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Mathematics Pedagogical Strategies to Create a Positive College Classroom Community

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ABSTRACT

Creating a positive classroom community is an instrumental component toward attaining student success. This study incorporated cooperative learning and mathematics journaling as pedagogical tools in four sections of College Algebra over two years. Participants (n = 84) consisted of diverse undergraduate students at a medium-sized, four-year public university. The researcher collected data in a mixed-method research design using multiple sources, including classroom observations, video recordings, pre/post interviews, student mathematics journals, and the Mathematics Self-Efficacy Scale (MSES). The researcher conducted data analysis through the constant comparative data analysis method and to strengthen the validity and reliability of the study, used three strategies: triangulation, member checks, and inter-rater reliability. Results indicate that students gained a sense of belonging, embraced their classmates, fostered communication, and increased participation and mathematics self-efficacy.

Keywords: Classroom community, cooperative learning, mathematics journals

1. Introduction

Research indicates that establishing and maintaining a positive classroom community plays an instrumental role in the pathway to student academic success Hiebert et al. (1997), Tinto (2000). Numerous teachers have been implementing various pedagogical approaches while attempting to build a positive classroom community. Within the past 25 years, cooperative learning[1] has emerged as one of the prominent pedagogies in developing student learning Rogers et al. (2001). The National Council of Teachers of Mathematics (1991) asserts, "Whether working in small or large groups, [students] should be the audience for one another's comments – that is, they should speak to one another, aiming to convince or to question peers" (p. 45). Cooperative learning provides students with opportunities not only to construct knowledge while participating in a community of practice Lave and Wenger (1991), but also to actively engage in discussions with peers to cultivate learning Davidson et al. (2014). In this study, the cooperative learning strategy employed was the Student Team Achievement Division (STAD), which Slavin (1991) described as small groups of learners with different levels of ability working together to accomplish a shared learning goal.

To augment the benefits of cooperative learning, mathematics educators advocate that journaling helps students clarify their thoughts, pose and examine questions, and reflect on their analyses Countryman (1992). Through consistent journal writing, students obtain a deeper understanding of mathematical concepts by clearly communicating their ideas Jurdak and Zein (1998). Students also learn how to better assess their own performance through journaling activities. Countryman explains, "Knowing mathematics is doing mathematics. Students can learn mathematics by exploring, justifying, representing, discussing, using, describing, investigating, predicting, in short by being active in the world" (p. 2). Expressing ideas through journal writing is an ideal activity to enhance mathematics comprehension.

The purpose of this study was to determine the effect of incorporating cooperative learning and mathematics journaling as pedagogical tools in diverse college mathematics classrooms to create a positive classroom community. A pivotal goal for building a positive classroom community is to embrace individuals, particularly those of cultural, ethnic, and linguistic diversity. Studying students and their respective cultures, backgrounds, and interests is imperative to learn about diverse classrooms. Establishing a positive classroom community is crucial to support diverse student learning and development in valuing classmates' ideas and respecting one another as individuals Boaler and Staples (2008). This study analyzed various ways to capitalize on the strengths that diversity[2] brings to the classroom.

[1] Cooperative learning is defined as: "the instructional use of small groups so that students work together to maximize their own and each other's learning" (Johnson et al., 1991, p. 3).

2. Research Site and Participants

This study took place in four sections of College Algebra over two years at a medium-sized, public university located in the western United States. The researcher specifically selected College Algebra because it is an essential course that is either the terminal mathematics class for many non-Science, Technology, Engineering, and Mathematics (STEM) majors or a prerequisite for future STEM-related courses. The researcher chose these particular sections because they were offered by the university's diversity program, which strives to support ethnically diverse students, older-than-average (25 years and older) students, veterans, or first generation in college students in acclimating to the college lifestyle. The researcher solicited participants for this study from these four sections of diverse undergraduate students, and the participants were the students (n = 84) who attended at least 80% of all class meetings.

