that learning increases when students are asked to generate their own context of meaning by self-organizing the materials (Moreno & Valdez, 2005).

Based on the three assumptions on how people learn words and pictures, Mayer (2001) proposed seven principles for the design of multimedia instruction. Mayer's (2001) cognitive theory of multimedia instruction has practical applications and is based on many research

findings that specifically investigated multimedia learning (Reed, 2006). Mitchell (2003) argues that Mayer's (2001) principles of multimedia design could be collapsed into six key categories: integration, parsimony, narration, individual differences, personalization, and interactivity. *Integration* suggests that audio/text need to be highly integrated with the images used. *Parsimony* suggests that students learn more deeply from multimedia presentations when extraneous words, sounds, video, and pictures are excluded. *Narration* suggests that students learn more deeply from narration than from on-screen text. *Individual differences* suggest that learning is better if the target audience has low prior knowledge of the content (intended for novices) and they have high spatial ability. *Personalization* suggests that students learn more deeply when words to the narration are presented in conversational style and include personal comments. *Interactivity* suggests that students learn more deeply when they can control the presentation rate of multimedia explanations than when they cannot.

Method

Participants

During the fall 2010 and fall 2011 semesters, 78 undergraduate, teacher education students enrolled at a small, urban college in the southwest United States participated in this study, of whom 55 were female and 23 were male. The median age of students was 23.2. Students were enrolled in either *Language Acquisition and Learning* or *Secondary Pedagogy*. Both courses require students to observe a classroom teacher from the school district. Students observed teachers using Smartboards, projectors, Elmos, PowerPoint, and videos in the classroom. *Language Acquisition and Learning* is a required course for both elementary and

secondary education majors. I taught both courses concurrently during the fall 2010 and fall 2011 semesters.

Students enrolled in both courses each semester indicated that they use the computer for social media purposes, to browse the internet, to study online, and use Word or PowerPoint at work and school. Six students used movie maker software prior to the study, mainly to organize personal and family photographs. No students completed a similar class project prior to this study.

Data collection and analysis

Data were collected from a questionnaire on students' experiences with multimedia, classroom observations, informal discussions, and students' final movies. The questionnaire asked the following questions and was administered at the end of the semester: 1. What were the benefits or things you liked the most about this project? 2. What did you find challenging or dislike about this project? 3. After completing this project, how comfortable are you integrating technology into the curriculum (uncomfortable, somewhat comfortable, comfortable, very comfortable)? 4. After completing this project, how knowledgeable are you on your selected content (not knowledgeable, somewhat knowledgeable, knowledgeable, very knowledgeable)?

The framework for the content analysis of the qualitative data was based on the design principles from Mayer's (2001) cognitive theory of multimedia learning. Data were analyzed using constant-comparative methodology (Bogdan & Biklen, 1998) and aligned with six key themes of Mayer's (2001) cognitive theory of multimedia learning: *integration*, *parsimony*, *narration*, *personalization*, *individual differences*, and *interactivity* (Mitchell, 2003). Quantitative data were analyzed by tabulating responses and calculating percentages.

Procedure

Students enrolled in both courses met once a week for an hour and a half and actively studied theory, models, hypotheses, and teaching and learning strategies. The final assignment in both courses was to create a four to five minute multimedia movie on a selected topic studied in class. Criteria for the final project included: an audio recording; images, text, or graphics; evidence of critical thinking and reflection; completion of the project in iMovie or Windows Live Movie Maker; and posting the final project to YouTube. YouTube was selected because it provides easy access to movies. YouTube movies were posted as "unlisted" and were not available publically on the Internet. The use of video in the movie was optional.

Students were required to include information from the course textbooks and two additional resources in their final projects. I showed students how to locate research in educational databases such as ERIC and Education Full Text. All project topics were submitted to me by email for consideration. Students were not expected to purchase software or hardware to complete the project. All courses met in an electronic classroom on campus with access to the Internet, Windows Live Movie Maker, microphones, webcams, and Flip cameras. Students had the option to complete the final project using iMovie. Students were aware, however, that the college did not have Apple computers on campus.

I conducted two technology lessons during the first two weeks of the semester. I taught students Windows Live Movie Maker, how to import video from a web camera or Flip camera, and assisted students to create YouTube accounts. I also shared movies created by former students and movies I created for classroom instruction. Students experimented with the technology in class and created mock movies on a topic of their choice. The "lab" classes

allowed students to practice the technology skills and troubleshoot problems and concerns with me and their colleagues before they "jumped" into the project.

All students were required to create a draft copy of their project and submit it to me at the mid-semester for a grade and feedback. Students were assigned a partner and required to provide each other with feedback on their draft projects. Students and I discussed characteristics of providing quality feedback before they reviewed each other's mid-semester projects. Final projects were required to show evidence of critical thinking of the information gathered from the textbook and additional resources. On the last day of the semester, all movies played on multiple computers in the college's Teaching and Learning Media Center. Students interacted and viewed each other's projects.

Results

Data from this study fit into six themes from Mayer's (2001) cognitive theory of multimedia learning: *integration, parsimony, narration, personalization, individual differences, and interactivity* (Mitchell, 2003). These themes will be presented in this section as they relate to the benefits and challenges of using student-generated multimedia instruction with teacher education students.

Integration

Students agreed the benefit of using student-generated multimedia instruction provided not only the flexibility of choosing a topic but also the flexibility of presenting the topic. The majority of students agreed the integration of multimedia in their final projects was unique, meaningful, and fun. It allowed them to think outside the box and be creative with audio, text, images, and video. One student noted, "The versatility of the project allowed me to stretch my creative wings." Another student commented, "Not many teachers allow us to complete this kind

of project. I was excited to see how it turned out in the end." Several students commented on the value of recording audio and integrating it into a movie with text and stated they prefer multimedia projects over traditional exams or research papers.

A major challenge for students was time. Many students stated it was time consuming to research content, write a script, record audio or video, locate or design images to accompany the audio or video, and integrate all multimedia into a final product. Most students, however, felt rewarded in the end with their finished products. One student noted that time consumption is expected with these types of projects. "It takes time and practice to master the technology," he or she stated.

Students noted that failed technology was one of the major challenges with the integration of multimedia in their projects but, interestingly, demonstrated persistence in troubleshooting the problems on their own. One student explained, "I ran into problems at the beginning with the technology and thought making my movie would be difficult but I worked though the problems and in the end I felt proud and a sense of accomplishment with my movie." The feeling of frustration when technology failed and the feeling of pride and ownership with the finished product were echoed by several students. Another student explained, "I am very basic in technology and found I was constantly frustrated when the technology did not work. However, it is hard to be negative about using technology. I want to be distinguished in using it [technology]." A few students were unable to upload their movies to YouTube because their files were too large, the files were not saved or exported properly, or the website was down for maintenance.

Students agreed it was overwhelming to hear the course expectations and learn new software during the first weeks of the semester without a selected topic in mind. Students agreed

they would have preferred the technology lessons after they read a few chapters from the textbook and were familiar with course-related topics. This would have helped them apply their newly acquired skills and reduce the initial anxiety of the assignment.

Responses to the question on integrating technology into the curriculum administered at the end of the semester revealed 37 students (47.44%) were very comfortable integrating technology into the curriculum, 28 students (35.90%) were comfortable integrating technology into the curriculum, 12 students (15.38%) were somewhat comfortable integrating technology into the curriculum, and 1 student (1.28%) indicated he or she was uncomfortable integrating technology into the curriculum after completing this project.

Parsimony

Mitchell (2003) writes the quality and effectiveness of student products could be largely explained by parsimony. Most students selected stock images or clipart from the Internet to include in their movies. One student, for example, selected reader's theater for her project and included several images from the Internet of students performing in the classroom. Several students used images unnecessarily or as "fillers" (Mitchell, 2003) with no connection to their content. Although the use of video was not a requirement of the project, a few students used Flip cameras to record themselves and interview principals and students. Others photographed their own images and used movie and audio clips from blockbuster movies. One student selected the jigsaw teaching strategy for his project and assembled a jigsaw puzzle in his movie as he narrated the text. Another student discussed constructivism in her project and inserted video clips of students working in a science lab and used animations. Similarly, a student, who researched critical pedagogy, chose to compare her research to a marching band and inserted video clips of a marching band while she narrated her text. Another student decided to approach her project on

classroom management from a journalistic perspective. She designed her project as if she were a news anchor reporting the news. She included music, graphics, text, and video interviews with students as one would see on the evening news.

Overall, a major benefit of using multimedia in this study was a greater understanding of selected content. One student said, "This project required me to be a problem solver and critical thinker. It made me process and apply the knowledge I obtained from my project as a whole rather than in parts." Another student stated, "I dove head first into my topic and truly discovered first-hand what I was presenting. The project required me to be submersed in information and grasp a deeper understanding of the content." "I feel that if someone were to approach me with questions about my topic, I would be able to answer them thoroughly and even engage them in a discussion," said another student.

Responses to the question on knowledge levels of selected content administered at the end of the semester revealed 44 students (56.41%) were knowledgeable on their selected content, 31 students (39.74%) were very knowledgeable on their selected content, 3 students (3.85%) were somewhat knowledgeable on their selected content, and no students indicated they were not knowledgeable on their selected content.

Students noted it was challenging to keep the final project within the required time limit. Several students preferred to expand on their ideas and felt restricted with the four to five minute limit imposed on them. One student commented, "I wish we could have made our movies longer because I had a lot of information to share and more to say." Data also reveal that several students were their own worse critics. A student stated, "I wish my movie could have been more creative. I found that no matter what I did, it was still boring." Another student stated, "This project took me about nine hours to complete because I wanted it to be perfect, yet I feel like it

was still inadequate." A third student wrote, "I like all of my information in my project. I just wish that it was more exciting."

Others considered their projects as experimental or "trial and error" runs for the next time they create similar projects. One student stated, "I think it would be enjoyable to do the project again now that I am familiar with my content and technology." Another student said, "The movie is informative but basic. I wish I used more creative ideas." Another student noted, I was able to focus on the nuts and bolts of my topic and was able to get a good grip on it. The next time I complete a project like this I would like to get more creative and exciting.

Narration

All students were required to use original audio recordings in their final project and successfully completed their narrations. A few narrations were not recorded with optimal settings and contained background noise or static. A few students stated it was challenging for them to listen to their own voice. One student stated, "It was difficult and intimidating to hear myself speak. It was also intimidating to know that my peers would be listening to my work." Others commented on rerecording their audio several times because they spoke too fast or stumbled over the words. Students agreed their narrations contributed to a greater understanding and increased engagement with their selected content.

Although adding music in the background of the audio was not a requirement of the project, several students inserted music with their audio file. One student, who decided to use music in his final project, said "it was challenging to find a song long enough to play in the background of my audio."

Personalization

The term personalization is used to refer to narration that is conversational, personable, and contains the first-or second-person rather than the third-person (Mayer, 2001). Only half of the students' projects contained some degree of personalization. Since the majority of students had little, if any, teaching experience, a challenge for many students was making personal connections from their selected content to practice. Those students who personalized their narration did so with intended application and stated how their new-founded knowledge and skills would assist them in the future as classroom teachers. One student selected a topic, the No Child Left Behind Act, on a whim and through his or her research realized how important and personal the topic was. The student stated, "At the beginning, I just chose this topic because someone said it in class but as I researched it I realized how important and personal it was. The history of the NCLB Act was the most interesting." A few students were substitute teachers and made personal connections to their experiences in the classroom as substitutes.

A few students disclosed they were English language learners (ELL) and made connections from their selected movie content to their own personal experiences as ELL. A student commented, "After researching my topic, I realized I was reading about the same system [dual language program] I was in when I was younger. This helped me make connections and personalize my movie." Another student shared, "By researching sheltered instruction, it gave me a chance to put the different steps in my own words and provide personal examples from my own experiences so I can remember the steps and use them in my future lessons."

Individual differences

Students were informed that their target audience was each other, fellow colleagues in class, and should assume they are novices with low, if any, prior knowledge on the topics. All

projects were created for a novice to use. One student shared his or her movie with several individuals before it was due to be certain the content was concise and understood. He or she wrote:

> I had to make sure people understood what I was trying to say so I asked different people to review my project even if I didn't want them to. I felt it was important to get feedback because of different learning styles. This pushed to me to learn more because I wanted to make sure all students could understand my content.

Mayer (2001) writes that the target audience benefitting the most from multimedia would be those with high spatial ability. Spatial ability is generally defined as the ability to generate, maintain, and manipulate mental visual images (Carroll, 1993). Mayer (2001) argues that conventional instructional messages are heavily verbal, but multimedia messages are verbal and visual, so multimedia learners need to be able to form, hold, and use mental images. No students used spatial abilities in their projects.

