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Academic emotion and self-efficacy impacting sense of math class belonging in college students

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**ACADEMIC EMOTIONS AND SELF-EFFICACY IMPACTING SENSE OF
MATH CLASS BELONGING IN COLLEGE STUDENTS**

by

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A Thesis

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Thesis Chair: Dr. Carmelo Callueng, Ph.D

Dedications

This thesis is dedicated to my family, whose constant support helped me get to this point. I would also like to dedicate this thesis to my friends, whose constant encouragement kept me going.

Acknowledgments

I would like to thank my mom and dad for giving me everything I have needed in life to get me to this point in my education. I would also like to thank my sister and boyfriend for being the greatest support system I could ask for and for continuously pushing me to keep going. I would like to thank my peers for their support and help throughout this process. Finally, I would like to thank Dr. Carmelo Callueng for all of his help and insight that has facilitated the completion of this research.

Abstract

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ACADEMIC EMOTIONS AND SELF-EFFICACY IMPACTING SENSE OF MATH
CLASS BELONGING IN COLLEGE STUDENTS
2016-2017
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Master of Arts in School Psychology

A student's sense of belonging has been shown to have positive effects on a student, such as increased motivation and performance (Neel & Fuligni, 2013; Mcmahon, Parnes, Keys, & Viola, 2008). Positive emotions within the academic setting as well as strong self-efficacy have also been found to have these implications (Pekrun, 2006). The impact of emotions in an academic setting and self-efficacy on student's sense of belonging in the classroom is a relatively novel research topic especially in college students. If found, the correlation between academic emotions and self-efficacy along with their impact on sense of belonging can be used to support the need for further research and possible improvements in the classroom. The study explored the influence of academic emotions and self-efficacy on sense of belonging in math classrooms among college students. Three validated Likert scales and a demographic questionnaire were combined into an online survey that was completed by 34 students who were enrolled in general math courses at Rowan University in Southern New Jersey. A nonparametric correlational analysis was used to analyze the data. It was found that academic self-efficacy and several academic emotions significantly influenced sense of math class belonging. Lastly, boredom as an academic emotion was not associated with sense of belonging.

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Chapter 1

The Problem

Sense of belonging or the connectedness and value a student feels within the classroom has a strong effect on the student (Goodenow, 1993). College students spend a long period of time in the classroom, so it is important they feel comfortable and a part of the class. A majority of past research focuses on how school belonging affects academic achievement of students. Very little research has been conducted on the student's internal feelings and its relationship with school belonging.

College students experience numerous emotions within their classes. While negative emotions often come to mind, students have both positive and negative feelings toward their classes. It is important to understand the emotions students have and the effect those emotions on students. Understanding the effects of emotions will help professors gain knowledge about their students. Pekrun, Goetz, Titz, and Perry (2002) identified positive and negative emotions that are either activated or deactivated when students are engaged in academic tasks. Positive activating emotions include enjoyment, success, and pride. On the other hand, positive deactivating emotions are contentment and relief. Negative activating emotions include anxiety, shame and anger whereas, negative deactivating emotions are boredom and hopelessness. A recent study by Lam, Chen, Zhang, & Liang (2015) found that school belonging was positively correlated with positive activating and deactivating emotions and negatively correlated with negative activating and deactivating emotions.

Sense of belonging is important for students to help them feel capable and important. It has been found that sense of belonging is positively impacts behavioral,

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academic, and psychological functioning of students (Goodenow & Grady, 1993). It is not out of the realm of possibility to think that this could translate to a math class where students often face negative emotions of anxiety and other negative emotions that accompany anxiety (Brunyé, et al., 2013).

Classroom emotions have been found to have a strong relationship with self-concept (Goetz, et al., 2012). Adams and Holcomb (1986), found that negative cognitions or poor attitudes toward math contribute greatly to lower efficiency in math. Lower achievement is associated with lower self-concept (Guay, Ratelle, Roy, & Litalien, 2010) and less of a sense of belonging (Lam, Chen, Zhang, & Liang, 2015). Badura's social cognitive theory (1977) states that an individual's beliefs in their abilities produce the emotions they experience. So students who believe in themselves are likely to have more positive emotions. Freeman et.al (2007) found that school belonging is positively associated with academic self-efficacy.

This study hopes to extend the empirical knowledge of sense of belonging by linking to some internal traits that can impact college students' math achievement. Previous studies have focused mostly on academic emotions and achievement of high school students but limited research has been done on this topic involving college students. College is a stressful phase of formal education and an understanding of the relationships between student's internal feelings and classroom social environment may contribute in improving the academic functioning of college students.