The researcher selected Dr. Sanders[3] and his four sections of College Algebra because he has been instructing college level mathematics for 13 years, regularly employs a variety of pedagogical approaches including cooperative learning, and consistently receives exceptional teacher evaluations. In addition, these particular sections housed a variety of diverse students. As illustrated in Table 1, the students in this study included ethnic minority, older-than-average, first generation in college, and international students. The 84 participants consisted of 40 male and 44 female students, of which 15 were international students from China, India, Japan, and South Korea, 26 were Hispanic Americans, 11 were Asian Americans, 8 were African Americans, and 24 were Caucasian. Many of the Caucasian students were older-than-average, veterans, and/or first generation in college students. Because the purpose of this study was to determine the effect of incorporating cooperative learning and journaling in diverse classrooms to create a positive classroom community, these sections made an ideal milieu for the study.

The students and their demographic information in the four College Algebra sections are summarized in the table below:

[2]The author uses the term diversity as defined by The National Council for Accreditation of Teacher Education (2008): "differences among groups of people and individuals based on ethnicity, race, socioeconomic status, gender, exceptionalities, language, religion, sexual orientation, and geographical area."

[3]To maintain conditions of anonymity, all names used are pseudonyms.

[4]Several students qualified for more than one category. i.e. older-than-average, veterans, and/or first generation in college.

Table 1: Demographic Information of Students in Four College Algebra Sections

Sec.	Sem./Year	Stud.	Gender	Age	Diversity Type
1	Fall 2011	22	10 Male 12 Female	18 - 28	13 Ethnic Minority; 4 International; 5 Caucasian: 3 older-than-average[4], 2 veterans, 1 first generation in college
2	Spring 2012	10	5 Male 5 Female	19 - 29	4 Ethnic Minority; 2 International; 4 Caucasian: 2 older-than-average, 2 veterans, 2 first generation in college
3	Fall 2012	27	14 Male 13 Female	18 - 25	16 Ethnic Minority; 4 International; 7 Caucasian: 4 older-than-average, 2 veterans, 3 first generation in college
4	Spring 2013	25	11 Male 14 Female	19 - 32	12 Ethnic Minority; 5 International; 8 Caucasian: 5 older-than-average, 1 veteran, 3 first generation in college

3. Data Instrumentation and Analysis

Given the goal of comprehending the highly complex phenomenon of learning mathematics through cooperative learning, the researcher collected data using multiple sources in a mixed-method research design Creswell and Plano Clark (2007). The researcher compiled the qualitative data from classroom observations, video recordings, pre/post interviews, and student mathematics journals to primarily analyze the intricacies of students learning and doing mathematics.

The researcher administered the Mathematics Self-Efficacy Scale (MSES) Betz and Hackett (1983) as a pre/post survey to quantitatively determine the effect of taking the College Algebra course on students' self-efficacy [5]. Research studies demonstrate that if students possess a higher self-efficacy, then their academic performance in mathematics is increased Hall and Ponton (2005), Multon et al. (1991). Additionally, when variables such as mathematics aptitude, gender, and anxiety are controlled, mathematics self-efficacy beliefs are predictive of students' choice of major and overall academic performance Hackett and Betz (1989).

[5]Bandura (1995) defined self-efficacy as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations" (p. 2).

The researcher conducted data analysis through the constant comparative data analysis method Glaser and Strauss (1967), and used three strategies to strengthen the validity and reliability of the study. First, the researcher performed triangulation Denzin and Lincoln (1998) throughout the analysis process to understand multiple sources in relation to each other, elucidate clear trends and themes, and fortify the study's credibility. Second, the researcher completed member checks Lincoln and Guba (1985) with participants throughout the study to ensure accurate transcription and data interpretation. Third, the researcher executed inter-rater reliability Mays and Pope (1995) with an experienced colleague to increase the study's reliability. Independent coding resulted in 95% reliability between our coding, and when the rare discrepancies did emerge, we discussed the difference in detail, resolved the disparity, and refined the codes and themes. As displayed in Table 2, the researcher analyzed multiple data sources to elicit clear trends and themes.