Interactivity

All projects were created either in iMovie or Windows Live Movie Maker and uploaded to YouTube. The Internet address generated by YouTube was shared with me and other students. All YouTube movies opened in a web browser with control features such as play, pause, and stop. The control features allowed the viewer to control the pace of the presentation. Internet addresses of the final projects were bookmarked by students and saved for multiple viewings.

Discussion

This study examined the use of multimedia among teacher education students, including the benefits and challenges of using student-generated multimedia instruction in the curriculum. Students overwhelmingly agreed that the use of multimedia to complete their course assignment was fun, engaging, authentic, and provided opportunities to express themselves creatively. Students agreed the use of multimedia instruction allowed them to obtain a sense of

accomplishment, pride, and ownership of their final projects. Students reported being knowledgeable and having a greater understanding of their selected content and felt comfortable integrating technology into the curriculum after completing their multimedia project. These findings support previous research on the use of multimedia projects in classrooms that assist learning, contribute to higher levels of student engagement, a deeper understanding of course content, and serve as a good pedagogical strategy to encourage leaners to think critically about academic content (Dunsworth & Atkinson, 2007; Mayer, 1997; Mitchell, 2003; Seo, Templeton, & Pellegrino, 2008).

Challenges surfaced as students used multimedia instruction in the curriculum. Students noted it was challenging to complete multiple components of the project at once, such as researching content, selecting or developing images and/or text, recording audio and/or video, and uploading the final project to the Internet. Similar projects in the future should provide ample time for students to research and gather information on their content before they learn related technology and then provide ample time for students to select or develop images, text, or graphics. Additionally, multimedia manuals or tutorials should be posted to an online website or discussion board for students to read and view. Open labs should also be available to students throughout the semester where they can drop by and meet with the instructor to discuss technical or theoretical concerns and questions. These suggestions may help reduce some of the challenges identified in this study and reduce students' concerns about being overwhelmed with multimedia.

Students also noted that failed technology such as software or website glitches contributed to high levels of anxiety and frustration. This finding is consistent with researchers who identified technical difficulties as main hindrances to multimedia projects (Seo, Templeton, & Pellegrino, 2008). Additionally, students wished their projects could exceed the four to five

minute time requirement. It is unclear whether allowing students to exceed the time requirement would have distracted them from producing parsimonious projects or if the added time would have contributed to a greater understanding of their selected content.

Data from this study reveal that students had a difficult time making personal connections from the course content to practice. A lack of teaching experience by the majority of students at the time of this study may have contributed to this finding. Mitchell (2003) argues that Mayer's (2001) principle on personalization should allow individuals to create emotional connections with the viewer. Mitchell's suggestion may provide additional options for students who struggle to include personal comments in their multimedia and may allow them to present information beyond the first or second-person voice.

It is interesting to note that a selected group of students routinely checked the number of views their movies received online and competed with each other for the highest number of views. Since the movie was posted to YouTube as an unlisted movie, I can assume they shared their movies links with each other, family, and friends before the final project was due. It is unknown what effect, if any, this friendly competition had on obtaining new knowledge on topics selected by other students. It is also unknown what effect the display of final projects at the end of the course had on students' understanding of topics selected by other students. Similar projects should include an assessment tool, beyond the mid-semester peer evaluation, that allows students to demonstrate their understanding of content from other completed projects.

The finding that students viewed their projects as experimental or "trial and error" runs for similar projects created in the future suggests that students may challenge themselves more once the novel effect of using multimedia has worn off and the appropriate skills have been obtained. This can be viewed as a benefit and challenge of this study. Practicing technology is

important for preservice teachers; however, technology skills alone cannot guarantee the effective use of technology in the classroom (Ertmer et al., 2005). To help preservice teachers integrate technology into teaching in meaningful ways, teacher education programs need to help preservice teachers understand how technology connects with content and pedagogy (Lei, 2009).

As stated earlier, students were required to observe a classroom teacher as part of the course requirement. School placements for student observations were random and arranged by the school district. It is unknown if the classroom teachers used technology as best practices with strong connections to academic content and whether or not classroom observations influenced students' multimedia projects. This information was not collected in this study. Further research is needed in this area.

Researchers argue preservice teachers need to observe and use technology in authentic K-12 school contexts (Barab, Squire, & Dueber; 2000). Whether the teaching of technology occurs through didactic lectures or open-ended projects, if the learning occurs exclusively in the university context there will continue to be a gap between school learning and real-world application (Barab & Landa, 1997). It is recommended that teacher preparation programs identify professional development schools or partnership schools that effectively use technology in the classroom and place their preservice teachers at those schools to complete observation hours and student teaching internships and practicums. Dawson and Nonis (2000) found that school-university collaborations produce positive attitudes toward the integration of technology into the classroom, increased skills and knowledge of educational technologies, confidence in technological abilities, content specific uses of technology, and classroom management issues related to educational technologies. Other researchers recommend the idea of *Learning by Design*, whereby teachers learn about educational technology by engaging in authentic tasks in

small collaborative groups (Koehler & Mishra, 2005). Further research in this area will assist teacher educators' understand and identify ways to integration technology in a meaningful and successful manner.

Conclusion

Teachers have a vital role to play at the intersection of technology and 21st century skills—modeling their confidence with technology, guiding young minds toward constructive educational purposes, and teaching students new skills for a competitive, global world (Grunwald and Associates, 2010). Teacher preparation programs are expected to embrace and support this role. This article provides an example on how teacher educators can integrate multimedia in their programs and has promising implications for other teacher educators interested in replicating similar projects. The results of this study have initiated a dialogue within my own school of education on the role of technology throughout our teacher preparation program, including the role of technology in student teaching and the delivery of student teacher portfolios. Initial and ongoing exposure to multimedia in teacher preparation programs has the potential to enhance preservice teachers' confidence and competence with technology and increase student engagement. Students of this study agree that the benefits of using student-generated multimedia instruction outweigh the challenges.

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An Alternative to Gap-Gazing: Examining Differences Within Groups and Similarities Between Groups in Urban High Schools

Carol S. Parke

Abstract

This paper provides an illustration of how schools can use their extensive student databases in a way that goes beyond comparing differences between demographic subgroups. The urban district was already aware of the extent and nature of achievement gaps *between* demographic subgroups as published in accountability reports. They were in need of a more nuanced investigation of differences *within* subgroups to examine two areas of concern: a) decrease in student enrollment after 9th grade, and b) low student performance in high school mathematics. One result showed considerable math performance differences within the Black subgroup for students who *stayed* in the district all four years (cohort) versus students who *exited* the district at some point after 9th grade (non-cohort). Results within the White subgroup were similar.

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Introduction and Literature Review

Many educators, administrators, and researchers across the country believe we have reached a point where "gap-gazing" studies, focusing solely on identifying achievement differences between demographic subgroups, are no longer informative (e.g., Rodriguez, 2001). In her AERA presidential address Ladson-Billings (2006) argued that the focus on the "gap" is misplaced. She likened the achievement gap between Black and White students to an education debt that has accumulated over time. Other researchers such as Gregory, Skiba, and Noguera (2010), have suggested the need for additional research that addresses existing discrepancies in resources and quality between schools serving poor communities and those in more affluent areas.

A recent issue of the *Journal of Research in Mathematics Education* focused on different perspectives of gaps analysis and the direction that future research should take. One perspective is that the research on gaps needs to become more nuanced and results more accessible and useful to educators (Lubienski, 2008). "Instead of dismissing gap-focused research as mere gap-gazing, the mathematics education community should move toward richer sets of contextual factors and outcomes" (p. 354). Specifically, she suggests analyses that intersect race with socioeconomic status and gender as well as non-complex, but detailed, analysis to help practitioners determine when gaps begin, which groups to target, and which areas of classroom practice and instruction to address.

Gutierrez (2008) outlined the negative impact of gap-focused research. Dangers include "offering little more than a static picture of inequities, supporting deficit thinking and negative narratives about students of color and working-class students…and promoting a narrow definition of learning and equity" (p. 357). She describes the differences in research on between-

group variance (gaps between Black and White students, for example) versus within-group variance (variation among Black students across schools or over time). The former analysis focuses on individual effects to determine success, whereas the latter suggests that school effects are useful in determining success. Instead of analyses that lead to negative conversations, Gutierrez (2008) is a proponent of more research on the differences among students within subgroups rather than between subgroups. She also encourages research on Black and other marginalized students who are excelling and advancing in math.

Regardless of the specific directions suggested by these perspectives, neither advocates eliminating large-scale gaps analysis. Statistical models using hierarchical linear analysis are recognized as necessary and important, but Gutierrez stated that "there have been so many, [they are] only accessible to a few, and we know the answers already" (p. 368). Lubienski and Gutierrez's (2008) ideas for future research overlap in terms of: a) uncovering gaps in educational opportunities, b) studying school contexts instead of variables that cannot be controlled by schools or researchers, c) emphasizing similarities between student subgroups and differences within a group, and d) validating that students of color and working-class students are worthy of study in their own right.

A report on the characteristics of minority secondary students who excel on the SAT and in the classroom is an example of such research (Bridgeman & Wendler, 2005). These researchers identified the top 10% of student scorers on the SAT and examined high school course-taking and performance data within the Black subgroup and within the White subgroup. The statistical analysis they used was not complicated, but produced powerful outcomes accessible and interpretable to everyone. Results showed more similarities than differences between Black and White students.

Overall, students of both ethnicities in Bridgeman and Wendler's study (2005) took similar types of courses and reached about the same level of success. Likewise, students who took rigorous math courses and performed well in them also tended to score high on the SAT. This was true for both Black and White students. Participation in school activities was also similar between the subgroups. The researchers state that "when we focus only on mean score differences (the average gap) among students, we tend to overlook the relatively high performing minority students. Many minority students achieve high SAT scores [and] pursue challenging courses in high school" (p. 1).

Purpose

The purpose of this paper is to provide an example of how schools can utilize their extensive longitudinal databases in ways that go beyond comparing differences between demographic subgroups. Efforts of assessment personnel in district offices are often focused on mandated accountability reporting. Unfortunately, this use of data does not usually produce results that are meaningful and useful to educators in improving their schools.

In the study described here, administrators and teachers in an urban school district had two concerns. One was the decrease in student enrollment in high school, especially after 9th grade. Another concern was the low level of student math achievement on the state assessment. An investigation of these two areas was undertaken as part of a collaboration established between the district, a faculty member in a nearby university, and a community educational organization. Outcomes of the partnership included annual progress reports distributed to all parents in the district (e.g., A+ Schools, 2007) and supplementary reports (e.g., Parke, 2006; Parke, 2009;

Parke & Kanyongo, in press) that addressed specific district issues such as the two described here.

With regard to enrollment decreases, research shows that student mobility is one risk factor that continues to be identified as detrimental to student achievement. Mobility can be defined by the type of move, the timing, and the extent of the move (within versus outside the school system) (e.g., Alexander, Entwistle, & Dauber; 1996). Studies show that students who are mobile tend to have lower achievement scores and fall at least one year behind stable students (e.g., Hinz, Kapp, & Snapp, 2003; Temple & Reynolds, 1999). Moreover, schools and teacher suffer negative consequences when a large portion of the student population is mobile (Fowler-Finn, 2001; Stover, 2000; Titus, 2007). Teachers spend more time on remediation, less time on new topics, and are less likely to try out new strategies and innovations.

The district knew that a large portion of students enrolled in the first year of high school did not remain in the district schools and were mobile. However, there had not been a systematic investigation of the characteristics of students who stayed versus those who did not. A cohort of students can be defined in many ways. Mobility research helped to specifically define the cohort in this study as students who stayed in the district's high schools from 9th grade to 12th grade. The non-cohort was defined as students who attended 9th grade in the district but did not remain the entire the four years.

With regard to math performance, the district's other concern, they were already aware of the extent and nature of gaps between subgroups as published in various annual accountability reports. The Bridgeman and Wendler study (2005) helped to define the variables for which the 9th grade cohort students and 9th grade non-cohort students were compared. They included scores on large-scale math assessments, cumulative grade point average (GPA) in math courses,

and percent of students taking advanced math courses (e.g., trigonometry, statistics, calculus). Finally, demographic and mathematics indicators were examined by school for the subgroup of students who excelled on the math assessment (i.e., scored in the top 25% of students in the district). A small portion of the complete analyses is included in this paper. Selected results for the following questions are presented.

- What are the characteristics (attendance, math course taken, and math failure rates) of all 9th grade Black *non-cohort* students who exited the district at some point during high school versus all 9th grade Black *cohort* students who stayed in the school district all four years?
- Same question as above, except for all 9th grade White *non-cohort* versus *cohort* students.
- How do each of the ten high schools in the district compare in terms of the characteristics described above as well as students who excel on a math assessment, advanced math courses taken, and cumulative math GPA?

Methodology

The "cohort" consisted of 1,566 9th grade students (49% of all 9th graders) who stayed in the district high schools for four consecutive years. They may have changed schools within the district, but did not leave. The remaining 1,655 9th grade students (51% of all 9th graders) were defined as the "non-cohort"; that is, students who exited the school system at some point during high school. They may have dropped out after 9th grade, transferred to a school outside the district, or repeatedly entered and exited the district over the years and eventually graduated or dropped out.