Purpose

The purpose of this study was to determine the impact of college students' academic emotions and self-efficacy on their sense of belonging in a math classroom. The results from this study can be used to improve the sense of belonging in classrooms.

Research Questions

This study answered two questions:

1) Do academic emotions influence sense of belonging in math classroom?

2) Does self-efficacy influence sense of class belonging in a math classroom?

Hypotheses

The following questions were asked based on previous research on the topic.

1) Academic emotions significantly influence student's sense of belonging in a math classroom.

2) Academic self-efficacy significantly influences student's sense of belonging in a math classroom.

Significance of the Study

This study could help the topic gain more attention and encourage more research. It could greatly improve strategies for increasing positive emotions, along with student's self-efficacy and sense of belonging in the classroom. The enhancing in these psychological variables may lead to individual or overall improvement in student's academic achievement in mathematics courses.

Limitations

The sample of this study is quite limited and therefore the results may not be generalizable to the entire college population. Another limitation to the study was lack of incentive that could had possibly motivated more students to respond to the survey. In relation to lack of incentive, students may not have had taken the survey seriously because they did not gain anything upon completion.

The absence of demographic characteristics of participants was a limitation of this study. Results may not be further discussed due to lack of sample characteristics that can possibly be link to the correlations of between academic emotions, self-efficacy, and sense of math class belonging.

Assumptions

1) It was assumed that participants completed the survey seriously and provided honest answers.

2) It was also assumed that the scales used to measure the primary variables in the study demonstrated adequate item sampling of behaviors that capture students' self-efficacy, academic emotions, and sense of belonging.

Definition of Terms

Academic emotions. Refer to either activating or deactivating feelings. Activating emotions are emotions that release emotion through a reaction. Deactivating emotions are a release of emotion that creates an end to the current emotion. These emotions can be either positive or negative (Pekrun, Goetz, and Titz, 2002).

Self-efficacy. An individual's belief about his or her competency to succeed (Bandura, 1997).

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Academic self-efficacy. A student's beliefs about his or her ability to perform an academic task (Schunk, 1991).

Sense of class belonging. The respect, acceptance, inclusion, and support a student feels as a member of the classroom (Goodenow, 1993).

Self-determination theory. Humans have three basic needs in life: autonomy, relatedness, and competence (Deci & Ryan, 2008).

Control-value theory. Control is a student's beliefs in their abilities within the academic world. Value is the significance of the academics to the individual (Pekrun, 2000).

Overview of the Study

The rest of the chapters go into more detail about the study that was conducted. In Chapter 2, previous research and findings on academic emotions, self-efficacy, and sense of belonging are discussed as support for the importance of this study. Chapter 3 provides information on the setting and participants, measured used, data gathering procedures, and data analysis. Chapter 4 summarizes the findings of the study presented in tables and their corresponding interpretations. Finally, Chapter 5 discusses the findings of the study and implications of those results.

Chapter 2

Review of Literature

This section discusses empirical literature and theoretical framework of the study. It also reports research findings related to the primary variables of the study that was conducted. Support for the importance of this study is provided and discussed. The chapter begins with the theoretical knowledge for academic emotions and the research that has been conducted based on the theory. Next, academic self-efficacy and the theories and research determining the different aspects of self-efficacy are discussed. Finally, there is a focus on sense of belonging. This is where the chapter takes a look at the theoretical ideas behind sense of belonging and the research that has found important implications for increasing sense of belonging among students. Then, the focus turns to the minimal research available on the study's research questions. It looks at the relationship that has been found between academic emotions and academic self-efficacy to a student's sense of belonging.

Theoretical Framework of the Study

Control-value theory of academic emotions. The theory on academic emotions is the Control-value Theory. This study will be conducted and contain questions based on this theory due to previous research. This theory was developed by Reinhard Pekrun. He developed it due to the lack of integrated theories on emotions and their functions. Control and values are essential to the occurrence of academic emotions (Pekrun, 2000). An individual's control in this theory is their beliefs about their abilities in academics. The value is the significance of the assignment (Muñoz, Noguez, Neri, Mc Kevitt, & Lunney, 2016). A student who believes in their abilities and understands the importance

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of their work will not necessarily have all positive academic emotions, but they will experience some type of academic emotion. Achievement emotions are directly related to achievement activities or outcomes (Pekrun, 2006). These emotions can be temporary or more long-term and recurring. In this study, the emotions may be either temporary for this particular semester, or they may recur in future math classes.