Table 2: Data Analysis Procedures

Data Source	**Data Analysis**
Classroom Observations[6]	Multiple coding methods on field notes focusing on peer-to-peer and student-to-teacher interaction and discourse
Video Recordings	Video breakdown and analysis using Studiocode
Pre/post Interviews	Multiple coding methods concentrating on student perspectives of pedagogy, learning independently and collaboratively, and self-efficacy
Journal Reflections	Multiple coding methods on student perspectives and perceptions of the learning environment, pedagogy, and class as a whole
Pre/post MSES	Various statistical tests using the Statistical Package for Social Sciences (SPSS)[7] to determine the effect of the project on enhancing students' self-efficacy

4. Results and Discussion

4.1 Cooperative Learning Fosters Communication and Increases Participation

Research shows that for group work to optimize productivity, students must "share the responsibility for developing a community of learners in which they participate" in Hiebert et al. (1997). Understanding that structured teams enhance fruitful collaboration, Dr. Sanders organized students into mixed-ability groups of 3 - 4 members based on mathematics skill level, cultural background, and gender. Each member was assigned a specific role: *team captain*, *facil-*

[6]The observation rubric used was the Instructional Quality Assessment (IQA), designed by Matsumura et al. (2006) to analyze mathematics instruction and learning using a combination of lesson observations, academic rigor, and accountable talk.

[7]For details on SPSS usage, please refer to section 4.4.

itator, *recorder/reporter* and/or *resource manager* Johnson et al. (1998). To encourage productive communication, Dr. Sanders held each student accountable for completing his or her role by continuously checking in with each group. Student roles rotated weekly to provide them with the opportunity to grow and develop through fulfilling the various assignments. Throughout the study, role assignments motivated students to collaborate as a team, building camaraderie and solidarity to help the group successfully tackle problems.

The teacher played an essential role in organizing lessons by requiring each student to comment constructively *at least* once per problem every class period, with the overarching goal to encourage all students to "talk math." Dr. Sanders also offered productive reinforcement to students, ensured they received positive encouragement from peers, and facilitated student communication by *not* telling them the solutions, but rather pointing them in the right direction.

Although the majority of the students worked reticently at the start of the semester, as they grew more comfortable engaging in mathematics discourse, they began to more freely share their reasoning, ideas, justification, and solutions. This process created a more cohesive group, fostered communication, and supported students in gaining a sense of belonging in the classroom. Jacob, an 18-year old Asian American freshman in section 3, stated in his pre-interview that he "absolutely hated math" because he felt like he was all alone, and ultimately quit working when he was unable to solve problems. However, in his post-interview, Jacob attributed cooperative learning to completely changing his perspective of math. He noted, "I never thought I would like math, but, I have grown to appreciate it. And I really enjoy working with others because I can ask them questions, and they can ask me, and we can learn together." In each of the four sections, the qualitative data revealed a clear trend that cooperative learning aided students in fostering communication.

Juanita, a 22-year old Hispanic sophomore in section 2, opined her dislike of mathematics at the start of the semester because if she got stuck she had nowhere to go. Toward the end of the semester, she explained how interacting with peers helped increase her understanding of mathematics. Juanita described how she became more comfortable in the classroom and that group work benefitted her "because if I didn't know the answer to something, somebody else like knew it, then we kind of just bounced ideas off each other." Bouncing ideas off of classmates became a common theme with students benefitting collectively from combining their knowledge of mathematical concepts.

In his analysis of cooperative learning, Kagan (2014) explains, "Interactive processing has several advantages over solo processing: Partners offer ideas that would not otherwise occur to an individual," and "out of the interaction process ideas often emerge that neither partner would have thought of on their own" (p. 122). As the students combined their funds of knowledge they expanded their interactive processing skills, as well as enhanced their overall mathematical content knowledge.