Variables for the first two questions were attendance in 9th grade, math course taken in 9th grade, and failure in at least one semester of the math course in 9th grade. Data were analyzed within the Black subgroup of students (n = 739 cohort and n = 1090 non-cohort) and the White subgroup (n = 780 cohort and n= 500 non-cohort) across all high schools in the district. Due to the small numbers of students of other ethnicities (e.g., Asian American, Hispanic), they were not included in these analyses.

For the third question, data was examined by disaggregating the ten district high schools to examine potential differences in educational opportunities based on the school a student attends. In addition to the variables described above, others included advanced math courses taken by cohort students, cumulative math GPA, and characteristics of students who excel on a math assessment.

As with any investigation of empirical data, a variety of statistical techniques may be used. For the purposes of investigating this district's concerns, the intention was to obtain descriptive, yet technically sound, results in order to provide school personnel and the community an easily interpreted picture of their schools that would encourage them to explore the data further. Gutierrez (2008), Lubienski (2008), and Bridgeman and Wendler (2005) were influential in focusing this study's analysis on comparison of characteristics within the Black and White subgroups, analyzing math data within each high school, and examining characteristics of Black and White students who excel in math.

Results for 9th Grade Non-Cohort versus 9th Grade Cohort Students

Overall, there were differences in attendance and math course failures for the 9th grade cohort students versus the 9th grade non-cohort students within each ethnicity subgroup. However, with regard to the type of math course taken, there were no differences between the cohort and non-

cohort students. In nearly all cases, results for Black students were similar to those for White students. The specific results are presented below.

Attendance

Figure 1 shows that the majority of both Black and White non-cohort students were non-attenders (83% and 73%, respectively), a district classification of students who attended school less than 95% of the required days during the school year.

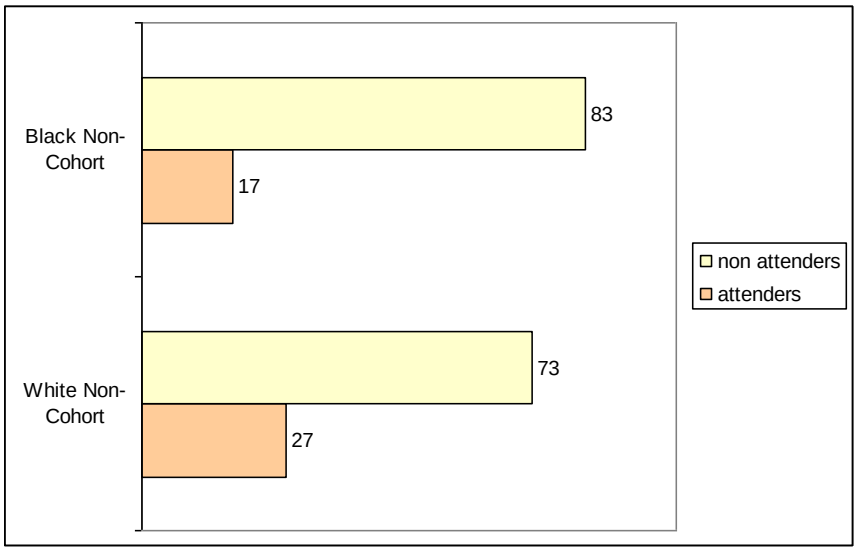

Figure 1. Percentage of Black and White 9th grade non-cohort students by attendance status.

Conversely, percentages of non-attenders were significantly smaller for cohort students. This was true for both ethnicities. Only 40% of Black cohort students were classified as non-attenders ($\chi 2_{(1)} = 124.74$, $p<.001$). Similarly, only 18% of White students were classified as non-attenders ($\chi 2_{(1)} = 232.50$, $p<.001$).

Math Courses

As shown in Figure 2, the pattern of math course-taking for Black non-cohort students is nearly identical to the pattern for White non-cohort students. For example, the percentage of Black students who took Algebra 1 in 9th grade (65%) was statistically similar to the percentage of White students taking this course (67%) ($\chi 2_{(1)} = .28$, p=.590). Smaller percentages of students in both ethnicity subgroups took General Math, Geometry, and Algebra 2 in 9th grade.

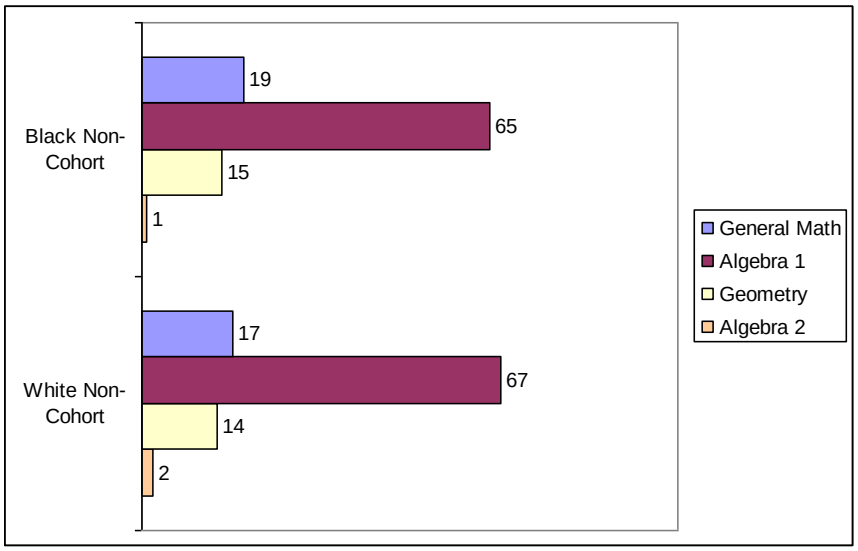

Figure 2. Percentage of Black and White 9th grade non-cohort students by math course taken.

Surprisingly, results for cohort students did not differ from those shown in Figure 2 for the non-cohort students. This was especially true within the Black subgroup. Cohort versus non-cohort percentages differed by only a few points for each math course (p>.05). Likewise, within the White subgroup, cohort and non-cohort percentages were similar for General Math and Algebra 2 (p>.05), however more White cohort students (39%) than White non-cohort (14%)

students took geometry ($\chi 2_{(1)} = 62.09$, $p<.001$); and fewer White cohort students (52%) than White non-cohort (67%) students took Algebra 1 ($\chi 2_{(1)} = 11.98$, $p=.001$).

Failures in Math Courses

Results for this variable were the most striking. For both Black and White non-cohort students, failure rates for math courses were high. Within the Black subgroup, Figure 3 shows that the percentage of students failing at least one semester increased as the level of the math course increased, from 51% of the students who took General Math to 80% of students who took Algebra 2.

Within the White subgroup, the percentages of non-cohort students failing General Math and Algebra 1 were statistically similar to the percentages within the Black subgroup (for General Math, $\chi 2_{(1)} = 0.32$, $p=.571$; for Algebra 1, $\chi 2_{(1)} = 2.38$, $p=.123$). Failure in Geometry occurred within the White non-cohort subgroup, but the percentage was smaller than that for the Black non-cohort students ($\chi 2_{(1)} = 7.99$, $p=.005$). The number of students taking Algebra 2 for both ethnicities was small, thus a statistical comparison of the percentages failing this course was not possible.

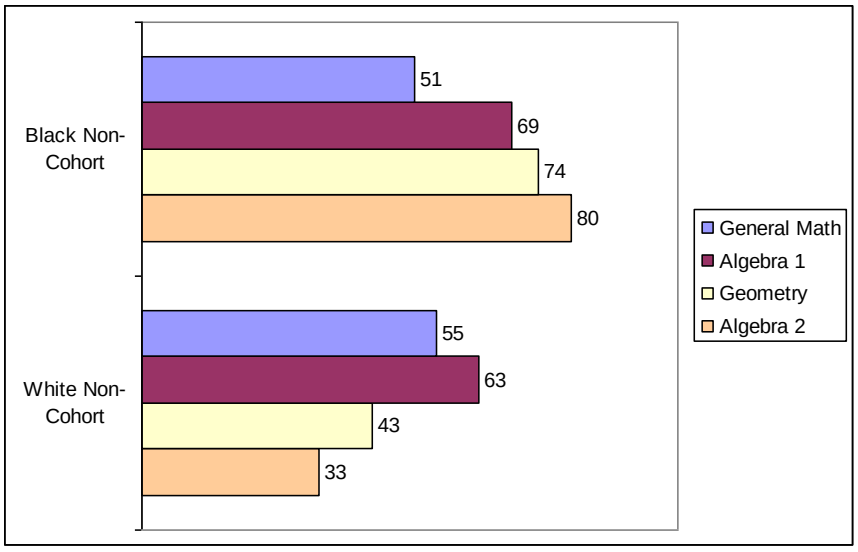

Figure 3. Percentage of Black and White 9th grade non-cohort students receiving at least one "F" grade in their math course.

As Figure 4 shows, results were quite different for cohort students. Percentages of students failing at least one semester of their math course were small for both ethnicities. The most interesting result was the low percentage of failures in Geometry for Black cohort students (13%), which was statistically similar to the 8% of White cohort students failing this course ($\chi 2_{(1)} = 2.292$, p=.130).

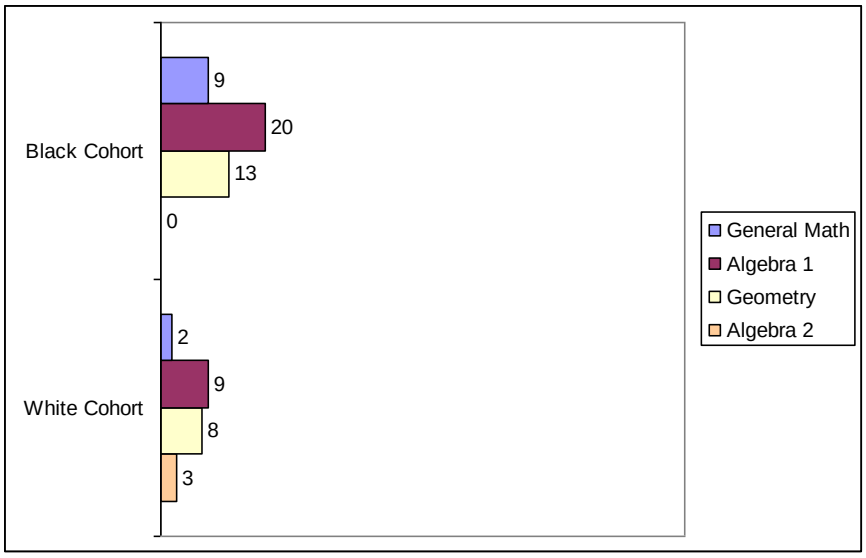

Figure 4. Percentage of Black and White 9th grade cohort students receiving at least one "F" grade in their math course.

Results Disaggregated by School

School results varied widely. First, the percentage of 9th grade non-cohort students in a school ranged from 18% to 77% within the Black subgroup and from 11% to 78% within the White subgroup. Thus, some high schools kept more of their students in the district throughout the high school years than others. Another major difference occurred for math failure rates. In Algebra 1, for example, the percentage of 9th grade Black and White non-cohort students who received a failing grade ranged from 45% to 80% across the ten high schools. The range was even wider for failures in geometry, 0% to 88%.

Large differences also occurred across schools with regard to students who excel on a 9th grade standardized assessment of mathematics. In one school, almost two-thirds of the students (62%) scored in the top 25%. However, another school had only 5% of their students scoring in the top 25%.

When interpreting these results along with additional school-level data, some outcomes were not surprising. For instance, one school that is often referred to as a "top-performing" school did indeed have positive results. It is a magnet school for the arts and has one of the smallest percentage of students from low-income families. The attendance rate is high, and serious disciplinary incidents are almost non-existent. This school had the smallest percentage of non-cohort students across all ten schools and the smallest percentage of students with failing math grades. Cohort students who stayed in the school scored above district average on the state math assessment, took advanced math courses, and had cumulative math GPAs above the district average. These results were true for both the Black and White student subgroups.

A few schools, however, had results that warranted further study at the classroom level. Three schools are highlighted here. For the past several years, School A has often been described as a "low-performing" school with attendance and discipline problems. Data from this study also showed discouraging results. For example, more than 75% of their 9th grade students did not remain in the district, the largest percentage across all ten schools.