Activating positive emotions strengthen motivation, while deactivating negative emotions are damaging to motivation (Pekrun, 2006). Motivation in turn leads to better academics overall, which is something all school professionals hope for their students. Deactivating positive emotions and activating negative emotions are much more complex. It is possible for these types of emotions such as, anger, anxiety, or shame to have two opposite outcomes depending on the situation (Pekrun, 2006). This being said, positive academic emotions do not always yield positive outcomes and negative academic emotions do not always yield negative outcomes (Pekrun, 2006). A student who is having anxiety about a test, may over prepare and get a good grade on the exam. This is an example of a negative emotion yielding a positive outcome. Negative academic emotions often accompany mathematics. Students who experience negative emotions like math anxiety avoid math in any possible way (Brunyé, et al., 2013; Hembree, 1990; Henrich, Sloughter, Anderson, & Bahuaud, 2016).

On a personal level, students can develop recurrent academic emotions due to either repeated academic experiences or generalization of academic experiences (Pekrun, 2006). Socially, the type of instruction, teacher support, peer support, classroom values, and feedback on achievement shape student's academic emotions (Pekrun, 2000; Pekrun,

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2006). Social and environmental factors are essential in the formation of academic emotions, which agrees with the social cognitive perspective on development (Pekrun et al., 2002; Lam, Chen, Zhang, & Liang, 2015).

Research. When academic emotions first became an interest, the greatest focus was on negative emotions. Specifically, the focus was on test anxiety and how test anxiety affects a student's academic performance. It has been found that high levels of test anxiety significantly impact academic performance in a negative way (Cassady & Johnson, 2002; Hembree, 1988; Hunsley, 1985).

In attempt to even out the research, Goetz, Frenzel, Hall, & Pekrun (2008) conducted research on positive emotional experiences of students. Positive emotions positively relate to student involvement (Wigfield, Battle, Keller, & Eccles, 2002), which is particularly important for college students. Positive emotions toward a subject will help determine what field they will go into for their future career. Perkrun et al. (2002) stated that positive emotions are important for goals and challenges, an open-mind, problemsolving, self-regulation, and more. Positive emotions foster more progressive learning because of the confidence they create.

It is helpful and important to arrange academic emotions in a domain-specific way. Students experience emotions within each class they take. Professionals in schools need to know whether students are experiencing anxiety or boredom in one class specifically, or if it is an emotion they experience in all classes. This helps professionals determined the most appropriate intervention and assistance for the student. It also is useful to determine possible commonalities within classrooms that may be causing these emotions within the students in the class. This domain-specificity has also increased with

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measures on self-efficacy, self-concept, academic goals, task values, and other motivational aspects (Goetz, Frenzel, Hall, & Pekrun, 2008).

Focus has been put on domain specific research because there has been weak relations shown between different domains (Goetz, et al., 2008). Academic emotions have not been examined much in between-domain terms, but other psychological constructs have been and that is where the weakness of between domains relationships has been found. It seems improbable that a student would have the same enjoyment or anxiety in math class or science class that they have in English. This is why the research looked specifically at math classes (Goetz, et al., 2008). This aligns with Pekrun's previously mentioned control-value theory. If a student feels they have control over their work and grades and values both of those aspects of the class, then they are likely to have positive emotions. Positive academic emotions and self-efficacy have been shown to be related to higher academic achievement (Goetz, et al., 2008). It is important to look at the relationship between these variables and sense of belonging in order to confirm their importance.

Between-domain academic emotions were looked at by Goetz, et al. (2008). This research took data on four different class subjects: mathematics, science, social studies, and English. The data showed that academic emotions were similar between similar domains. This relationship is weak, along with the relationship between the other variables of subject and emotion. There is little research on the topic due to little understanding of how an emotion in one subject relates to the same or different emotion in another academic subject.

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Online classes, mostly in colleges have become extremely common. Individuals can learn full bachelor degrees and even master degrees fully online. It takes some adjustment to go from the usual face-to-face classes to online lectures, discussions assignments, and exams. Particular emotions may increase or decrease, depending on one's feelings toward this method of learning. Online learning provides a different environment than traditional face-to-face classes, but it still elicits emotions from students. Boredom, frustration, anxiety, confidence, fear, isolation, and enjoyment have been found within students in online learning classes (Hara and Kling, 2000; You, Kim, and Park, 2012). Daniels and Stupnisky (2012) concluded that control and appraisals are still mostly responsible for the emotions students may experience. The negative emotions may be felt from the indirect method of learning or the inability to effectively use technology. Positive emotions are likely to stem from having more control over when work gets completed and when lectures are listened to.