As the students grew more comfortable working together, their participation increased substantially. During post-interviews, all participants credited

cooperative learning for helping to increase their participation. Maya, a 19-year old African American sophomore in section 4, said, "Toward the end of the semester, we were more willing to participate because we were comfortable with each other... We sorta formed a math family." The video data substantiated Maya's comment, showing her actively and comfortably engaged with her group members. Toward the end of the semester, the below exchange between Maya and Samantha, a 19-year old Caucasian first generation college student, captured on video took place while solving for the domain of the following function:

$$f(x) = \frac{4}{x-3} \tag{1}$$

Samantha: Ummm. I have no clue how to find the domain.
Maya: Try to think of the value for x that makes the function undefined.
Samantha: Why?
Maya: Because that value is not part of the domain.
Samantha: OK. So it's supposed to be x is not equal to 3?
Maya: You got it!

From this interaction, cooperative learning provided Maya with an opportunity to enthusiastically encourage her struggling classmate. When Samantha obtained the correct answer, Maya embraced her with a smile, and together they developed trust and enhanced their participation. In addition to this video recording example, the researcher found that classroom observations, journal reflections, and post-interviews all demonstrated the trend of students increasing their participation through cooperative learning.

4.2 Cooperative Learning and Mathematics Journals Break Down Barriers

Jin and Rahul, the two English as a second language (ESL) students in section 2, enjoyed cooperative learning and writing journal reflections because although effective communication in English was sometimes a struggle, both students agreed that the pedagogical approaches were beneficial. They emphasized that communicating through multiple ways provided various opportunities to comprehend the material. Mathematics journals not only helped the teacher understand his students better, but the students also learned about their classmates' perspectives, interests, and challenges.

In this study, participants completed mathematics journals each week as a self-reflection tool and shared them with both their classmates and teacher on Fridays. Their reflections focused on class-related questions containing two components: Part one featured weekly questions asking: What did you learn this past week? How did you feel while learning mathematics? Part two asked more specific questions regarding the past week, such as the following: Do you

feel more comfortable in the traditional lecture-setting or cooperative learning? Please explain why.

Sharing journals in groups helped break down barriers, an example of which was Jin, who alluded that the more he discussed mathematics with American students the more comfortable he became. Jin noted, "I can have the chance to talk to others, and I can teach them how to do the question, and they can help me understand some words." Rahul echoed Jin's sentiments that working in groups broke down the language barrier. Video data showed that during group work, Rahul avidly participated. He expressed his delight in participating because when his group solved problems it "felt good," which kept his interest in mathematics at a high level.

In addition to the language barrier, another shattered barrier was student reticence. Although many students began the semester timid and not willing to participate, the majority of the students ended the semester fully engaged in learning and being gregarious with their classmates. Sharing journals with peers helped create a supportive learning atmosphere. In section 1, Melissa and Jamison, both older-than-average, Caucasian veterans accentuated that working in groups played a crucial role in building friendly relationships with classmates and the teacher. Melissa noted that the efficiency of cooperative learning hinges on the effectiveness of communication. She stated, "Group work can be dynamic because it helps students to be less shy and know how to strengthen relationships." Learning how to develop and maintain healthy relationships can prove to be a lifelong learning skill both in and outside the classroom.

At the beginning of the course, many participants held preconceived notions of disdain for mathematics coursework. Collaborating with classmates in a supportive learning atmosphere established a context in which these notions could be challenged. Throughout the post-interviews, all of the participants asserted that the more they worked with their classmates, the more comfortable they felt learning mathematics. A supportive atmosphere was conducive to students working more efficiently with peers, and feeling more willing to ask questions. These are developments that greatly assisted stuents in the documented shift in their respective standpoints. In section 3, Esther, a 23-year old Hispanic female, stated, "I used to think group work was a waste of time. But now I realize it's useful because we can work together to solve problems we couldn't by ourselves. It's a good skill, not just in class, but also in different jobs and life."