Another particular result was especially troubling. Compared to all other district schools, School A had the largest percent of Black and White students taking geometry (23% and 18%, respectively), but receiving a failing grade in at least one semester (88% and 100%, respectively). This raises the question of whether students had the necessary prerequisite knowledge for learning geometry. Geometry is one of the district's core courses, but when taken in 9th grade it is considered "advanced". Research on course requirements and enrollment in math courses indicates that it may be detrimental to place students in a math course before they have the necessary skills (Finn, Gerber, & Wang, 2002; Lee, Croninger, & Smith, 1997). A look inside this school and its classrooms is necessary to answer questions about the criteria used to

determine when a student takes geometry. If students have not demonstrated adequate prior knowledge, it is a disservice to them to be set up for failure. The content, instructional techniques, and assessment in the course should be examined.

The next case is School B which is neither a "top-performing" nor "low-performing" school based on state assessment results. It is not located in an affluent neighborhood and the majority of students come from low-income families. However, several results from this study were quite positive. First, it was one of the best schools at keeping both Black and White students in the district. Approximately 80% of the students who started 9th grade in this school did not leave the district. Why is this school able to keep their students throughout high school while other schools with similar student populations are not?

Secondly, unlike School A, School B had among the lowest failure rates in geometry for 9th grade cohort and non-cohort students. It would appear that students enrolled in geometry were academically ready to take the course. Third, with regard to results from analyses of Black cohort students, this school was performing better than all but the two "top-performing" schools (the arts magnet school and a neighborhood school in the most affluent area of the city). A high percentage of Black students took advanced math and a low percentage received failing grades. Furthermore, there was a high percentage of Black students in the top 25% of scorers district-wide on the math assessment. A qualitative look inside the math classrooms is now needed in order to determine how this school is able to serve their students better than other demographically similar schools.

The final case, School C, has a high percentage of low-income families and a high rate of serious discipline incidents. It is not considered a "low-performing" or "high-performing" school. Students' scores on the math assessment are near district average. However, the

cumulative math GPA for Black cohort students from 9th to 12th grade was higher than all the other high schools, including the "top-performing" ones. Once again, it would be helpful to gather data from the mathematics classrooms to explore why test scores are average, but course grades are high.

Discussion

The district knew that some of their schools were academically serving students better than others based on standardized assessment scores. The value of this study was that it included other indicators of math performance and it provided concrete information on non-cohort versus cohort mathematics coursework data within demographic subgroups. Certain schools were targeted for more in-depth qualitative analysis of several specific issues.

First, mathematics content may vary widely from one classroom to another and from one school to another (Ma & Wilkins, 2007; Finn et al, 2002), and several versions of each math course may be offered. In this district, there were basic, standard, honors, and summer-class versions of Algebra 1. How do they differ? If a student takes and passes a Basic Algebra 1 course, can he/she be successful in a Standard Geometry course?

Secondly, results from our study showed a relationship between receiving at least one failing grade in a math course and being classified as a "non-cohort" student. Research has shown that urban students have difficulty recovering from failure in mathematics courses and many eventually drop out of school, especially when the failure occurs during their first year after a school transition, for example, from middle school to high school (Roderick & Camburn, 1999). Early failures in high school tend to be connected to other problems as well, such as lack of motivation, lack of parental support, and discipline. As mentioned previously, students need

adequate preparation for the next level math course. Schools in this district varied widely in the percentage failing advanced courses in 9th grade. It would be worthwhile to compare the processes for enrolling in math courses at each school.

With regard to math course grades, cohort students in School C had the highest average math GPA of all district schools, while their scores on the state math assessment were near district average. Research has shown that grades and test scores have a moderate correlation at best, meaning that they tend to rank students somewhat differently. Willingham, Pollack, and Lewis (2002) found several factors that accounted for differences in observed grades and grades predicted from test scores. One is the inherent nature of large-scale assessments versus classroom assessments. The former covers a broad range of content learned over time, whereas the latter is typically more aligned to day-to-day instruction. Another factor is grading variations among schools and teachers. Additional elements may or may not play a role in assigning grades (e.g., attendance, effort, behavior, assignment completion, and class participation). What is the best measure of math performance – standardized tests or course grades? The answer, of course, is that no single measure of achievement should be used to make decisions. Rather, multiple measures of math performance allow all students to best demonstrate their knowledge.

Finally, additional variables can be incorporated into studies of schools. These include student academic self-concept, behavior, approach to school, motivation, and attitudes and beliefs towards mathematics. Upon first glance, these variables might be thought of as inherent to the students themselves, but in fact a positive school environment can have a large impact on how students view themselves academically and how they approach their school life.

Final Remarks

The meaningfulness of data maintained in schools' extensive electronic database systems depends on the ability to retrieve what is needed and produce results that are useful and easily understood. The purpose of our study was guided by the district's needs, which is a first requirement for the usefulness of data. It focused on the subject area of high school math, students who leave the district, and students who stay all four years. Regardless of the specific questions, however, the intention for sharing our study is to demonstrate an approach to data analysis that did not focus on what they already know (i.e., the existence of gaps across demographic subgroups) but rather a more detailed investigation of differences within subgroups and similarities between subgroups. Although the analysis was straightforward and simplistic, the process of obtaining data from the longitudinal database was complex. This is the value of college or university faculty partnering with practitioners. Most school districts lack the time, personnel, and resources to begin these types of studies. When faculty conduct the initial analyses to answer specific questions, results will provide districts with a starting point for further investigations inside schools and classrooms. Ultimately, as stated by Lubienski and Gutierrez (2008), there is the hope that we can "decrease the dangers of gaps analyses [and] increase the potential for…our work to have beneficial impacts" (p. 370).

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Creating Excellence Through School Culture:

The Target, the Team, and the Tactics

Connie Myer

Abstract

Although specific, common characteristics have been found among high-performing schools, the predominant finding in the research literature is that there is no single, clear-cut recommended approach to attaining these characteristics. The position proffered in this paper is that: (1) a school leader can create a powerful, high-performing school by engineering a culture in which all elements are collectively focused on student success, and (2) this culture can be created by centering on three broad areas: the target, the team, and the tactics. The successful school leader must establish a shared vision and align all the elements of the school toward achieving that goal. The leader must build strong teams who work collaboratively toward the shared vision. Previous research is cited regarding the tactics that can be used to effectively implement this school improvement work. It is proposed that strong leaders whose behavior is based on an understanding of the insights presented here will have a direct, positive influence on both personal and organizational success. The case made here is the synthesis of ideas drawn from a focused review of the literature, the author's background in education leadership, and conclusions of case studies conducted on six high-performing schools in Tennessee.

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Education literature is replete with studies examining high-performing schools across the country and documenting the characteristics they have in common. Although specific, common characteristics have been found, the predominant finding is that there is no single, recommended approach to attaining these characteristics of high-performing schools.

The position proffered here is that: (1) a school leader can create a powerful, high-performing school by engineering a culture in which all elements are collectively focused on student success, and (2) this culture can be created by centering on three broad areas: the target, the team, and the tactics. This position is the synthesis of ideas drawn from a focused review of the literature, the author's background in education leadership, and conclusions of case studies conducted on six high-performing schools in Tennessee. The remainder of this paper presents information to justify the argument.

Tennessee High-Performing Schools (THPS) Case Studies

In 2005, the Appalachia Educational Laboratory (AEL) at Edvantia, a nonprofit education research and development corporation, funded a study conducted by Craig, Butler, Cairo, Wood, Gilchrist, Holloway, Williams, and Moats. The purpose of the study was to identify the common characteristics of high-performing schools in Tennessee, to determine if these features were consistent with what other studies of high-performing schools have reported, and to consider whether any of the identified components had any potential for being used to improve student achievement in low-performing schools.

Literature Review. The predominant finding in a review of the relevant research literature in the THPS study reveals that there is no single thing schools can do to become more successful in producing higher levels of student achievement, other than perhaps to engage in years of hard work focused on that improvement. Other findings, which were related to high

expectations, curriculum, instructional time, collaboration and hard work, effective leadership, and parent involvement, were consistent with findings in other studies.

High Expectations. Researchers found that high-performing schools typically embrace a culture of high expectations. These high expectations for students generally motivate students to perform at higher levels and support increased student achievement. It is also common that this culture of high expectations is directed at faculty and staff and includes regular students as well as students with special needs.

Curriculum. Studies of high-performing schools indicate that these schools focus on the curriculum and work to ensure that their curriculum, instruction, and assessment are aligned with applicable standards. Top-performing schools report extensive use of standards to design curriculum and instruction, assess student work, and evaluate teachers.

Instructional Time. Studies of schools in several states have found that faculty in high-performing schools maximize the amount of time spent on instruction by structuring the school day efficiently and creating additional time for instruction. This was accomplished variously by structuring the school day to minimize interruptions and transition time and by providing additional instruction time after school or during the summer. Other researchers observed that an academic, instructional focus was a common feature of the high-performing schools they studied.

Collaboration and Hard Work. The presence of talented, hard-working, effective teachers was identified by several researchers as a component of high-performing schools. Collaboration or teamwork has been reported as a key feature that hard-working teachers exhibit and is another characteristic commonly observed by researchers in high-performing schools. Also found was that a collaborative attitude tends to characterize the relationships of staff within high-performing schools as well as relationships between the school and outside entities such as

the district office and the larger community. Also emphasized was the role of collaborative or democratic decision-making processes.

Effective Leadership. Effective leadership is another important characteristic of high-performing schools. A common theme in existing research is that school leaders in successful schools tend to focus on instructional issues. Principals have been characterized as "leaders of learning," and that their direct involvement in the teaching and learning process is critical.

Parent Involvement. High-performing schools are frequently found by researchers to have high levels of parent involvement. Whereas the nature of the involvement varies from school to school, it was noted that high-performing schools tend to work to actively involve students' parents in the teaching and learning process.

Other Factors. Other characteristics and practices identified by researchers as being associated with high-performing schools include: (1) purposeful teacher hiring practices, (2) effective use of resources, and (3) differentiation or flexibility in instruction.

Research Methods. Six schools were selected for the study: two elementary, two middle, and two high schools considered to be high performing based on a set of mathematics and English/language arts performance indicators. A battery of selected surveys was conducted using Edvantia's descriptions of the components of continuously improving schools: learning culture, school/family/community connections, effective teaching, shared leadership, shared goals for learning, and purposeful student assessment. In addition, researchers conducted teacher and administrator interviews and reviewed school documents.

Findings. The researchers found that high-performing schools in Tennessee were characterized by dedicated, hard-working teachers who were implementing curricula described

as being aligned with state standards and working within school cultures of high expectations for student and teacher performance.

School leaders in these high-performing schools attempted to make teaching and learning the central focus of the schools. Teachers employed multiple assessment strategies and used data to make instructional decisions to implement differentiated teaching strategies in order to meet the learning needs of their students. All of these things occurred in an environment of strong parent interest and community support, and continuous improvement is the norm. Decades of study by various researchers and organizations support these findings as common to high-performing schools.

Recommendations. As a result of the study, researchers advised leaders of low-performing schools to: (a) emphasize high expectations for student behavior and learning; (b) emphasize high expectations for teachers; (c) work hard with dedicated effort; (d) focus on effective teaching; and (e) involve the parents. Each of these recommendations is well documented and supported in the relevant research literature. However, there was no single, definitive method for improving a school that could be recommended (Craig, J., Butler, A., Cairo, L., Wood, C., Gilchrist, C., Holloway, J. Williams, Moats, S., 2005).

The notion proposed in this paper is that the school leader can make immense strides in school improvement by focusing on the transformation of the school culture. Herein is the explanation of a proposed three-pronged approach—the target, the team, and the tactics—to shaping a school's culture that will form the foundation of a powerful, high-performing school.

Three Important Elements of Transforming a School Culture

The only thing of real importance that leaders do is to create and manage culture, according to Schein (1992). An academically effective school is distinguished by its culture: a

structure, process, and climate values and norms that channel staff and students in the direction of successful teaching and learning (Purkey & Smith, 1989). This kind of powerful school has a strong sense of collective identity and community spirit that can carry it through extraordinarily tough times (Kouzes & Posner, 2003). Creating such a school is imperative for the school leader, who can achieve it by focusing on the target, the team, and the tactics to transform the school culture.

The term *target* refers to a shared, unique vision of the ennobling possibilities for what the school could be. The term *team* refers to everyone involved with the school producing the human resource synergy that gives the group the ability to outperform even its best individual member (Buchanan & Huczynski, 1997). The term *tactics* refers to the thoughtful means by which the school leader can create a culture of success in which both students and teachers flourish. The design of a high-performing school culture begins with establishing the target.

The Target. The terms *target*, *vision*, *mission*, *objective*, and *purpose* are often used interchangeably. In any case, developing an ideal vision as a target requires thoughtful planning. The norms of a school, regardless of how they manifest themselves, underscore the point that they should represent a clear, articulated vision of what the school stands for, a vision that embodies core values and purposes (Saphier & King, 1985). You have to know where you are going and be able to state it clearly and concisely. You have to care about it passionately. That all adds up to vision. The vision is the concise statement or picture of where the school and its people are heading and why they are proud of it (Phillips, 1992).