The control-value theory still applies to online learning. Positive or negative emotions will also rise or descend depending on how much the student values the online class and subject. One study found that the positive emotion, excitement, is likely to intensify the student's interest in the online course, whereas the negative emotion, boredom, was found to do the opposite (Tempelaar, Niculescu, Rienties, Gijselaers, & Giesbers, 2012). Another found that student's self-efficacy was a positive antecedent to hope, but the relationship is not as strong as that in a traditional class setting (Marchand & Gutierrez, 2012). Marchand and Gutierrez (2012) also found that students encounter more frustration and anxiety when deciding on face-to-face classes, compared to online

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courses. The relationship between online learning and academic emotions is still being studied and looking for ways to improve it as it continuously grows.

Theories on self-efficacy. Albert Bandura's (1997) social cognitive theory discusses self-efficacy as a main construct in the theory. The definition Bandura gives of perceived self-efficacy is "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments". So it is how an individual thinks they will do with a particular task or goal. It seems that self-efficacy has both a cognitive and motivational aspect to it. Self-efficacy is goal related. It does not have a comparative nature, rather it is based solely on one's perception of themselves. Along with this, self-efficacy refers to a future perception. For purposes of this study, it refers to how students thought they would do in the math class they were taking.

An individual's self-efficacy determines the amount of effort they put into their goals (Bandura, 1977). If a student feels they have the ability to complete something to get closer to reaching a goal, they will put a good amount of effort into completing that task. Self-efficacy is not the sole determinant of the effort an individual will put into their work, but it is a very important one. Enhanced self-efficacy can be generalized to numerous situations once is it learned. An important area for self-efficacy is education (Bandura, 1977). Self-efficacy is the domain specific perceived self-confidence someone has in their abilities. Confidence in oneself is essential in most aspects of life, but especially in education. Having little confidence in one's academic abilities causes students to do below average, receive failing grades, and maybe even drop out as they reach high school. Students need to be taught to believe in themselves and have confidence so they will continue to pursue their education and future aspirations. How an

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individual thinks and feels about his or herself can determine how that individual behaves and the choices they make. In an educational setting, a student who thinks they are incapable of a task will not do their best work. Low self-efficacy can clearly be detrimental in education.

This study looked at self-efficacy in the math classroom. Math is often perceived as hard and useless. Together, individuals should work to challenge and dispute these perceptions. Teachers and professors have the ability to help student's math self-efficacy increase and improve student's academic success (Nordstrom, 2012). There is a strong relationship between academic self-efficacy and academic achievement. Academic selfefficacy is necessary for higher levels of academic achievement (Bandura, 1997). Academic self-efficacy has been found to improve academic achievement in numerous studies (Zimmerman, 1990; Bandura, 1977; Alivernini & Lucidi, 2011; Komarraju & Nadler, 2013). Students with high self-efficacy self-regulate and in turn, perform better academically (Komarraju & Nadler, 2013).

Research. Academic self-efficacy is extremely important. Pekrun (2004) found a positive relationship between higher self-efficacy and positive test-related emotions. This makes it likely that academic self-efficacy will have a correlation with academic emotions within the results of this study. Self-efficacy has been found to have an impact specifically on math performance (Hoffman & Spatariu, 2008; Mcmullan, Jones, & Lea, 2012). Self-efficacy is often determined by personal experience and observed learning. Negative experiences and observed learning will most likely lead to low self-efficacy in math class, which may affect a student's belonging and success in school.

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Self-efficacy is a determinant in college and career choices. A student who does not have high self-efficacy in math, will most likely not apply to be a mathematics major or any type of science major. High academic achievement in high school is related to higher self-efficacy in ability to complete college (Irwin, J. V., 2008). If something can be done to increase student's self-efficacy about going to college and pursuing a career, then it should be done. Student's that have better perceptions of their achievement and ability to achieve will probably pursue their goals for education and career.   As previously stated, self-regulation increases self-efficacy and leads to better academics. Self-efficacy has been found to predict GPA outcomes in college students through self-regulation (Komarraju & Nadler, 2013). Those of self-regulate set individual goals for themselves that they have to work toward. Setting these goals and reaching them, increases their perceived perception in how the will perform in a particular class. Students who self-regulate also use positive self-talk and encourage themselves that they will do well and will succeed (Bandura, 1997). Self-regulation should be something taught to students at a young age so they can improve on it and continue to use it throughout their schooling. This way, there is a better chance their selfefficacy will be good and so will their grades.

The school climate can also have an effect on its student's self-efficacy (Høigaard, Kovač, Øverby, & Haugen, 2015). This Norwegian study found that schools and classes with a more task-oriented climate, had students with higher academic achievement and higher self-efficacy. This is an important topic that could use some more research. Different school climates should be observed, along with their student's perceived self-efficacy and average grades. This would help determine the most

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appropriate and helpful school climates there are so all schools can work toward increasing self-efficacy in their students.

