

Community Involvement, Mentors, Cultural Relevance, and Discourse Will Build Equity in Mathematics Classrooms

Jennifer Rodin

Oglala Lakota College

Abstract: Evidence shows that marginalized students reach higher levels of success and empowerment in mathematics courses when role models from their own cultural communities participate in the classroom experience. Discourse, respect, and collaboration are highly valued in Lakota culture, so it is natural to include these protocols in the normative culture of the learning environment. Relevance is always crucial in mathematics education, especially when the standardized text books and curricula often omit specific examples of the mathematics of indigenous people, or ethnomathematics in real life. We instructors need to find ways to make mathematics come alive for our students, so they can see that the world of mathematics is vibrant, accessible to everyone, and always developing in new and exciting ways. Mathematical thinking is something that all of us humans do! Exploring that fact with our students leads to improved mathematics learning, depth of knowledge, empowerment, and satisfaction for all involved.

INTRODUCTION

This Wiglawaw Wounspe Wawokiya (*helping people learn to calculate for themselves*) project is rooted in a research proposal and annotated bibliography that I submitted as part of the requirements for an Introduction to Research class in 2017. It continued to germinate through a collaborative friendship that grew between Rita (names have been changed), a mathematics teacher at a nearby elementary school which I will call Windy Tree, and me, when Rita agreed to advise me on a curriculum study assignment that was required in a Mathematics Education class that I took during the spring of 2018. Now, the project is beginning to bloom into something new and exciting, in this Lakota community where I have worked for 14 years.

I am originally from New Jersey, have lived and taught in many different places, which enriched my worldview and accentuated my passion for ethnomathematics, social justice, and equity/empowerment through quantitative literacy, or critical mathematics pedagogy. I live in Western Nebraska, where I raised my children, and I teach mathematics, mathematics education, and developmental mathematics, at Oglala Lakota College, in South Dakota. I am a doctoral student at the University of Wyoming, in the College of Education, where I am pursuing my Ph.D. in Mathematics Education, with a focus on equity and social justice. Through extensive

conversations with students and teachers, and informed by my recent research and courses at UW, this idea developed, and we are currently putting it in place. I will describe how our project originated, discuss the human interactions that got Wiglawa Wounspe Wawokiya underway, explain our goals, and share a brief description of our conversations, challenges, and progress.

THE QUESTION

Do role models from the local community have a positive impact on the students with whom they interact in P-8 mathematics classes? This impact will be investigated in the areas of mathematics content and discourse performance levels, as well as attitudinal factors such as confidence, enthusiasm, tenacity and enjoyment. There have been fairly recent studies done by Eglash (2013), Marx et al. (2009), and by Civil & Bernier (2006), which indicate that role models positively influence the performance and attitudes of learners. Almost 30 years ago, Robert Moses explored and utilized facets of role modeling in his highly successful Algebra Project (1989), and Lipka & Mohatt (1998) started their journey into transforming schools for Yup'ik students and communities in Alaska. My own study focuses on college student role models in local elementary school mathematics classrooms, on an Indian Reservation in the United States. This particular idea has not yet been extensively examined, as far as I have seen, yet the concept was suggested by my students, vetted by a teachers and community members, and fits beautifully with aspects of the Lakota Values, four of which are generosity, courage, respect, and wisdom (http://kalloch.org/lakota_four_values.htm).

The college student helpers have an approximate mean age of 25 years (OLC demographics), they are all genders, and current college level mathematics students who have achieved different levels of academic success. Oglala Lakota College (OLC) is a decentralized, accredited, four-plus year, tribal college, serving primarily Native American students. Windy Tree is a public, federally run, Bureau of Indian Education (BIE), school. This project is currently situated in a village on an Indian Reservation, Rita is a Lakota woman who lives in this community and has taught at this school for 22 years. I, the OLC instructor/coordinator, am a non-Lakota woman who lives in nearby Nebraska. I have been learning about Lakota culture for over a decade, to be a better instructor, but I am aware that I will still be learning for the rest of my life. As an outsider, I will never be an expert. Both the college and the elementary school function through a rich Lakota cultural lens, and are already grounded in extensive community involvement and a focus on relationships. These schools are located in one of the most impoverished counties in the United States (<http://www.4aihf.org/id40.html>), but we are focusing on strengths, not deficits. Inclusion of role models in the learning process at local schools has not yet been thoroughly or consistently explored at OLC. The role model participants for this study are volunteers from my current and former math classes, and come from the local community, with similar ethnic, SES, cultural, and language backgrounds to the students.

The 3 purposes of this study are to give our college students the experience of sharing their knowledge, helping others, deepening their mathematical communication skills, participating in the many different ways of knowing mathematics, and serving as inspiring role models; to give our educational administrators at both sites a rich understanding of the dynamics and results of classroom mathematics role models; to help out in an understaffed, low-performing elementary school, where many students report feeling mathematically inadequate. Building stronger, culturally responsive, connections and bridges between the two schools and with the local community is the theme that connects our 3 purposes.

