Self-Regulation & Student Achievement in Mathematics

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Introduction

The expectations for success is considerably lower for students from families with lower SES backgrounds, divorce, or separation (Milne, Allison, & Plourde, 2006).

According to Martin (2012), minority students’ competencies continue to be viewed negatively, where underachievement and failure in mathematics is more emphasized than their success and resilience.

Intrinsic motivation also plays an important role in academic achievement (Caldwell & Ginther, 1996; Gustafson, 2002).
I have observed many students that could not solve problems that required the use of higher order thinking skills. Not because students did not have the academic ability; it was because they did not have the support to develop self-efficacy and academic confidence.

I teach mathematics to students who have backgrounds similar to mine. I want to be the change agent that cultivates success, even if it is one student at a time.

“You may not control all the events that happen to you, but you can decide not to be reduced by them” (Angelou, 2014).
“All students can learn including students in urban and high poverty schools” (Rousseau & Powell, 2005, p.29).
Tupac Shakur, a hip-hop artist, wrote an autobiographical poem entitled the “The Rose That Grew From The Concrete”.

Like many urban youth, Tupac was exposed to violence, drug abuse, and incarceration. In his music, Tupac can often be heard encouraging youth to keep their heads up through their circumstances.

He is known for crediting Maya Angelou and William Shakespeare for his ability to write poems and lyrics.

Two decades after his death, Tupac remains one of hip-hops most iconic figures. In 2017, Tupac Shakur was inducted into the Rock & Roll Hall of Fame.
The Rose that grew from Concrete

Did u hear about the rose that grew from a crack in the concrete?
Proving nature's laws wrong it learned 2 walk without having feet
Funny it seems but by keeping its dreams it learned 2 breathe fresh air
Long live the rose that grew from concrete when no one else even cared!

(Shakur, 1999)
“Urban”

- Often defined based on personal opinions and judgments (Kumasi, 2012).
- The U.S Census defines urban as an area with a population of two thousand five hundred people or more (U.S. Census, 1995).
- Urban is used as a reference to students who live in communities with low SES, or schools that have high populations of students that receive free or reduced lunch (Gregory, Skiba, & Noguera, 2010).
- Students who live in or attend schools in urban areas, are viewed as having minimal academic abilities (Creasey & Jarvis, 2013).
- African American and Latino students often have the highest representation in schools that are classified as urban.
“If urban youth are like roses in concrete and grow in spite of severe neglect what might the world look like if these youth were given the right amount of nurturing in their homes, communities, and schools?” (Kumasi, 2012, p.37).

What if urban students where compared to roses? Their tenacity, courage, and resilience is vibrant like the color of a petal. But their survival skills can be as protective as a thorn.
Statement of Problem

Rousseau and Powell (2005) state, “Low income minority students have fewer opportunities to learn high quality mathematics” (p. 3). As a result, systematic marginalization occurs (Rousseau, & Powell, 2005).

The number of urban students that take courses beyond algebra is often compromised due to the previous extensive focus on remediating basic skills by middle grades teachers (Matthews, 2005).

A dominant storyline in student achievement in mathematics for minority students are the circumstances the students encounter such as cultural differences, family background and SES, and deficits in problem solving skills (Martin, 2012).
The purpose of this study is to investigate the influence of self-regulation on student achievement in mathematics.
Research Questions

1. How are self-regulatory skills developed in academic and non-academic settings?
2. How are self-regulatory skills used to influence academic achievement in math?
3. How do students perceive teachers’ use of Culturally Relevant Pedagogy in mathematics classrooms?
Conceptual Framework

Social Cognitive Theory
• SCT suggests that a person has beliefs about their own personal abilities. The ability is based on a behavior, the person, and the environment. Each stage affects the other, which has an overall effect on desired behavior (Bandura, 1986).

Culturally Relevant Pedagogy
• CRP has been defined as “a pedagogy that empowers students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes” (Ladson-Billings, 1994, p. 18).
Note: Figure 1.2 is a modified model of Social Cognitive Theory and Culturally Relevant Pedagogy.
# Data Collection

**Methodology (Mixed Methods)**

- Student Mathematics Learning Survey
- Focus Groups
- Interviews

**Participants**

- 30 students completed survey
- 8 students and 2 teachers participated in focus groups
- 1 academic coach and 2 teachers participated in individual interviews
Data Analysis

Phase 1

- SPSS was used to analyze quantitative data to explore the level at which particular variables were correlated (CoolIDGE, 2012).
- Data screening occurred through examining Cronbach’s alpha to determine the reliability of the scales.
- For constructs with $\alpha > .70$, high levels of internal consistency exist, therefore survey items appear reliable (Coolidge, 2012).