It makes sense that a task-oriented environment would produce such results, but a similar study had different findings. Peters (2012) did a study on school climate, selfefficacy, and academic achievement as well. She focused on the math classroom. It was found that the class climate was not a significant predictor of academic achievement, nor a facilitator in self-efficacy and achievement. Although the study did not implicate school climate as important for self-efficacy and achievement, it did find that students with higher self-efficacy in math had higher academic achievement, which confirms previous research relating to the topic.

Theories on sense of belonging. Self-determination theory has much evidence behind it. SDT states that humans have three basic needs. These are competence, relatedness, and autonomy (Deci & Ryan, 2008). This theory considers different types of motivation. Intrinsic motivation addresses the impact of social experiences and the need for societal belonging (Mclellan, et al., 2011). Humans need to feel related to others (Baumeister & Leary, 1995; Ryan & Deci, 2000; Deci & Ryan, 2008). As a basic need for humans, society works to create groups in all aspects of life. This sense of community and belonging increases motivation, which is important in all aspects of life, especially academics. Intrinsic motivation often increases with a sense of relatedness (Ryan & Deci, 2000). The relatedness that students experience can be encouraging within their classes. As one of the three basic needs, sense of belonging or relatedness should be highly encouraged within all school systems. Motivation is important to success in academics, which can be increased by relatedness to peers and teachers. As humans, we all want to

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belong to something and feel at least a little important no matter what the environment, so it makes sense that belonging within the classroom is essential to student's success.

   Research. Studies have often examined the need for relatedness and belonging. Researchers have worked to learn just how important the basic need to belong is, which is why numerous studies have determined the importance of sense of belonging in the school setting. It has been found that students who feel they belong have higher academic values (Neel & Fuligni, 2013). Higher academic values tend to lead to higher academic achievement.

   Peer and faculty support also improve motivation for students to persist in school (Mcmahon, Parnes, Keys, & Viola, 2008). The support of peers and faculty in the school are important to an individual's sense of belonging. Students are likely to feel out casted when peers and faculty do not encourage or acknowledge them. Sense of belonging in an academic setting often focuses on the relationship between student and teacher, but it should also include peer relationships. A sense of community in school is important. Deci & Ryan (2008) examined motivation and the effect support has on students. They acknowledge that factors like and individual's relationship with friends, parents, teachers, and peers facilitate internalization and encourage an individual to take strides in their interests. Belonging to a group promotes effort that an individual might not experience if they do not feel as though they have a place where they belong, especially in school. The implications of one study encourages professors to use group work to facilitate the growth of friendships and connections. Students tend to learn a good amount about their classmates through group work. It also encourages professors to require their students to participate in some sort of service-learning project (Pichon, 2015). Some schools may

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consider having pep rallies or other fun meetings that will show the students they are important and supported. These types of interactions will produce similar experience and give students ways to relate to their peers. It provides a time for students to open up to people they feel they relate to. This creates an overall better environment and stronger sense of belonging, which often leads to more persistence to continue on with college courses. Persistence in academics is needed in order for students to push and work through any obstacles they may encounter. If students feel defeated, they will not succeed how society wants them to. The previously mentioned study was based on community college students taking classes on a four-year college campus, but it shows the importance of making sure all students feel some sense of belonging.

A student's sense of belonging increases their retention of classwork and their persistence in finishing class assignments as well as the class itself (Prasad, 2014). Persistence in school is important, especially for students that may struggle with academics. Sense of belonging and persistence has been shown to decline over the academic year (Hausmann, Schofield, & Woods, 2007), so it is essential to find new ways to maintain sense of belonging throughout the school year in order to keep up student's persistence and grades. If students are more involved in the school and committed to the school personally, then it is likely they will be more committed to their academics too.

Students who independently pursue involvement in extracurricular activities are more committed to their school and have higher grades (Spady, 1971). Not only will involvement help students find friends and be more comfortable at school, but socializing experiences in schools encourages the development of skills and attitudes that will be useful in future endeavors (Spady, 1971). All schooling is meant to prepare students for

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their future. Finding a place they belong and developing themselves can most likely result in confidence in their abilities whether it be for internships, job interviews, job workshops, or even in their personal lives. This confidence can carry them through the rest of their experiences and choices within their chosen career.