WHY THIS PROJECT IS IMPORTANT

Barriers in mathematical progress continue to haunt a large number of learners in the United States, especially students who come from non-dominant ethnic backgrounds (https://nces.ed.gov/programs/raceindicators/indicator_rcb.asp). During the past twenty years, research has grown in the areas of relationships, discourse, community-building, and inclusion of role models to foster higher levels of student engagement, satisfaction and learning in school. Students from non-dominant cultures often come to us from communities which place a higher value on connections, collectivity, family, community, conversation and non-linear learning processes (Civil, 2006; Moses, 1989). This pilot project, which will examine the specific effects of introducing consistent role models into mathematics classrooms, will grow into a larger study, and inform our efforts to move toward equity and success in the high status field of mathematics. I believe that the student participants will attain higher outcomes in content assessments, and attitudinal improvements for their mathematics learning.

WIGLAWA WOUNSPE WAWOKIYA IN ACTION

Growing out of many conversations between Rita and me, since last spring, and gathering momentum through conversations with my mathematics students at OLC and with local community members, there is enthusiasm for this project. My current students, in the Calculus 1, Calculus 3, Trigonometry, Algebra, and Math for Elementary Teachers classes, helped develop this project, and believe it is valuable. Some of them have volunteered to be classroom helpers at Rita's school. We have been meeting with the school principal and with the P-8 teachers, who are looking forward to our involvement. The OLC students, aided by a college staff member who is a Lakota language expert, and aided by an elder, created the name for our group and project. I have ordered t-shirts, which will be printed by a local artist, for our classroom helpers to wear. This will strengthen the cohort bond, and build confidence for the OLC math helpers. There have been a few delays. The concern about background checks took some time to take care of, and the Windy Tree principal and teachers had some unforeseen, unrelated, situations arise at the school, which stalled our start date. We are currently poised to begin on a small scale in the classrooms, next week.

CONCLUSION AND OUR NEXT STEPS

This project is likely the beginning of a larger-scale study of the effects of role models in mathematics classrooms in Lakota Country. During and after this initial year of collaboration and bridging, the classroom teachers, student helpers, and I, will document all project-related activities and conversations, be thoroughly mindful of Lakota cultural norms, and keep communication open among all stakeholders and participants. In this way, we will collaboratively determine the next best steps to take. I will reach out to involve more community members, parents, and leaders, as well as more OLC faculty, staff, and students. If the study grows, we will obtain the necessary permissions to study and write more about our experiences, in a narrative, ethnographic, style. We are excited about this project. We really think that Wiglaw Wounspe Wawokiya is going to have a positive impact in many ways.

REFERENCES

- Ahmad Azmi, S., Ahmad, A., Khalique, N., & Khan, Z. (2014). Role models and occupational ambitions of in-school male adolescents. *Industrial Psychiatry Journal*, 23(1), retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4261211/>, 12/15/17.
- Babey, S., Wolstein, J., & Diamant, A. (2016). Adolescent physical activity: role of school support, role models, and social participation in racial and income disparities. *Environment and Behavior*, 48(1), 172-191.
- Byszewski, A., Hendelman, W., McGuinty, C., Moineau, G. (2012). Wanted: role models.- medical students' perceptions of professionalism. *BMC Medical Education*, 12(115), 1-9.
- Carsten-Conner, L. & Danielson, J. (2016). Scientist role models in the classroom: how important is gender matching? *International Journal of Science Education*, 38(15), 2414-2430.
- Civil, M., Bernier, E. (2006). Exploring images of parental participation in mathematics education: challenges and possibilities. *Mathematical Thinking and Learning*, 8(3), 309-330.
- Eglash, R., Gilbert, J., Taylor, V., Geier, S. (2013). Culturally responsive computing in urban, after-school contexts: two approaches. *Urban Education*, 48(5), 629-656.
- Friedman, A., Melendez, C., Bush, A., Lai, S., & McLaughlin, J. (2017). The Young Innovators Program at the Eshelman Institute for Innovation: a case study examining the role of a professional pharmacy school in enhancing STEM pursuits among secondary school students. *International Journal of STEM Education*, 4(17). 1-7.
- Hoogerheide, V., Loyens, S., & van Gog, T. (2016). Learning from video modeling examples: does gender matter? *Instructional Science*, 44(1). 69-86.
- Kalloch, Ken. (date unknown). *The Four Values of the Lakota*. Retrieved from http://kalloch.org/lakota_four_values.htm, 10/12/2018.
- Lipka, J., Mohatt, G., Ciulistet Group. (1998). *Transforming the culture of schools: Yup'ik Eskimo examples*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Marx, D., Ko, S., Friedman, R. (2009). The "Obama Effect": how a salient role model reduces race-based performance differences. *Journal of Experimental Social Psychology*, 45, 953-956.
- Moses, R., Kamii, M., McAllister Swap, S., Howard, J. (1989). The Algebra Project: organizing in the spirit of Ella. *Harvard Educational Review*, 59(4), 423-443.
- National Center for Educational Statistics. (updated July, 2017). *Status and Trends in the Education of Racial and Ethnic Groups*. Retrieved from https://nces.ed.gov/programs/raceindicators/indicator_rcb.asp.
- Read, B., (2011). Britney, Beyoncé, and me – primary school girls' role models and constructions of the 'popular' girl. *Gender and Education*, 23(1), 1-13.