One of the most consistent themes offered by leaders of high-performing schools is that the central principle of the vision for the school is student learning (Patterson & Kelleher, 2005). It is the school's role to improve society by producing literate, self-supporting citizens who make

a contribution to their world. This role gives a common purpose to all the elements of the school (Wilmore, 2002).

Kouzes and Posner (2003) encourage leaders to envision the future and imagine the attractive opportunities that are in store once they and their constituents arrive at the final destination. In some ways, leaders live their lives backward. They see pictures in their mind's eye of what the results will look like even before they have started their project, much as an architect draws a blueprint or an engineer builds a model. Their clear image of the future pulls them forward. Intentional, proactive planning is an important part of the process of establishing a target vision.

The purpose of the planning process is to identify, from among the myriad of things that could be done, those few strategic objectives that, when achieved, would produce previously unattainable results. The planning process is the vehicle for setting priorities. It is also the means by which new ideas, old beliefs, and current practices are put under the magnifying glass. Planning provides a strategic framework for action, but it does not end at the close of the school year. The process is dynamic and continuous. Plans may have to be modified, but if priorities are set, all can continue to stay focused on reaching the target (Kaltman, 1998).

The development of a school vision involves getting faculty, staff members, families, and committee members together to talk, discuss, collaborate, and use data-driven decision making to determine exactly where the campus is now and where it wants to be in the future. The place the school wants to be becomes the campus vision. From that point on, everything the campus does should be aligned with that vision. Develop goals and strategies to achieve it. Align resources and staff development with it. Everything said, done, planned for, or purchased should focus on the achievement of this collaboratively developed campus vision. This does not mean the vision

won't change as the school changes. It simply means that at this moment in time, this is the school's vision. As times and situations change, so will the vision. Everything grows and changes; so does the vision (Wilmore, 2002).

When a target is clearly established, decision making is easier. If an activity causes you to lose sight of your priorities and is unrelated to the target, it needs to be questioned. It is tempting to get sidetracked into pursuing easy, but unrelated, successes. The yardstick that should be used to measure performance is not a list of minor, perhaps peripheral, accomplishments, no matter how long. Even extraordinary performance on a secondary priority is only an unnecessary success and an unwelcome distraction. The real measure is the contribution you are making toward achieving your primary objective and this is where all efforts need to be concentrated (Kaltman, 1998).

There are people who do not put emphasis on a school vision or mission. They consider it to be merely "soft stuff" that people in ivory towers talk about but that has no real meaning in the actual management of a school. The problem is that if we do not know where or why we are going someplace, it should come as no surprise when we do not get there. We must "begin with the end in mind" (Covey, 2004).

Educational leaders, along with leaders in most professions, have a deserved reputation for "spewing forth a barrage of well-intentioned slogans that attempt to convey meaning but fail miserably in practice. No wonder people tune out when school leaders start chirping about mission, vision and values" (Patterson & Kelleher, 2005). Many times school leaders themselves aren't clear about what they mean. This lack of clarity inevitably creates even greater confusion in the minds of those receiving the message. Especially in times of adversity, people need leaders to provide clear direction anchored in clearly understood values. These personal values

are nested in layers to create a hierarchy that portrays what matters most to you (Patterson & Kelleher). When these personal values are embedded in the shared vision for the school, there is a heightened sense that everyone in the school is both obligated and able to take control of his or her life and can make a positive difference in the school. This is the foundation of building effective school teams.

The Team. Grand dreams do not become significant reality through the actions of a single leader. Leadership is a team effort—but creating and sustaining the team requires individual leadership. A simple test to detect whether someone is on the road to becoming a leader is the frequency of use of the word "*we"* (Kouzes & Posner, 2003).

Leadership does not exist in a vacuum but is simply one component of effective organizational behavior (Glatthorn & Jailall, 2009). No matter how capable a leader is, he or she alone won't be able to deliver a large project or program without the joint efforts and synergies that come from the team. Whereas there are several hundred definitions of leadership in the academic literature, the simplest way to know is just to look to see whether that person has followers, perhaps whether they see themselves as such or not. If you think you're a leader and you turn around and no one is following you, then you're simply out for a walk (Kouzes & Posner, 2010).

A conductor works at getting each member of the orchestra to play an instrument in concert with all the other members; success is determined by how well they play together. Good leadership enables the players, whether in the orchestra or on the basketball team, to achieve more as members of the group than they ever could as individuals. Leadership is about relationships. A leader must form relationships that build a team (Hoerr, 2005).

The principal with a moral imperative can help realize it only by developing leadership in others. It is the *combined* forces of shared leadership that make a difference. School leadership is a *collective* enterprise (Fullan, 2003). The term *team* can represent groups as broad as the multicultural citizens of the whole school district or as narrow as the social studies faculty in a high school. Every organization has subcultures (Patterson & Kelleher, 2005).

We all need to remember that success begins with building relationships. It doesn't end there, and relationships aren't the only things that matter. However, unless the relationship piece is in place, successfully completing the task will be much more difficult, whatever the task may be (Hoerr, 2005).

The role of the principal in cultivating a network of relationships is of importance not only in developing collaborative, participatory decision making but in maintaining the restructuring effort as a whole (Prestine, as cited in Murphy & Seashore, 1994). The principal of a successful school is not the instructional leader but the coordinator of teachers as instructional leaders (Glickman, 1991).

Part of the appeal of a team for its members—and a tool team builders can use—is the human need to *belong*. When the needs for safety and for physiological well-being are satisfied, the need for love, affection, and belonging can emerge. People seek to overcome feelings of loneliness and alienation. This involves both giving and receiving love, affection, and the sense of belonging (Maslow, as cited in Huitt, 2007). The need to belong is a powerful, fundamental, and extremely pervasive motivation (Baumeister & Leary, 1995). Another reason team membership can be personally appealing is that one of the most powerful internal motivators on the planet is a sense of meaning and purpose (Thomas, 2009).

Facilitative principals have repeatedly expressed the value of the support network that a group of like-minded colleagues provided them. They bring teams of teachers, parents, and support staff to network retreats. They seek out each other socially and professionally. For instance, a common occurrence in such a setting is for the high-school staff to visit an elementary school in another district, where they would learn about a technique such as portfolio assessment. Elementary principals feel comfortable interacting with middle school and high school principals. Their common link is their belief that staff should be involved in and have ownership of decisions that affect their capacity to teach effectively (Murphy & Seashore, 1994).

In a school with a facilitative leader there is a heightened sense that everyone in the school is both obligated and able to take control of his or her professional life and work environment—that everyone can and must make a difference in his or her school (Murphy & Seashore, 1994). People organize together to accomplish more, not less. Behind every organizing impulse is a realization that by joining with others we can accomplish something important that we could not accomplish alone. This impulse to organize so as to accomplish more is not only true of humans but is also found in all living systems (Hesselbein & Cohen, 1999).

Every living thing seeks to create a world in which it can thrive. It does this by creating systems of relationships in which all members of the system benefit from their connections. This self-organization in the sciences is everywhere, from microbes to galaxies. Patterns of relationships form into effective systems of organization. Organization is a naturally occurring phenomenon. The world seeks organization, seeks its own effectiveness, and so do the people in their organization (Hesselbein & Cohen, 1999).

As a living system self-organizes, it develops a shared understanding of what is important, what is acceptable behavior, what actions are required, and how these actions will get done. As the system develops, new capacities emerge from working together (Hesselbein & Cohen, 1999).

Organization occurs from the inside out as people see what needs to happen, apply their experience and perceptions to the issue, find those who can help them, and use their own creativity to invent solutions. People are exercising initiative from a deeper desire to contribute, displaying the creativity that is common to all living things (Wheatley, as cited in Hesselbein & Cohen, 1999).

Leaders are continually opening new avenues for people in the organization. They are moving toward true team structures, opening to more and more participative processes, introducing new ways of thinking (Hesselbein & Cohen, 1999). Many leaders say they feared giving up control. They feared the consequences of letting go. Ultimately, however, they found their fears were groundless. They found an unimagined resource capability that emerged when there was a common vision and a common value system (Hesselbein & Cohen, 1999).

A leadership team is composed of individuals who know that, by themselves, they lack the time, energy, and expertise to make consistently wise decisions on behalf of the organization. By relying on other team members, these individuals gain from the counsel, perspective, and different skill sets of the rest of their fellow leaders. Although the leadership team does not act robotically with a single voice, it functions much like a president's cabinet, sharing insights and coming up with the best recommendations possible (Bell & Smith, 2010).

When storms strike an organization, the *collective* resilience of those inside the organization helps determine whether the organization plateaus after the storm at the (a)

dysfunctional, (b) survival, (c) recovery, or (d) growth level of functioning (Patterson & Kelleher, 2005). A team with a strong sense of collective efficacy holds a deep-rooted belief in the group's capacity to face any threat that arises with the confidence that the culture will prevail. The team leader plays a crucial role in creating a social context that enables the team to face storms, achieve successful outcomes, and emerge with increased team efficacy (Patterson & Kelleher, 2005).

Successful leaders find it necessary to identify a constituency that they are going to work with. Somebody has to be their arms and legs (Lezotte, as cited in Patterson & Kelleher, 2005). A collaborative school team should plan ways to solicit and involve multiple stakeholders from families and the entire community to become involved and invested in the progress of their schools toward the collaboratively developed vision of excellence. What others may not be able to supply in money, they may be able to supply in time, talents, expertise, or other resources. The number-one thing we need to solicit actively and positively every day is support. We need the support of the entire school community (Wilmore, 2002).

Tactics. Great organizations begin the process of finding a path to greatness by confronting the brutal facts of their current reality. When you start with an honest and diligent effort to determine the truth of your situation, the right decisions often become self-evident. It is impossible to make good decisions without infusing the entire process with an honest confrontation of the brutal facts. Leadership does not begin just with vision. It begins with getting people to confront the brutal facts and to act on the implications (Collins, 2001).

To change the culture requires that more desirable qualities replace the existing unhealthy elements. Clear personal and collective visions are crucial for this enterprise (Barth, 2002). Educators Saphier and King (1985) identified a dozen healthy cultural norms: collegiality,

experimentation, high expectations, trust and confidence, tangible support, reaching out to the knowledge bases, appreciation and recognition, caring celebration and humor, involvement in decision making, protection of what is important, traditions, and honest and open communication. These qualities dramatically affect the capacity of a school to improve and to promote learning.

It is important for symbol and ceremony to fit student perception that teachers care about their achievement and the perception of teachers that administrators place improved student performance foremost in their orientation in their jobs. If that is true, then a strong and consistent school cultural consensus will emerge (Iannaccone & Jamgochian, 1985).

The power that administrators need cannot be given to them; they must earn their power. If administrators lack power or fail to use the power that they have (which is the same as not having the power in the first place), chaos ensues. Sometimes the chaos is loud, with disagreements, destructive battles, a lack of clarity about the organization's direction, or outright rebellion. At other times, the chaos is quiet, characterized by a high degree of apathy, with each person following his own path, moving toward and arriving at a range of destinations. In either case, if the person running the school lacks power, it bodes poorly for everyone, including the students. Of course power that is used negatively bodes poorly as well. How power is used is a significant factor in a school's culture and in determining whether or not that school attracts and supports strong teachers (Hoerr, 2005).

Discussion. The key to the three components of the target, the team, and the tactics is excellent leadership. Good leaders change organizations; great leaders change people. Leaders guide the creation of the vision, deal with external parties, and inspire, but leaders also execute

the strategies that make the vision a reality, deal with the employees, and follow through to ensure that the right things are done in the right way (Hoerr, 2005).

Relationships. Researchers at the Center for Creative Leadership found that the critical success factor for the top three jobs in organizations is relationships with subordinates (Sessa & Taylor, 2000). When leaders are in tune with the emotions of others, they create resonance between leader and constituent and among constituents, much like the musicians in an orchestra create resonance when their instruments are in tune. Insensitive, tone-deaf leaders drive negative emotions and create dissonance in a group. This discord is highly destructive to the group's functioning. Only resonant leaders generate the amplification that enables groups to produce exceptional results (Kouzes & Posner, 2003).

Throughout human history people have risked life, security, and wealth for something that is greater than themselves. People want a chance to take part in something meaningful and important. There is a deep human yearning to make a difference. People want to know that there is a purpose to their existence. They want to know that their lives mean something. A significant part of the leader's job is uncovering and reflecting back the meaning that others seek (Kouzes & Posner, 2003).

Because extraordinary achievements do not result simply from the actions of the leader, it is critical that the leader builds a team of people who feel powerful and capable of taking action. When people are with this kind of leader, they feel empowered, listened to, understood, capable, important, like they mattered, challenged to do more, and other similar descriptors. The best leaders take actions that make people strong and capable. They make people feel that they can do more than they thought they could. One of the reasons people want to follow a leader is

because they know that they will be better off as a result of being in that relationship than they would be otherwise (Kouzes & Posner, 2003).