As one would predict, teachers play an important role in their student's sense of belonging within the classroom. Teachers have the ability to form a relationship with their students, as well as facilitate a classroom relationship. Teacher support and encouragement create a more welcoming classroom and the opening for a strong sense of belonging within that classroom. Perceived teacher-support and school belonging have been found to have negative correlation with school misconduct (Demanet & Houtte, 2011). Decreasing misconduct is important in all ages in order to provide a better future. Most people respond well to caring environments and teachers have the opportunity to create those environments. The class environment influences how competent a student feels and how related students feel toward their peers (Hughes & Chen, 2011).

Although no demographics were collected for this study, previous studies have looked at minorities and have found that minority students often do not feel like they belong as much as their white counterparts (Johnson, 2013). It is necessary for schools to encourage activities and group work among all of their students, regardless of their ethnicity, religion, or any other identity. All underrepresented groups should be allotted the same encouragement and interventions that previous studies have found to work to increase sense of belonging for students. More specifically and related to this study, math class sense of belonging is important. Math classes tend to be very individualized and

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lecture heavy. Incorporating more inclusive activities to encourage more group work may increase excitement about the class, along with motivation and sense of belonging.

Empirical Studies on Relationship of Study Variables

  Academic emotions and sense of belonging. Autonomy support is an important variable for a student's academic emotions. Belonging creates a better class environment for students. It is more likely for students to feel confident in a classroom where they are comfortable and do not fear harsh judgement. Academic emotions mediate the relationship between academic achievement and school belonging (Lam, Chen, Zhang, and Liang (2015). This means school belonging creates more positive emotions like hope and excitement, which then in turn leads to higher academic achievement. Students who feel like they belong will experience less negative emotions like hopelessness and shame. Having less negative academic emotions may also increase their academic achievement (Lam, Chen, Zhang, and Liang 2015).

  Teachers have the ability to create an atmosphere of support and connectedness. Building strong relationships in a school setting is important for the growth of students both academically and socially. Roeser, Midgley, and Urdan (1996) found that better relationships in the school settings lead to a stronger sense of school belonging. Good relationship usually equate to more positive emotions. This shows that there is a relationship between academic emotions and an individual's sense of belonging, but the subject is still lacking research. As always, confounding variables should be considered. There may be other aspects of the school environment, the individual's personality, the day they are having, or something else that is increasing academic emotions.

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Self-efficacy and sense of belonging. Self-efficacy and sense of belonging both have an impact on a student's academic success. High self-efficacy and a strong sense of belonging equate to higher academic achievement. The relationship between the two warrants more investigation. A positive correlation has been found between academic emotions and self-efficacy (Judge and Ilies, 2002). A higher level of self-efficacy and desire to succeed breeds success and students are more likely to experience positive affect (Bong & Skaalvik, 2003). A positive affectation creates better opportunities for student relatedness and belonging. Students who feel they will do well in their classes and have confidence will likely be more open to involvement in different activities at the school and engage in more conversation with other students. This creates friendships and belonging.

Emotional arousal can affect an individual's self-efficacy (Bandura, 1977). Positive and negative emotions can arise from either a sense of belonging or a lack of sense of belonging. Self-efficacy has the ability to affect how a student relates to his or her classmates and how connected they feel to the class. A student's confidence in their abilities often affects their openness in class. It is hard for a student who does not feel comfortable in the classroom to feel like they belong there.

Students who feel like the classroom is competitive rather than inviting do not feel a strong sense of belonging and this affects their self-efficacy, especially in mathematics and science classrooms (Mcmahon, Wernsman, & Rose, 2009). Larrain (2015) found increased school belonging was significantly and positively related with higher mathematics self-efficacy. This may be due to the particular instructional method or the specific environment the teacher created. This study looked at that same relationship and

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can possibly provide support for the previous research. This support will hopefully encourage more studies to consider this relationship and increase the knowledge available on the topic. The relationship between these two variables needs more attention in the academic world.

Synthesis

The theories and research provide valuable information in terms of what studies should look at and possible implications for the results. Academic emotions, academic self-efficacy, and sense of belonging are each an important part of a student's success within the school system, hence the need for more research on their relationship. Each of the variables individually results in better academic achievement; a common goal for most students, teachers, and parents. This has been found almost every time a study has examined these variables. Research on this topic is lacking, along with implications for educators. This research is necessary for teachers and professors to understand how they might be able to further improve their student's academics, experiences, and feelings toward schooling.

This research study looked to confirm the findings on academic self-efficacy and sense of belonging and academic emotions and sense of belonging. Math can be very difficult for some, so it is important to understand ways to help those who are not proficient in math succeed, regardless of the difficulties they may face. There are hopes that this study will facilitate more research on these variables in all different subjects in order to find ways to help with the betterment of students as an individual and as a student in their particular community.