Dante, a 22-year old Hispanic sophomore, echoed Esther's thoughts in his journal by explaining: "When you group up with someone you need to not only understand your own way of learning but also understand everyone elses [sic] point of view which can be more educational in the long run." Cooperative learning not only produced positive outcomes in the classroom, but also could have lasting ramifications for lifelong learning efforts. Esther and Dante described the importance of acquiring lifelong skills, and how working harmoniously with others, being a trustworthy teammate, and respecting classmates can extend well beyond the classroom walls. Researchers in Davidson and

Major (2014), note that cooperative learning benefits students in "intergroup relations, including friendship across racial and ethical boundaries, development of interpersonal skills, and the ability to take the perspective of another person" (p. 18). In the post-interviews, the participants stressed that reinforcing these lifelong skills can help them be more successful in and outside the classroom.

4.3 Mathematics Journals Build Social Capital when Enrolled in Current and Future Courses

As students shared journal responses weekly, they developed skills in both mathematics and interpersonal relationships. Ultimately, participants cultivated their social capital [8] in three ways by: 1) fortifying relationships with their classmates, 2) establishing and maintaining a positive classroom environment, and 3) expanding their networks of support while looking toward future classes. Strengthening social capital established the classroom as a supportive community McKinney et al. (2006), which provided the students with more learning opportunities in both current and future shared classes. The unanticipated finding was that the social capital gained can be maintained and applied later to recreate the cooperative learning strategy in other courses that may or may not have the technique integrated into classroom activities.

For instance, Alyssa, a 20-year old Asian American female in section 1, described the benefits of an increased social capital in her journal response: "Knowing how to build relationships is important because people feel more comfortable with each other. This helps students learn better in the classroom." Alyssa expounded that once students build friendly relationships with their classmates, they are more likely to extend the relationships to other classes. Mulford (2008) found that social capital has valuable outcomes for students now and in the future because their relationships with their peers and teacher can have a positive impact on their sense of belonging to college, participation, retention, and achievement. The participants asserted that maintaining previously established relationships for future courses with classmates would be valuable for two major reasons: 1) students already have friends to turn to for assistance, and 2) friends as classmates foster a supportive learning environment in which students feel more comfortable.

Kenny, a 21-year old African American junior in section 3, provided an advantage for increasing social capital: "Once you feel comfortable with your guys in the classroom, that goes to outside as well – if you ever have a question on homework, you can text your guys and ask them." Getting help from others extends not only to classmates, but also to teachers, as Dante clarified, "Having Dr. Sanders walking around talking with each group helps to build teacher-student bonds. This will help us in future classes if we know another person in the class, have Dr. Sanders, or are able to build bonds in a similar fashion to ones we have here." A thorough analysis of the data in all sections showed

[8] Yosso (2005) defined social capital as "networks of people and community resources. These peer and other social contacts can provide both instrumental and emotional support to navigate through society's institutions" (p. 79).

a clear trend that honing social capital provides opportunities for students to succeed in both current and future courses.

4.4 Students Enhance their Mathematics Self-Efficacy

Juxtaposing the Mathematics Self-Efficacy Scale (MSES) pre-test and post-test scores, the researcher used SPSS to calculate descriptive statistics, which revealed an increase from the pre-test mean score of 5.23 (SD = 1.2147) to the post-test mean score of 7.02 (SD = 1.1823), in which 78 of the 84 participants' respective MSES scores improved. To further statistically examine the pre and post-test mean scores, the researcher performed a paired sample t-test, which resulted in a P-value = 0.006. Thus, there was a statistically significant difference between the pre and post-test MSES scores. Furthermore, the reliability coefficient (Cronbach's alpha) of the MSES scores was 0.91, indicating a high measure of internal consistency.