The leader acts as the group's emotional guide. The primordial task of leadership is driving the collective emotions in a positive direction and clearing the emotional smog created by toxic emotions (Goleman, Boyatzis, & McKee, 2004). Those who turn good into great are motivated by a deep creative urge and an inner compulsion for sheer, unadulterated excellence for its own sake. Those who build and perpetuate mediocrity, in contrast, are motivated more by the fear of being left behind (Collins, 2001).

Highly successful leaders channel their ego needs away from themselves and into the larger goal of building a great organization. It is not that these leaders have no ego or self-interest. Indeed, they are incredibly ambitious—but their ambition is first and foremost for the institution, not themselves. Highly successful leaders are a study in duality: modest and willful, humble and fearless (Collins, 2001).

Highly successful leaders have the attitude that, "I will take responsibility for this bad decision, but we will all take responsibility for extracting the maximum learning from the tuition we have paid." When you conduct autopsies of how difficult situations were handled without blame, you go a long way toward creating a climate in which the truth is heard. If you have the right people in the organization, you should almost never need to assign blame but need only to search for understanding and learning (Collins, 2001).

Good leaders create *thinking machines*. This means hiring people who are intelligent, eager to learn, show initiative, and have common sense. The job of the leader is to help them to realize a shared sense of purpose through discussions of the objectives and the important role each of them plays in implementing the action plans that led to the objectives. The leader should

give them empowering instructions, but remember that empowered people make mistakes. The empowerment message should be reinforced by turning those mistakes into training opportunities (Kaltman, 1998).

Realistic optimists hold high expectations for the future and, at the same time, understand that achieving something less is not total failure. The organization's goals should live in the heart, soul, and mind of the people who make up the institution. When this is the case, the people find ways to work within the realities of the human condition and the realities of the organization to achieve these goals. Just as one's core values express an overall belief about what is important in life, certain professional values express one's belief about what matters most in the work environment (Patterson & Kelleher, 2005).

School leaders are energy creators. Their own personal energy directly affects the collective energy of the organization. Resilient leaders recognize this impact and, when storms strike they consciously implement strategies to protect the team members' physical energy, nurture their emotional energy, help center their mental energy, and challenge them to draw on their spiritual energy to sustain them through the storm. A team's resilience capacity represents the team's potential to make good things happen in the face of a storm (Patterson & Kelleher, 2005).

When you believe the best about your people and treat them as talented contributors, they tend to produce in kind. This is not Pollyannaish leadership. It is a strategic choice to emphasize the positive, expect the best, and reward performance more often than punishing failure (Handy, 1996).

Leaders breathe life into the hopes and dreams of others and enable them to see the exciting possibilities that the future holds. Leaders forge unity of purpose by showing

constituents how the dream is for the common good. You cannot ignite the flame of passion in others if you cannot express enthusiasm for the compelling vision of the group. You must communicate your passion through vivid language and expressive style. The leader's excitement is catching. It spreads from leader to constituents. Their belief in and commitment to the vision are the sparks that ignite the flame of inspiration (Kouzes & Posner, 2003).

Exemplary leaders enable others to act. They foster collaboration and build trust. This sense of teamwork goes far beyond a few direct reports or close confidants. In today's "virtual" organization, cooperation cannot be restricted to a small group of loyalists; it must include all those who have a stake in the vision. You have to involve, in some way, everyone who must live with the results, and you must make it possible for others to do good work (Kouzes & Posner, 2003).

Successful school leaders can actively begin to put themselves in situations in which they are learning and in which their teachers see them as learners. In schools, expert power is the strongest, and it is incumbent upon every principal to work to develop this area. For principals, power is used to influence others to increase student learning. Developing and wielding expert power has the greatest potential for bringing about the growth of faculty and staff members (Kouzes & Posner, 2003).

Leaders also know that no one does his or her best when feeling weak, incompetent, or alienated; they know that those who are expected to produce the results must feel a sense of personal power and ownership. Leaders understand that the command-and-control techniques of the Industrial Revolution no longer apply. Instead, leaders work to strengthen others to deliver on the promises they make. A leader cannot hoard power; it must be given away. When you trust

others and give them more discretion, more authority, and more information, they are much more likely to use their energies to produce extraordinary results (Kouzes & Posner, 2003).

Good leaders proudly discuss teamwork, trust, and empowerment as essential elements of their efforts. A leader's ability to enable others to act is essential. Constituents neither perform at their best nor stick around for very long if their leader makes them weak, dependent, or alienated. When you make someone feel strong and capable, as if she can do more than she ever thought possible, that person will give all and exceed the leader's expectations. When leadership is a relationship, founded on trust and confidence, people take risks, make changes, and keep organizations and movements alive (Kouzes & Posner, 2003).

Good leaders serve as facilitators and developers rather than bosses. They are involved in helping to create a common vision of the school, to model behaviors consistent with that vision, and to allocate resources and distribute information that helps the total school community move toward that vision (Conley, 1993).

Leaders speak most clearly with their actions—changes they make in decision rules (who has the authority to make what decisions), allocation of personal time (meetings accepted and canceled), and relationships (taking the time to understand the personal stories of colleagues). When staff members hear the clarion call for transformation from a leader whose personal actions have remained unchanged, their hope turns to cynicism in an instant (Reeves, 2009).

The one quality in a leader that does matter is the ability to build relationships with people at all levels of the organization and to inspire the rest of the management team to do the same. CEOs who present themselves as fellow employees rather than masters can foster positive attitudes that translate into improved [organizational] performance (Hoerr, 2005).

Communication. Most successful leaders have the ability to communicate persuasively, either through creative use of words that paint a compelling view of the future for the organization or work group, or by the certainty with which the leader introduces the mission and the strategic plans to accomplish that mission. The second potential for influence comes from a leader's ability to tune in to the needs of the followers. Those people who feel that they are truly understood may be more likely to listen to the leader's ideas and implement his or her plans (Riggio, Murphy, & Pirozzolo, 2002).

To inspire others, the leader needs to be able to state what is unique and distinctive about the organization's vision of the future. It needs to be described so that people can picture it in their own minds, and you need to be able to talk about the future, not just the present in a way that is appealing to a large number of people. Your vision may be compelling to you, but if it is not attractive to others, they will not move toward it (Kouzes & Posner, 2003).

In schools, we must communicate to everyone—parents, community members, civic clubs, churches, strangers on the street—who we are, what we are there for, where we are going, what our plans are. Then we must invite them to join us in our crusade. Everyone involved with or who has an interest in the school is a part of the school community. The difference between success and failure revolves around analyzing and solving problems to overcome any barrier to success. Families are critical stakeholders in the learning community and, therefore, valuable assets. We need everyone in the community to help us achieve our vision (Wilmore, 2002). Leaders alone do not make anything great. Leadership is a shared responsibility. The attitude should be that you need others, and they need you. You are all in this together (Kouzes & Posner, 2010).

Leading from good to great does not mean coming up with the answers and then motivating everyone to follow your messianic vision. It means having the humility to grasp the fact that you do not yet understand enough to have the answers and then to ask the questions that will lead to the best possible insights (Collins, 2001).

Leadership. A leader's facilitative behavior is demonstrated by (a) creatively overcoming resource constraints of time, funds, and information; (b) maximizing human resource synergy by building teams with diverse skills and interpersonal chemistry; (c) maintaining sufficient awareness of staff activities to provide feedback, coordination, and conflict management; (d) spanning boundaries to create intraschool and community networks that provide recognition; (e) practicing collaborative politics that emphasize one-on-one conversation rather than large meetings; and (f) through these behaviors, modeling and embodying the school's vision. Principals use these tactics to solve student learning problems, create an environment for school restructuring, and build staff instructional and leadership capabilities (Goldman, Dunlap, and Conley, 1993).

Leaders set things in motion inside the organization. These things ripple through the system: some work, some don't, but the climate for experimentation is evident. A change here elicits a response there, which calls for a new idea, which elicits yet another response. It is an intricate exchange and co-evolution, and it is nearly impossible to look back and name any one change as the cause of all the others. Organization change is a dance, not a forced march (Hesselbein & Cohen, 1999).

The dimensions of leadership practice contributing most to teachers' commitment to change were those that helped give direction, purpose, and meaning to teachers' work (Goldman, Dunlap, and Conley, 1993). From her study on school culture as a control mechanism, Blanch

(1989) found that "group sensemaking" with school values indicates that culture is a strong control mechanism. She concludes that schools should attempt to foster consensus and that principals should act as consensus builders in the early stages of culture development.

The successful school leader must establish a shared vision and align all the elements of the school toward achieving that goal. The leader must build her own and her team member's abilities to work with each other. Doing this well will have a direct impact on both personal and organizational success (Goleman, 2006).

An organization is one large ecosystem that is interrelated and interdependent. The leader is always working on himself and working to improve his emotional bank account with others. He is working on structures, systems, and processes so they are in alignment with and supportive of the shared values and vision. Leaders need enough internal security to afford the risks of thinking abundantly and being willing to share power and knowledge and recognition and to gain and profit with other people. That is a prerequisite for tapping a new synergistic source of wealth and excitement (Hesselbein & Cohen, 1999).

The Library of Congress catalog lists more than 8,000 books written in the last 20 years on aspects of leadership. The newer perspectives on the topic center on putting ego aside, or better said, delaying immediate ego needs for the sake of finding fulfillment in the accomplishments of one's followers (Bell & Smith, 2010). A belief in oneself is the only thing that gives an individual the self-confidence to step into the unknown and to persuade others to go where no one has gone before. This self-confidence, however, has to be combined with the humility to accept that one can be wrong on occasion, that others also have ideas, and that listening is as important as talking (Handy, 1996).

Great leaders build greatness through a blend of personal humility and intense professional will (Collins, 2001). Good leaders do not consider themselves as superior leaders looking down on their less-fortunate counterparts. The best leaders have a multi-level moral imperative, personal humility, and intense professional will. They see their role as systematically developing leadership in others so that sustainability can be achieved (Collins, 2001).

Rather than thinking that you, as the leader, have all the answers, you need to be able to ask great *questions*. Great questions send people on pioneering journeys in their minds. They are much more likely to discover novel ideas when you set them free to explore on their own. The answers are out there, and they will be found among your constituents as long as people feel safe in offering them (Kouzes & Posner, 2003).

Asking questions is just one way that you can communicate that you believe in other people's abilities. Giving them choices, providing them with discretion over how things are done, and fostering accountability are others. People want to feel in charge of their own lives. They want to be in control. They want to determine their own destinies. They want to know that their input matters, that their ideas are good ones, that their answers are correct, and that their decisions will be supported. It is the job of the leader to increase people's sense of self-determination, self-confidence, and personal effectiveness. It is the job of the leader to interact with others in ways that promote connection, collaboration, confidence, and competence. When you do, you will see learning, innovation, and performance soar (Kouzes & Posner, 2003).

Clarity of purpose keeps principled warriors (those who mobilize strength, courage, and willingness to fight as necessary to fulfill their mission) focused on the big picture. It helps them avoid detours and chart a consistent course, while it permits them to be flexible about strategies

and tactics. With their eyes on the prize, conviction and commitment fuel their determination to pursue victory courageously and tirelessly. They are the warriors most likely to be remembered far more for what they built than for what they destroyed (Bolman & Deal, 2006).

A vision seen *only* by a leader, however, is insufficient to create an organized movement or a significant change. A person with no constituents is not a leader, and people do not follow until they accept a vision as their own. Leaders cannot command commitment; they can only inspire it. Leaders enlist others in a common vision. To enlist people in a vision, a leader must know his constituents and be able to relate to them in ways that energize and uplift them. People must believe that their leader understands their needs and has their interests at heart. Only through an intimate knowledge of their dreams, hopes, aspirations, visions, and values are leaders able to enlist support. Leadership is a dialogue, not a monologue (Kouzes & Posner, 2003).

To build and sustain a sense of oneness, exemplary leaders are sensitive to the needs of others. They ask questions. They listen. They provide support. They develop skills. They ask for help. They align people in a common cause. They make people feel as if anything is possible. They connect people to their need to be in charge of their own lives. They enable others to be even better than they already are (Kouzes & Posner, 2003).

In an organization with decisive leaders, the atmosphere is dynamic and vibrant. People move with a spring in their step and purpose in their direction. Opportunity seeks out the organization, and the well-focused one, backed by solid vision and well-thought-out goals, almost always succeeds (Phillips, 1992).

Peters and Austin (1985) advocated "preaching the vision." Attention, symbols, and drama are the nuts and bolts of leadership. Effective visions and organizational mission

statements cannot be forced upon the masses. Rather, they must be set in motion by means of persuasion. The people must accept and implement them wholeheartedly and without reservation. When this is achieved, it is always done with enthusiasm, commitment, and pride. Moreover, truly accepted visions tend to foster innovation, risk-taking, empowerment, and delegation. If the working troops understand what is expected of them, what the organization is trying to accomplish, then it becomes possible to make important decisions on lower levels, thereby creating a climate in which results and progress continually occur (Peters & Austin, 1985).