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Chapter 3

Methods

Setting and Participants

This study was conducted at a medium size public university in New Jersey. Sample was comprised of 34 college students who were recruited in various general math classes in spring 2017. Because participation is voluntary and anonymous, sampling of participants was non-random and specifically, convenience sampling.   Unfortunately, demographic characteristics of participants were included in the survey questionnaire.

Measures

Academic emotions questionnaire (AEQ). The AEQ is an 80-item Likert scale assessing class-related emotions pertaining to enjoyment, hope, pride, anxiety, shame, hopelessness, and boredom. These scales are in turn grouped into four emotion component subscales: affective, cognitive, motivational, and physiological. Items described feelings that a student may experience before, during, and after class. Response options ranged from 1 (strongly agree) to 5 (strongly disagree) (Pekrun et al., 2011). The AEQ has been reported to have good internal and external validity (Pekrun et al., 2011).

Self-efficacy for learning and performance scale. This is a subscale taken from the Motivated Strategies for Learning Questionnaire (MSLQ) for College students (Pintrich et al., 1991) to measure self-efficacy. It contains 8 questions that assess a student's beliefs in their performance and ability, which are rated on a Likert scale of 1 (not true at all for me) to 5 (very true for me). For example, the scale asks the student to rate the statement "I believe I will receive and excellent grade in this class". Another

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statement on the subscale is "I'm confident I can do an excellent job on the assignments and tests in this course". The score is calculated by taking the average responses in all the items on the scale.

The subscale was found to have to high internal reliability with Cronbach's alpha of .93 (Pintrich, Smith, Garcia, & Mckeachie, 1993). This specific scale had the highest positive correlation in the motivational scales in relation to the final course grade (r = .41). Self-efficacy was also found to be a valid measure of the motivational construct with a r = -.37 (Pintrich, Smith, Garcia, & Mckeachie, 1993). The motivational scales on the MSLQ, including self-efficacy, have strong predictive validity. The Self-Efficacy for Learning and Performance Scale is a reliable measure of college student's motivation (Pintrich, Smith, Garcia, & Mckeachie, 1993).

Psychological sense of school membership (PSSM). The PSSM is a Likert scale was originally developed by Goodenow (1993) and revised by Pittman (2007) for high school and college students. In this study, the revised version will be used which contains 18 questions describing college students' perceptions related to class belonging (e.g., "I feel like a real part of this class") rather than school belonging. Questions are answered using a five-point response options ranging from 1 (not true at all) to 5 (completely true).

Studies that used the revised version of the PSSM reported good internal consistency with Cronbach alpha ranging from .88 to.97 (Goodenow, 1993; Isakson & Jarvis, 1999; Pittman & Richmond, 2007; Pittman & Richmond, 2008). The PSSM has good concurrent validity that was supported in a study by Hagborg (1998). The PSSM is a trustworthy measure of student's sense of belonging.

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Procedure

First and foremost, an IRB for the study was granted by the Rowan University Office of Research Compliance. Upon IRB approval, the co-investigator selected four basic math classes at random. Each student within those classes were invited to participate in the study though an email that contained the link to the online survey created in Qualtrics. The email message explained the purpose of the study as well as privacy and confidentiality of data to be collected from the participants. Participants were be informed that participation in the study was completely anonymous and voluntary, and that will not affect their math grades. The collected data were accessed by the coinvestigator and stored on a secured computer for data analysis.

Data Analysis

The data were screened for outliers and missing data. Participants with at least 5% of missing responses were deleted from the sample. Mean and standard deviation were calculated to initially describe averages and variability of scores on self-efficacy, academic emotions, and sense of belonging. Skewness and kurtosis were determined to assess normality of score distributions of the variables. Finally, Spearman correlation was employed to calculate the relationship of self-efficacy and academic emotions to sense of belong. A .05 alpha was set to decide the null hypothesis. All statistical analyses were conducted through SPSS version 24.

Results

Descriptive Statistics

Preliminary analysis involved calculating the descriptive statistics of the variables of academic self-efficacy, sense of belonging, and each of the seven academic emotions of excitement, pride, anger, anxiety, hopelessness, boredom, and shame. Table 1 shows the mean and standard deviation of each of these variables. Table 1 also includes the skewness and kurtosis each variable to assess normality. All calculated skewness and kurtosis values fell between -2 and +2, implying that all score distributions met normality assumptions (Meyers, Gamst, & Guarino, 2017).