Students justified that the principal reason they gained a higher self-efficacy was because they had the opportunity to explain solution methods to their classmates. During an analysis of post-interviews and journal reflections, a common theme emerged that teaching others helped solidify knowledge and enhance self-efficacy. Students emphasized that they retained information more efficiently by explaining concepts to their peers rather than just keeping knowledge to themselves.

Julio, a 22-year old Hispanic senior in section 4, frequently enlightened classmates by clarifying solution methods. He wrote in his journal that he liked group work because "I can share correct methods to my classmates." When the researcher later asked Julio how he benefitted by sharing methods, he responded, "I feel good for two reasons: first, my classmates are learning, and second, *I feel more confident*." Paralleling Julio's comments, Linda, a 20-year old first generation Caucasian college student articulated that teaching her classmates not only increased her self-efficacy, but also reinforced her mathematics comprehension: "If I just keep my knowledge to myself, I think I get it. If I explain it to my classmate, I *know* I get it." From these specific cases, Julio and Linda demonstrate the importance of explaining solution methods to their classmates. During the data analysis, a clear trend emerged indicating that teaching classmates not only benefits the learner in solving the problem, but also the student teacher in enhancing self-efficacy.

An example of a student benefitting by sharing knowledge was Angela, a 29-year old Hispanic female in section 2, who was a single parent of two young boys. Angela declared, "I like working in groups, because you never know what someone else can bring to the table. You can teach each other, and you can learn new and exciting things working in a group." The video data showcased an exchange between Angela and Adam while solving for the value of $f(1)$ in the following piecewise function:

$$f(x) = \begin{cases} x+1, & \text{if } 1 < \text{x} \leq 5 \\ -x-2, & \text{if x} \leq 1 \end{cases} \tag{2}$$

Adam: So, I don't know how to get $f(1)$.
Angela: Because there are two ones?
Adam: Yeah, I mean, both the top and bottom intervals have ones. Do I plug one into both functions, or just one of them?
Angela: That is tough. Well, only one interval actually includes one because it's x is less than *or equal to one*. The top interval doesn't include one because it's x is greater than one.
Adam: So, you plug it into the bottom?
Angela: Yes! That's correct.

From this interaction, Angela explained her solution method to Adam, which not only enriched his understanding, but also increased her self-efficacy. With more confidence in her mathematics ability, Angela is equipped to solve related problems or tackle more challenging ones. Similar to Angela's experience, the researcher found that the video recordings showed numerous situations of students helping their classmates discover correct answers. From the post-interviews, the researcher discovered a trend indicating that students who helped their classmates solve problems elevated their own self-efficacy.

5. Concluding Remarks

Enhancing mathematics self-efficacy is crucial for current and future research because studies Hall and Ponton (2005), Multon et al. (1991) demonstrate that when students distinctively acquire higher mathematics self-efficacy, then their classroom performance increases. Building self-efficacy will benefit students not only in the short-term (i.e. passing courses), but also in the long-term (i.e. diverse students with higher levels of self-efficacy are more likely to persist to graduate in STEM-related fields, which could possibly lead to diversifying STEM disciplines).

Engaging in cooperative learning and writing journal reflections helped students gain a sense of belonging, embrace their classmates, and increase participation, social capital, and self-efficacy. The overarching goal is to successfully utilize these pedagogical strategies to capitalize on the strengths that diversity brings to our classrooms. Establishing and maintaining a classroom community plays a crucial role in providing a safe learning environment, which subsequently provides a pathway for students to maximize their learning potential.

References

Bandura, A. (1995). *Self-efficacy in changing societies*. New York: Cambridge University Press.

Betz, N. E. and Hackett, G. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *Journal of Vocational Behavior*, **23**(3): 329–345.