In the physical world, climate can determine whether plants thrive or fail to grow. The climate of a school can similarly have a major influence on morale, learning, and productivity. A welcoming, safe, and supportive environment can help students believe in their potential and provide motivation for success—particularly if they feel they are respected in all their diversity, including differing types of talents and learning styles (Gorton & Alston, 2009).

Conclusion

Whereas research such as that conducted in the Tennessee case studies indicates there are specific characteristics common to high-performing schools, no single, clear-cut approach to school improvement has been identified. The position put forth in this paper is that by developing a shared target of excellence, creating a mutually beneficial team, and using research-based tactics to develop a positive culture of learning, the school leader can move the school to high-performing status. This approach produces a collective focus of all school-related elements on student success, which is the foundation of a high-performing school.

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Prominent Factors and Proposed Significant Solutions Relating to the Low Mathematics Achievement Among Indigenous Populations of Western Australia

Derek Gulling

Abstract

This literature review examines the significant factors that contribute to low mathematics achievement among indigenous populations in Western Australia and the proposed solutions. All authors suggested that geographic location, or remoteness, cause significant problems for student achievement. Factors such as teacher inexperience, lack of skills, or questionable competence levels as well as cultural identities are discussed and related to poor mathematical achievement. In response to these factors causing low mathematical achievement, several significant solutions are offered to address the poor achievement results. These solutions emphasize the importance of group work and creating heterogeneous groups that allow students to connect to one another in a meaningful way. Moreover, maintaining cultural identity by using the home language is important to interactions amongst students and teachers. Finally, utilizing multiple entry points as a means to properly educate each student emphasizes placement into learning situations that require cooperation, creation of constructive ideas, and critical thinking.

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Education officials have long been interested in the achievement of students given unique situations. One particular concern is the achievement of western Australian indigenous peoples. In this context, the term 'indigenous peoples' refers to the aboriginals of western Australian including those peoples who inhabit the Torres Strait. Furthermore, the terms indigenous and aboriginal are used synonymously in the articles reviewed.

Recent studies indicate an existing gap in achievement in the subject areas of math, science, and reading between indigenous students and non-indigenous students (Cresswell, Greenwood, & Lokan, 2001). Due to this gap, Australian education officials are greatly concerned with understanding the roots of the problem to facilitate an effective response. This literature review analyzes the significant causes of the growing achievement gap afore mentioned between indigenous and non-indigenous students' mathematical achievement and identifies proposed significant solutions that promote a resolution to that scoring gap.

Significant Factors Causing Low Mathematical Achievement Scores

Given that the indigenous student population in Australia's education system exhibit lower achievement in mathematics classes than non-indigenous students, discussion focuses on the significant factors contributing to this problem. All authors in this literature review agree that geographic location, specifically remoteness, is a prominent factor contributing to the decline in achievement. However, the authors each present differing opinions on how remoteness causes decline in achievement. Studies by Zevenbergen, Grootenboer, Niesche, and Boaler (2008) conclude that students in remote schools perform poorly in comparison to students who attend schools in metropolitan or urban areas. Zevenbergen, et al. (2008) also indicate that the mathematics achievement of indigenous students has been declining steadily over a period of

time. This decline, according to Zevenbergen et al. (2008), is solely caused by the remoteness of these schools and the physical distance from mainstream education. In a separate article, Jorgensen-Zevenbergen, Grootenboer, and Niesche (2009) suggest that remoteness in the context of communication is the primary reason that indigenous students struggle with mathematical achievement. The physical distance between remote schools in western Australia to populated areas that include well developed schools strains the ability for professional conversation between teachers at their respective institutions (Jorgensen-Zevenbergen et al., 2009). This lack of communication hinders the exchange of successful ideas, strategies, and outcomes between professional teachers, thus inhibiting collaboration between colleagues. Alternately, Matthews, Howard, and Perry (2003) indicate that remoteness is a prominent factor, however, these authors cite healthcare and socioeconomic status as prominent factors; not necessarily physical distance alone.

Matthews et al. (2003) assert that remoteness causes deeper issues related to poverty and poor healthcare. Remote regions often have inadequate health facilities and limited financial opportunities that are normally present in metropolitan settings. Supporting that claim, healthcare and poverty are factors related to the decline in achievement and were prominent among indigenous populations more so than non-indigenous populations (Australian Human Rights and Equal Opportunity Commission, 1995). The combination of these aspects deepens the issues caused by physical distance alone and substantiates Matthews, et al. (2003) claim. Also, in a study done by Jorgensen-Zevenbergen, Grootenboer, and Sullivan (2010), the issue of physical remoteness and isolation was further complicated by aspects such as health and education making them key components of the struggling achievement in math (Jorgensen-Zevenbergen, et al., 2010). Like Matthews et al. (2003), Jorgensen-Zevenbergen et al. (2010) claim poor health

and lack of education are prominent issues among several groups in the world and are generally well accepted as factual reasons for declining achievement. Here, lack of education refers to a failure of the education system rather than lack of educated parents, teachers, or administrators.

According to Jorgensen-Zevenbergen et al. (2009), another important factor for declining achievement is due to the role of the teacher. Specifically, the authors describe the teacher's role in the reformation of issues related to access and performance in mathematical topics. Here, the teacher's role is to provide adequate access to mathematical resources. The authors are vague on defining exactly what those resources might be, but one could assume the linguistic use of resources refers to material resources and not financial or administrative. However, the role of the teacher has always been to prepare the student in any way possible for success in any academic field.

Another factor based around the role of the teacher in the declining achievement among indigenous populations is that most teachers at indigenous schools are new or recent graduates and lack skills appropriate to teaching a student population of diverse cultural and linguistic backgrounds (Jorgensen-Zevenbergen, et al., 2009). It is important to address the differences in culture, whether those differences are dialects, beliefs, or customs. Failing to understand and cope with these differences can result in confusion, low motivation for students to succeed, and also frustration between educators and students. The teachers simply do not possess the skills to effectively implement strategies designed for these students since many of these teachers recently graduated from a university that taught education according to mainstream Australia. These teachers essentially find themselves disconnected from the needs of their students. This disconnection is an obvious realism that must be addressed to appropriately resolve the social conflict between students and educators.

Similarly, Jorgensen-Zevenbergen et al. (2010) cite the teachers' lack of experience as a negative aspect in remote areas. However, no definition is given to define lack of experience. Contextually, one could substantiate a claim that lack of experience refers to the inability of the teacher to implement effective teaching styles. Perhaps, in this statement, Jorgensen-Zevenbergen et al. (2010) are citing an overall lack of experience, such as a relationship between newly graduated teachers, their inability to effectively deliver classroom instruction, or their inability to socially connect with their students.

An additional factor for decline related to the teacher is the ideology that new graduates are often unable to provide adequate guidance services to students that a more experienced faculty member would be able to provide (Jorgensen-Zevenbergen et al., 2009). In this context, guidance refers to the ability of the educator to direct the student to academic success through strategies acquired through experience. These strategies may be anything from 'pep talks' on a bad day to tutoring students in an academic field. The lack of experience to provide guidance is related to the cultural disconnection. It is difficult to provide adequate instruction when disconnection and the inability to guide students serves to promote confusion and uncertainty.

Furthermore, this study indicates that there may be a lack of content knowledge of incoming teachers that obstructs successful teaching of the content to aboriginal students. (Jorgensen-Zevenbergen et al., 2009). If the teachers are not competent in their knowledge of a subject area, it is probable that success of students in the subject area will be modest, resulting in lower achievement than a student who may have had a more competent instructor.

Last, very high teacher turnover is influencing math achievement scores (Jorgensen-Zevenbergen et al., 2010). The consistent replacement of teachers does not allow for proper growth and relationship formation to occur at a sustainable and effective rate. This changing of

teachers also does not allow for academic relationships to form as well, thus, further hindering achievement possibilities.

Uniquely, Matthews et al. (2003) suggest that factors within aboriginal identity are the main cause for decline in achievement. A significant issue for students is the inability to associate with their aboriginal identities or their 'aboriginality'. As stated by Matthews et al. (2003), "Identity is the basis upon which Aboriginal students grow, develop and relate to those about them, including their teachers." (p. 4). The reference to aboriginal identity further extends to the use of the home language in class as a strategy for future success in raising achievement. Home language is a language spoken by the aboriginal peoples of a non-English origin.

Finally, the study also states that parent intimidation and cultural beliefs can also impede the ability to learn mathematics. Parents may feel intimidated that their children know more than they do, suggesting that some parents may be unwilling or unable to help with homework due to embarrassment or lack of skill. Alternately, parents may feel that the study of mathematics itself is irrelevant to their child's interests. Furthermore, frustration among Aboriginal parents remains high and could also affect the learning achievement of Aboriginal students if the parents cannot help with mathematics homework (Matthews et al., 2003). These factors combined can arguably cause a decline in mathematics achievement.

Synthesis of Factors Causing Low Achievement Scores

To better understand where scholars agree and disagree, a summary of these authors' perspectives in this review highlights similarities and differences between their points of view. First, the issue of remoteness is a prominent factor for all authors, yet each author contributed differing opinions on the idea of isolation and remoteness. Moreover, another similar factor

involved the lack of teacher experience and high turnover rate among teachers of Aboriginal populations. Two authors mentioned in this paper discussed this factor at length, Jorgensen-Zevenbergen et al. (2009) and Jorgensen-Zevenbergen et al. (2010).

What was most surprising were the lack of similarities between the three articles written by Jorgensen-Zevenbergen et al. (2008, 2009, 2010). Each article listed is written mostly by the same authors; each article is authored by Jorgensen-Zevenbergen and Grootenboer with a few differences in co-authors. Moreover, the articles were published only a year apart. Yet, there are key differences in position. For example, in Jorgensen-Zevenbergen et al. (2009), the authors discuss an additional factor not included in the other articles. The factor causing low achievement, according to the authors, is the lack of skills of incoming teachers. This is a bit different from other factors such as new graduates' lack of experience. The definition of lack of skills is the difference between the three articles. In actuality, it could be assumed that lack of skills could equate to lack of experience. The argument may seem tedious but the vague definition is indeed in need of a better, more concise, explanation. Furthermore, there are instances where lack of experience is defined in one setting but not in another.

An additional problem related to teaching is discussed by Matthews et al. (2003) and connects lack of resources to low achievement. This factor is not present in other articles. A definitive argument for lack of resources is certainly present given studies suggesting poor health and below average education systems can be attributed, at least in part, to low socioeconomic status among these regions. Therefore, lack of resources would greatly inhibit teachers to provide quality instruction and student ability to receive the instruction.

Finally, threatening the aboriginal identity, as suggested by Matthews et al. (2003) and Jorgensen-Zevenbergen et al. (2010), produces a problematic situation where mainstream culture

is adopted and the minority culture is replaced. Students who speak minority language cannot embrace a proper relationship with the teacher. This lack of relationship has detrimental effects of the ability to address issues with that particular child's learning and success in mathematics as a whole. As noted in other situations, it is interesting that the lack of aboriginal identity is mentioned by Jorgensen-Zevenbergen et al. (2010) and is not discussed as a problem in other articles written by the same authors.

Proposed Solutions to Raise Mathematical Achievement Levels

Discussing the significant factors causing low achievement score has but one purpose; to promote discussion of feasible solutions. The proposed solutions discussed by articles included in this review provide the potential of being an excellent practice. Further research is needed to study the implementation of these proposed solutions as well as their effectiveness.

A solution supported by Jorgensen-Zevenbergen et al. (2008, 2009, 2010) and Matthews et al. (2003) suggests that group work is a key component to a successful solution. Specifically, Jorgen-Zevenbergen et al. (2010) suggest that heterogeneous group work and collective responsibility can improve the low achievement scores. These authors believe that heterogeneous group work shifts the onus of responsibility from the teacher to the group of students (Jorgensen-Zevenbergen et al., 2010). This shift allows group members to be responsible for each other thus, in theory, promoting learning and peer support. If a student is unable to correctly respond to a question posed by the instructor, the responsibility of teaching that student falls upon the other group members. Moreover, Jorgensen-Zevenbergen et al. (2010) continue, "In line with a collective responsibility philosophy, there is no concept of a student failing or being left behind, and it is the role of the group to ensure that everyone is able to understand the work required"

(p. 5). Related, Jorgensen-Zevenbergen et al. (2009) imply that encouraging interaction among peers and deep learning within a group structure are also plausible solutions because this approach focuses on peer dependence and peer support.