Table 1

Descriptive Statistics of Academic Self-efficacy, Academic Emotions, and Sense of Belonging

Variable	M	SD	Skewness	Kurtosis
Academic self-efficacy	4.54	1.58	-.25	-.63
Sense of Belonging	3.73	.62	-1.08	1.25
Excitement	3.10	.89	-.29	.07
Pride	3.69	.80	-.84	1.08
Anger	2.14	1.00	1.11	.73
Anxiousness	2.52	1.14	.51	-.51
Hopelessness	1.84	1.17	1.5	1.39
Boredom	2.53	1.23	.33	-1.00
Shame	2.20	.97	.78	.29

Correlation Between Academic Self-Efficacy, Academic Emotions, and Sense of Belonging

Spearman correlation was performed to calculate the relationships between self-efficacy, academic emotions, and sense of belonging. As presented in Table 2, all the correlations were significant except for sense of belonging and boredom (r_s= .29, $p \geq$.05). There was a positive correlation between academic self-efficacy and sense of belonging (r_s= .55, $p \leq$.01). Similarly, positive academic emotions were significantly correlated with sense of belonging: excitement (r_s = .55, p $\leq$.01) and pride (r_s = .55, $p \leq$.01). Negative emotions were also significant correlated with sense of belonging: anger (r_s = -.40, $p \leq$.05), anxiety (r_s = -.42, $p \leq$.05), hopelessness (r_s = -.39, $p \leq$.05), and shame (r_s = -.42, $p \leq$.05).

Table 2

Correlation of Academic Self-efficacy, Academic Emotions, and Sense of Belonging

Note. * p≤ .05, * *p*≤ .01, **

	1	2	3	4	5	6	7	8	9
1. Academic self-efficacy	-								
2. Sense of belonging	.61**	-							
3. Excitement	.60**	.54**	-						
4. Pride	.66**	.55**	.65**	-					
5. Anger	-.56**	-.40*	-.60**	-.40*	-				
6. Anxiety	-.66**	-.42*	-.68**	-.39*	.68**	-			
7. Shame	-.45**	-.39*	-.71**	-.35*	.53**	.83**	-		
8. Hopelessness	-.55**	-.42*	-.63**	-.45**	.69**	.74**	.74**	-	
9. Boredom	-.35*	-.29	-.70**	-.45**	.63**	.53**	.63**	.68**	-

Chapter 5

Discussion

A good education is important to the growth of student's abilities and aspirations. Academic self-efficacy, academic emotions, and sense of belonging have each been shown to improve or facilitate improvement of academic achievement (Zimmerman, 1990; Pekrun, 2006; Spaddy, 1971). Academic achievement encourages goal setting and can help students reach their aspirations. The purpose of this study was to determine if there is a relationship between academic self-efficacy, academic emotions, and sense of belonging in math classes. The participants consisted of college students enrolled in a general math class in the South Jersey area.

Hypothesis 1 stated that academic emotions significantly influence a student's sense of belonging in a math class. The results showed that several academic emotions significantly influence a student's sense of belonging in a math class. The positive emotions, pride and excitement were significant impacted sense of belonging. This positive correlation supports previous research that positive academic emotions are likely to result in a higher sense of belonging (Lam, Chen, Zhang, and Liang, 2015). The negative emotions of anger, anxiety, shame, and hopelessness were significantly associated with sense of belonging. This supports previous research that negative academic emotions are likely to result in a lower sense of belonging (Lam, Chen, Zhang, and Liang, 2015). This study focused on academic emotions and sense of belonging, whereas previous research focused on academic achievement and motivation. It provides more support for the importance of the relationship between these two variables. The academic emotion of boredom was correlated with sense of belonging, but the value was

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not significant. There may be confounding factors as to why higher levels of boredom were not reported. It is possible that other distractions such as electronic devices and social media were being used during class and less boredom was experienced.

Hypothesis 2 stated that academic self-efficacy significantly influences student's sense of belonging in a math class room. The results support this claim, as well as previous research on the topic (Freeman, Anderman, & Jensen, 2007; Sakiz, Pape, & Hoy, 2012; Hogue, 2012).

Implications

The results of this study are important and useful for educators at most levels. Although the data were taken on college students, fostering a sense of belonging within classrooms is essential at all ages. Academic emotions and self-efficacy nurture a sense of belonging and this leads to better academic achievement. The results show educators can determine activities and work that could increase positive emotions in the classroom and improve student's confidence, in order to create a better sense of belonging between peers.

Limitations and Future Research

This study did not survey instructional methods of instructors in math classes and demographic characteristics. This information may have served as moderators or mediators to the relationships of variables investigated in this study. Future studies can consider these variables to expand understanding of the considerable influence of self-efficacy and academic emotions on sense of belonging in math classes. The sample and response rate were a major limitation of the study. Future studies should include larger sample size of college students from diverse backgrounds and multiple universities.

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