Phase 2

- Qualitative data were coded in Atlas Ti to determine if there were commonalities or trends that existed in the data (Saldaña, 2011).
- During the analysis, responses of students, teachers, and school leaders, were collected and analyzed separately.
- As a result of coded responses, themes evolved from data collected during focus groups and interviews (Saldaña, 2011).
Participant Perspectives

Constructs & Correlations
- Student Work Ethic
- Contributing Factors to Self-Regulation
- Use of Culturally Relevant Pedagogy in Math

Codes & Themes
- Self-Regulation: From Home to the Classroom
- Culturally Relevant Pedagogy in Math
- The Evolution: Cultivating Ongoing Student Success
- Educator Perspectives
Data Visuals

Constructs & Correlations

- Algebra I (HS) Math: 33%
- Co-Taught 8th Grade Math: 27%
- Advanced 8th Grade Math: 13%
- On-Level 8th Grade Math: 27%

Codes & Themes

- Student Actions: 40
- Positive Influence: 37
- Self-Regulation: 30
- Student Performance: 29
- Academic Achievement: 26
- Parent Influence: 22
- Social and Cultural: 18
- Negative Peer Influence: 15
- Motivation: 14
- Neighborhood: 13
- Positive Peer Influence: 13
- Real Life Experiences: 13
- Student Perceptions: 13
- Teacher Influence: 13
Note: Figure 4.3 Educator Focus Group and Interview Most Frequently Occurring Codes
Findings

Constructs and Themes: The Relationship Between Correlation Values and Coded Themes

- Quantitative and qualitative results indicated that similarities existed in student, teacher, and academic coach responses to survey items and responses to protocol questions.
- Results of survey items that were used in Constructs 1-3 were similar to the themes that evolved from the qualitative data.
How are self-regulatory skills developed in academic and non-academic settings?

• Students attributed skills such as perseverance and motivation to their success. Focus group and survey results related home life to academic success.

• Students confirmed that their environment does not always negatively influence their academic behavior (Ocak & Yamac, 2013). The alignment of SCT and the development of SRL further supports the idea that environments influence students’ academic achievement.

• When math teachers incorporate the use of *The 5 Practices for Orchestrating Productive Mathematics Discussions*, teachers are more likely to require student use of higher order thinking skills, which contribute development of problem solving and other mathematical skills used during SRL (NCTM, 2011).

• During student self-monitoring, skills that contribute to the development of SRL are used.
How are self-regulatory skills used to influence academic achievement in math?

- Survey results determined students have the desire to complete academic tasks. Although at times students would prefer to be doing something different, students are striving to complete tasks, which can be attributed to student success.
- Parents and teachers that encourage students to facilitate their own learning teach students to use self-regulatory skills that result in skill acquisition (Schunk & Pajares, 2001, p3).
- Students confirmed teachers’ perceptions supported their ability to work harder to avoid negative outcomes (Wyman et al., 1993).
- Students attributed high expectations from parents and guardians, teachers, and themselves to their success in math and other academic areas.
How do students perceive teacher’s use of Culturally Relevant Pedagogy in mathematics classrooms?

- Educators’ responses to the use of CRP in math implied that there is a need for modeling in math.

- Data suggested that use of deficit-based thinking from parents, guardians, and instructors influenced student perceptions of success (Gutierrez, 2008).

- Results confirmed that meeting the social and cultural needs of diverse populations should be used to close the academic achievement gap that exist for urban students (Ladson-Billings, 1994).

- Students did explain that classes used references to social and cultural topics, but the lessons geared toward use of CRP did not occur often. In 2004, Rousseau and Powell discussed the belief that cultural and economic differences should be acknowledged to increase student achievement in math.
In 2006, Ladson-Billings described an educational debt that exits among students with low SES. She goes on to state that CRP should be and can be used to increase student achievement levels (Ladson-Billings, 2006).
I feel as if the people from the bad neighborhoods they want to like get out the neighborhood, so they strive to do better in school so they can get like the good grades so and go to like a good school and get a good job and try to get like them and their family out of that bad neighborhood. (Student A, personal communication, April 20, 2018)
Significance of Study

- In 2000, 38.3% of all students in the United States received free or reduced lunch (U.S. Department of Education, 2010). Since then this figure has increased over 10%.

- Continued research on the impacts of failure avoidance as a motivational factor can assist in educational development and achievement specifically for urban youth.

- Educator preparedness for effectively instructing students will benefit student achievement in math.

- Deficit-based thinking has many effects on student achievement in math.

- Changing the narrative to better understand how urban students successfully perform under various conditions.
Recommendations for Future Research

• Investigating how to promote student achievement in mathematics will serve as an effective contribution in educating students in urban communities.

• Research in math education on how to increase the use of culturally relative topics related to academic standards should occur.

• Continued research on the impacts of failure avoidance as a motivational factor should continue in order to assist in educational development and achievement in mathematics.
Conclusion

• In 1999, hip-hop artist Tupac Shakur wrote a poem titled “The Rose That Grew From the Concrete”. At the end of the poem Tupac states, “Don’t ask why ask how.” When reflecting on this statement simply consider not why the rose grew from the concrete but how the rose grow from the concrete. Instead of asking why some urban students perform poorly in school, ask how urban students are able to perform well in school with various circumstances.

• During the study, student use of failure avoidance was one of the most effective strategies discussed. However, both educators and parents must evolve from constant reference to deficit models which have both positive and negative influences on student work ethic.


Brain Social. (2015, March 8), Tupac & Derrick Rose Commercial/PowerAde [Video file]. Retrieved from https://www.youtube.com/watch?v=ws0hrf4GHeE

Brain Social. (2018, October 1), Dave Chappelle & Maya Angelou Interview [Video file]. Retrieved from https://www.youtube.com/watch?v=gCDm6UGQSBU


“I’m not saying I’m gonna change the world, but I guarantee that I will spark the brain that will change the world.” – Tupac Shakur

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