Furthermore, another discussion purports that introducing and assigning tasks within the group promotes equal participation (Jorgensen-Zevenbergen, 2009). This concept is certainly valid if done correctly and may give group members a feeling of importance or self-worth within the class. However, it may be difficult to assess how successful this approach would be. The effects of responsibility and titles vary greatly from student to student and could cause problems in interactions between peers. Thus, the only viable solution would be to ensure that all participants in the group have equal responsibility and everyone has been assigned a task. Ensuring equality is and would be a difficult task and would require an experienced instructor. Interestingly, the concept of task assignment is strictly that of Jorgensen-Zevenbergen et al. (2009).

Matthews et al. (2003) offer a similar idea concerning group work. These authors generalize the concept by arguing that a group of peers working collectively towards a particular solution is a worthwhile and effective method. Matthews et al. (2003) offer no different approaches to how group work should be designed, thus implying similarities between Jorgensen-Zevenbergen et al. (2010) and Jorgensen-Zevenbergen et al. (2009). Furthermore, Jorgensen-Zevenbergen et al. (2008) portray group work as an affirmative method to increase achievement using responsibility and peer interaction.

A second prominent solution offered is the use of multiple entry points and multiple dimensions of teaching. For instance, as noted in Jorgensen-Zevenbergen et al. (2010), implementing diverse mathematical concepts that cater to a wide range of mathematical

backgrounds and interests promotes thinking and learning mathematically. Furthermore, Jorgensen-Zevenbergen et al. (2010) suggest that these entry points lead students to explore alternative ideas and opinions subject to the intellectual and mathematical abilities offered in the group. Figuratively speaking, these entry points intentionally cause students to venture into situations requiring cooperation, understanding, and ultimately, creative thinking.

In the article written by Jorgensen-Zevenbergen et al. (2009), the authors include multiple entry points as a method for improving low achievement in mathematics. They state that it is necessary to include multiple entry points to avoid having a student feel alienated from the rest of the group (Jorgensen-Zevenbergen et al., 2009). In order to teach to the entire class, the teacher must utilize multiple entries (pathways and representations) to tend to the diversity of learning present in the class. Some learners are auditory whereas others are visual or kinesthetic. Thus, offering multiple teaching techniques and tasks can meet all of these different learning styles and avoids alienating a student for his or her specific learning style.

According to Jorgensen-Zevenbergen et al. (2008), in order to achieve equitable pedagogies, multiple entry points are essential as listed in the rubric for equitable pedagogies (for further reading, please reference p. 4-7, Jorgensen-Zevenbergen et al., 2008). One can assume that multiple entry points in this circumstance are similar if not equivalent to arguments made in other works written by these same authors.

Another widely accepted solution by Jorgensen-Zevenbergen et al. (2008, 2009, 2010) and Matthews et al. (2003) is to maintain cultural identity while teaching these students. Despite the agreement among authors, each author has a slightly different view of how this solution is attainable. Jorgensen-Zevenbergen et al. (2009) suggest that in order to maintain cultural identity, the instructor must use the home language while teaching in place of the majority

(dominant) language. Furthermore, Jorgensen-Zevenbergen et al. (2009) state, "Students are encouraged to negotiate meaning in their home language, but must report their findings in Standard Australian English." (p. 283).

Jorgensen-Zevenbergen et al. (2010) also agree that the use of home language is important to solving the problems causing low mathematics achievement scores. Jorgensen-Zevenbergen et al. (2010) state, "This approach reduces the cognitive load demanded in switching and translating between languages, and thus frees cognition and interaction to enable greater possibilities for meaning making." (p. 6). It would certainly seem plausible that cognitive abilities would be better able to focus on learning mathematics if that ability was not strained between deciphering language while managing new mathematical content.

Finally, Jorgensen-Zevenbergen et al. (2008) also suggest that the use of home language helps students overcome low achievement scores in mathematics. The students may use their home languages to determine meanings and grasp content, then during feedback, the students can translate and report in English (Jorgensen-Zevenbergen et al, 2008). In this way, students encounter material initially in the language that is most comfortable for them.

Interestingly, Matthews et al. (2003) also cite the need to maintain cultural identity but do not cite the use of home language as means to do so. They instead suggest that the role of mathematics in maintaining cultural identity is overlooked by those who teach and develop the curriculum. In order to maintain cultural identity in mathematics, Matthews et al. (2003) imply that there is a need to explore the Aboriginal beliefs regarding mathematics. Furthermore, the Aboriginal beliefs regarding learning the science of mathematics need recognition as some sub-cultures or tribes regard learning in vastly different manners than dominant cultures.

With reference to maintaining identity, it is worthwhile to note a specific suggestion that teachers should be culturally aware of their lesson plans, tests, and other classroom academic components used to instruct students (Jorgensen-Zevenbergen, 2009). However, teachers in these situations will be instructing students from multiple cultures or tribes and creating lesson plans based upon this ideal may be challenging. One must consider how likely a culturally homogenous classroom is going to be, primarily because these same authors determined a significant factor contributing the low mathematics achievement scores is the cultural diversity in the classroom.

Similar to the support for culturally based lessons, several authors comment on the relationship between instructor and student. For example, Jorgensen-Zevenbergen et al. (2010) state that for successful mathematics instruction, teachers must be supportive in their interactions among students to promote healthy comprehension. According to Jorgensen-Zevenbergen et al. (2010), this supportive interaction is already documented among a growing number of teachers. This optimistic data suggests that this component is already in place. However, if all but one teacher supports strong interaction between teacher and student, there still exists an opportunity for a lower achievement for that particular class.

Furthermore, Matthews et al. (2003) also state that supportive relationships strengthen mathematical ability. These supportive relationships are positive and reinforced by a strong commitment to success (Matthews et al., 2003). Evidence of this thought can be found in the following quote, "Aboriginal students respond best when there are positive personal relationships with teachers…Teaching methodologies that include strong teacher-pupil relationships reduce competition, restrict verbal communication, limit direct questioning and emphasize practical experience and group co-operation…" (Matthews et al., 2003, p.3). There exists a strong support

for positive interaction among teacher and students regardless of the specific cultural characteristic present. Even in majority culture, this positive interaction is needed for successful development of knowledge. Changing the environment of teaching does not change the necessities and underlying practices of teaching.

Finally, there is strong support for a new approach to mathematical thinking. Jorgensen-Zevenbergen et al. (2010) provide details for this new approach using complex tasking. The following excerpt from Jorgensen-Zevenbergen et al. (2010) outlines the effectiveness of complex tasking,

> They have shifted from a predominately rote and drill learning approach, to using more tasks that are rich and somewhat complex (relative to the age of the learners). This has been a strong change in the teachers' practice as they have come to see that the students are capable of learning complex mathematics with appropriate scaffolding. For the participating teachers, there has been a strong shift from deficit, low level thinking of learners to a view that sees Aboriginal learners as capable and confident. (p. 8).

The method of using complex tasking is also found in Jorgensen-Zevenbergen et al. (2008) who suggest that complex tasking provides an opportunity for deep learning through rigorous mathematical tasks. No specific definitions were stated for the type of complex tasking, however, it is inferred that complex tasking refers to structured and defining concepts that allow students to think critically and perhaps ‘outside of the box’.

Synthesis of Proposed Solutions to Increase Achievement Levels

This literature review has presented information pertaining to possible solutions to factors causing a low achievement score in mathematics among Australian Aboriginal peoples. While information presented by the authors has similarities, there are also some notable differences.

Beginning with the discussion pertaining to group work, one can note that Jorgensen-Zevenbergen et al. (2008, 2009, 2010) and Matthews et al. (2003) agree that group work is a possible solution. Each author presented group work and defined that group work must include some faction of responsibility for group members. The same four articles also cite the need for enhanced interactions among peers and their collective work together. However, despite these similarities between works, there were prominent differences and lack of congruency. Specifically, Jorgensen-Zevenbergen et al. (2010) mention using group work as a solution but stated that the responsibility for learning rests within the group and not with the teacher. As mentioned before, the students are responsible for each other's learning. Jorgensen-Zevenbergen et al. (2008, 2009) do not mention this shift of responsibility in either the 2008 or the 2009 article. This difference is unusual and perhaps reasoning for that could be attributed to the fact that the 2008 and 2009 articles were written before the 2010 article opening up the possibility that a new thought emerged.

Uniquely, Jorgensen-Zevenbergen et al. (2009) were the only authors to note that assigning tasks within a group promotes equal participation and responsibility. In this circumstance, there are obvious issues including having an equal number of tasks to be assigned and promoting equal responsibility. The effectiveness of this solution would be determined by

the ability of the instructor to manage this equality among his or her students and groups. For this reason, this solution would need further investigation of its multiple, variable factors.

A second commonality between Jorgensen-Zevenbergen et al. (2008, 2009, 2010) and Matthews et al. (2003) is the multiple entry points approach. All of these authors agree that implementing multiple entry points for mathematical concepts to Aboriginal students would help to improve mathematical achievement scores. The difference is how to implement this solution.

Jorgensen-Zevenbergen et al. (2010) suggest that the teachers cater to a wide range of individuals and mathematical backgrounds. This multiple entry approach allows the instructor to structure lesson plans and activities that engage all learners and their learning styles (auditory, kinesthetic, or visual). Furthermore, Jorgensen-Zevenbergen et al. (2010) mention another benefit to this approach is that it allows students working within groups to explore different ideas and opinions, thus developing specific skills needed to be successful in mathematics.

In contrast, Jorgensen-Zevenbergen et al. (2009), discuss the use of multiple entry points to avoid alienation of individual students. The idea is to include all the students in structured activity that promotes equal learning.

Therefore, these inclinations to use groups and integrate multiple entry points raise a question; how can this approach be implemented? Authors indicate the desired outcomes or reasons behind using multiple entry points (all in an attempt to raise the achievement scores), however there are no specificities regarding how to implement those procedures. One could assume that these ideas are essentially left up to the teacher. However, leaving this approach to individual teachers will promote diverse instruction and it would be difficult to gauge the general effectiveness of this solution. Also, the issue raised by authors about teacher lack of experience and competence could be a mitigating factor. The use of multiple entry points to teach a lesson

or an activity is a good way to engage students, but if this is to be a plausible solution, these entry points would need standard guidelines for all teachers to follow.

Another solution that is proposed is the maintenance of the Aboriginal identity. Jorgensen-Zevenbergen et al. (2008, 2009, 2010) all agree that the use of home language is important to achievement in mathematics. In this way, students can approach new topics through a language that is familiar to them. Then, once the concept is acquired, they can translate to English. The only case against this idea would be one where there is more than one dialect among students in class which would prohibit student group work. At that point, this idea would not be as effective or realistic.

Matthews et al. (2003) offer another viewpoint concerning cultural identity. They do not explicitly state that the use of home language is necessary, despite an intense discussion within the article of the barriers of language between teacher and students. Matthews et al. (2003) suggest that the teacher must explore Aboriginal beliefs regarding mathematics because each culture is different and has different rules regarding learning mathematics. This opinion is a bit obscure. One can comprehend and believe the attempt at making learning mathematics a cultural issue, however, the article written by Matthews et al. (2003) discusses (as noted in previous sections in this literature review) the difficulties in overcoming the language barrier both culturally and mathematically. Subjectively, how can exploration into the beliefs of learning mathematics overcome the prominent issue of language barriers discussed throughout the entire article?

Several authors mentioned another possible solution to the problem facing Australian Aboriginal peoples. Jorgensen-Zevenbergen et al. (2010) highlight the importance of supportive interactions between the instructors and the students. Matthews et al. (2003) elaborate by not

only advocating for supportive relationships, but also for positive reinforcement by instituting a strong commitment to success.

Last, the concept of complex tasking was discussed among several authors. Jorgensen-Zevenbergen et al. (2010) write that complex tasking, along with appropriate scaffolding, will allow students to achieve success in mathematics. The concept of appropriate scaffolding is left open to interpretation. The authors could be suggesting that with the appropriate foundation, students can achieve mathematical success (or at least enough success to lessen the gap between Aboriginal and non-Aboriginal students). Furthermore, Jorgensen-Zevenbergen et al. (2008) continue that complex tasking provides an opportunity for enriched and deep learning. However, there are no ideas discussed that include adequate scaffolding or the types of complex tasking that could work to boost achievement scores.

Conclusion

This literature review presents information about a modern problem facing the Australian education system and the proposed solutions. There are arguments that support certain causes over another, yet it should be noted that every problem mentioned in this review can add to the severity of the issue. The factors causing low mathematics achievement among Aboriginal students in western Australia are significant and the proposed solutions offer hope for the future. This review acknowledges the challenge in defining and remediating low mathematical achievement and the use of the word ‘significant’ when discussing factors is used subjectively. From the literature, it appears that a single solution will simply not be enough to effectively raise and maintain math achievement. The struggles held by Aboriginal students will need multiple solutions to address multiple factors causing low achievement scores in mathematics.

Implementing multiple solutions simultaneously may further enhance mathematics achievement for all indigenous students. Further study of the implementation of these solutions and the effectiveness of each solution in raising math achievement will lead to greater understanding of how to best improve math achievement of the indigenous peoples of Western Australia.

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