Boaler, J. and Staples, M. (2008). Creating mathematical futures through an equitable teaching approach: The case of Railside School. *The Teachers College Record*, **110**(3): 608–645.

Countryman, J. (1992). *Writing to learn mathematics*. Portsmouth, NH: Heinemann.

Creswell, J. W. and Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Oakland, CA: Sage Publications.

Davidson, N. and Major, C. H. (2014). Boundary crossings: Cooperative learning, collaborative learning, and problem-based learning. *Journal on Excellence in College Teaching*, **25**(3&4): 7–55.

Davidson, N., Major, C. H., and Michaelsen, L. K. (2014). Small-group learning in higher education - cooperative, collaborative, problem-based, and team-based learning: An introduction by the guest editors. *Journal on Excellence in College Teaching*, **25**(3&4): 1–6.

Denzin, N. K. and Lincoln, Y. S. (1998). *Strategies of qualitative inquiry*. Thousand Oaks, CA: Sage Publications.

Glaser, B. and Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Thousand Oaks, CA: Sage Publications.

Hackett, G. and Betz, N. E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal for Research in Mathematics Education*, **20**: 263–271.

Hall, J. M. and Ponton, M. K. (2005). Mathematics self-efficacy of college freshman. *Journal of Developmental Education*, **28**(3): 26–32.

Hiebert, J., Carpenter, T. P., Fennema, E., Fuson, K. C., Wearne, D., Murray, H., and Human, P. (1997). *Making sense: Teaching and learning mathematics with understanding*. Portsmouth, NH: Heinemann.

Johnson, D. W., Johnson, R. T., and Holubec, E. (1998). *Cooperation in the classroom*. Boston: Allyn and Bacon.

Johnson, D. W., Johnson, R. T., and Smith, K. A. (1991). *Increasing college faculty instructional productivity*. Washington, DC: The George Washington University.

Jurdak, M. and Zein, R. A. (1998). The effect of journal writing on achievement in attitudes towards mathematics. *School Science and Mathematics*, **98**(8): 412–419.

Kagan, S. (2014). Kagan structures, processing, and excellence in college teaching. *Journal on Excellence in College Teaching*, **25**(3&4): 119–138.

Lave, J. and Wenger, E. (1991). Legitimate peripheral participation in communities of practice. In *Situated learning: Legitimate peripheral participation*, pages 89–117. New York: Cambridge University Press.

Lincoln, Y. S. and Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.

Matsumura, L. C., Slater, S. C., Junker, B., Peterson, M., Boston, M., Steele, M., and Resnick, L. (2006). Measuring reading comprehension and mathematics instruction in urban middle schools: A pilot study of the instructional quality assessment. *National Center for Research on Evaluation, Standards, and Student Testing (CRESST)*.

Mays, N. and Pope, C. (1995). Qualitative research: rigor and qualitative research. *British Medical Journal*, **311**: 109–112.

McKinney, J. P., McKinney, K. G., Franiuk, R., and Schweitzer, J. (2006). The college classroom as a community: Impact on student attitudes and learning. *College Teaching*, **54**(3): 281–284.

Mulford, B. (2008). *The leadership challenge: Improving learning in schools (Vol. Australian Education Review 53)*. Melbourne: Australian Council for Educational Research.

Multon, K. D., Brown, S. D., and Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology*, **18**: 30–38.

Rogers, E., Reynolds, B., Davidson, N., and Thomas, A. E. (2001). *Cooperative learning in undergraduate mathematics: Issues that matter and strategies that work*. Mathematical Association of America, Washington, D. C.

Slavin, R. E. (1991). *Student team learning: A practical guide to cooperative learning*. National Education Association, Washington, D. C.

The National Council of Teachers of Mathematics (1991). *Professional standards for teaching mathematics*. Reston, VA.

Tinto, V. (2000). Taking retention seriously: Rethinking the first year of college. *NACADA Journal*, **19**(2): 5–10.

Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education*, **8**(1): 69–91.