BUILDING SUPPORT COMMUNITIES FOR STATISTICS EDUCATORS

Lynette Hudiburgh[1] and Amy Hogan[2]
[1]Miami University, Oxford, OH
[2]Brooklyn Technical High School, Brooklyn, NY
hudibulm@miamioh.edu

As the need for data literate citizens and data scientists has become more urgent, there is an increasing demand for educators to teach statistics courses at the secondary (i.e., Common Core, AP Statistics) and post-secondary levels. An important, albeit often overlooked, part of making these courses successful is creating a supportive community for those statistics educators. Meaningful support for new educators or educators new to statistics is more than just content instruction; it can include mentoring, pedagogical strategies, lesson planning, course design, resource sharing, and general support. We will explore current successful statistics educator support programs, best practices for building a supportive community, and suggestions for implementing programs that help recruit, inform, and retain good statistics educators.

INTRODUCTION

Annually, in the United States, approximately 8% of teachers leave the profession (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Teachers who have not had adequate preparation or training to teach leave two to three times more often than those teachers who did complete formal teacher training programs (Sutcher, et al., 2016). We are faced with a huge teacher shortage, especially in technical areas like math and science. According to the U.S. Department of Education, 47 states and the District of Columbia identify teacher shortages in mathematics (Strauss, 2017). Additionally, the Learning Policy Institute reports "Teachers who receive [mentoring and other types of] supports have been found to stay in teaching at rates more than twice those of teachers who lack these supports" (Podolsky et al., 2016, p. 34). While there are many factors that contribute to attrition, many who left indicated that lack of professional learning opportunities, collegial relationships, and time for planning and collaboration contributed to their decision to leave teaching (Sutcher, et al., 2016). In this paper we will discuss the need for building professional support communities for statistics educators, and give examples of support communities available for secondary and post-secondary educators.

THE PROBLEM: WHY SUPPORT IS NEEDED

At the secondary level, many statistics classes are taught by mathematics educators who may, or may not have had much formal training in statistics. Very few math education programs require prospective secondary teachers to learn about statistics pedagogy. As a result, many teaching statistics rely on content knowledge gained from a past statistics class, or learn as they go. Therefore, support systems are needed to assist these educators in learning statistical content, and in developing their own statistics courses. Around the country there are several classes or workshops targeted at helping mathematics instructors learn to teach statistics by utilizing the Guidelines for Assessment and Instruction in Statistics Education (GAISE) and including the Common Core in their instruction. However, many educators may live in rural areas, far from university campuses. Or, they may be the only statistics teacher at their school. Hence, a variety of support systems for new statistics educators is essential.

THE SOLUTION: PROFESSIONAL SUPPORT COMMUNITIES

Professional support communities (PSCs) help teachers grow professionally but also keep them in the classroom (Sutcher, et al., 2016). PSCs go by many names, including communities of practice (CoP), professional learning communities or teams (PLCs or PLTs), and faculty learning communities (FLCs). CoP are people with shared expertise who come together to meet a common goal (Wenger & Snyder, 2000). PLCs and PLTs are characterized by shared values, collaboration, experimentation, taking action, focusing on improvement, and achieving results (Cooper, et al., 2011). An FLC is a cross-disciplinary group of faculty who build community as they actively engage in scholarship of teaching and learning (Cox, 2004). Regardless of what they are called,

PSCs focus on building community through the development of new skills and collaboration. Where and how the communities meet, face-to-face or online (synchronous or asynchronous), does not matter (Garfield & Everson, 2009), as long as they meet regularly. Irrespective of meeting modality, the community must provide members opportunities to participate in dynamic communication, to interact with each other, and to work toward a common goal, which leads to the development of trust and a sense of community (Rovai, 2002).

Pearl et al., (2012) purport that community-based professional development has a greater potential for developing pedagogical skills and content knowledge in statistics than individual professional development. Therefore, it is paramount that educators are given opportunities to participate in PSCs so they can discuss issues and ask questions that arise in the learning and teaching of statistics. It is this purposeful and sustained conversation among educators that is crucial (Rumsey, 1998). While there is not a one-size fits all approach, one can learn much from what has been done before and utilize those best practices to create a supportive community for professional statistics educators.

Support at the Secondary Level

Math for America (M*f*A), a nonprofit educational organization that offers fellowships to accomplished public school math and science teachers in NYC, offers monthly professional learning teams (PLT) on various topics. The M*f*A AP Statistics PLT has been meeting for several years. Teachers who are a part of the M*f*A AP Statistics PLT have varied experience ranging from seasoned teachers (10+ years) to teachers who are in their first year of teaching the course. PLTs are generally self-planned and self-coordinated by the teacher members. Consequently, the objectives of those meetings tend to be organic to the needs of the group. The meetings can have a content theme (e.g. Probability) or other pedagogical focus (e.g. looking at student communication in written work). In any case, members of the PLT take turns presenting and/or facilitating the discussions so that each meeting is productive. M*f*A teachers also use the meetings to present activities (either finished or works in progress), to ask questions, and to create common materials to bring back to their classrooms. Additionally, between-meeting communications can be useful to continue the discussion or implement created student activities.

There are many educator communities and forums available online. The Advanced Placement (AP) Statistics Teacher Community is a closed-group, moderated forum for teachers to pose questions, ask about content, or share ideas/resources related to the AP Statistics course and exam. Members vary in experience, location, school type, and pedagogical styles. There are many interactions between teachers that would be near impossible in person. For example, questions about particular exercises from a textbook will often be answered by one of the textbook authors themselves. In other cases, AP readers, those who score the exam, offer insight into how a particular question would be assessed or scored.

There is also a growing presence of statistics teachers on Twitter. One can find good conversations about statistics and statistics teaching using various hashtags. Many statistics educators use #statschat and there is often a monthly online chat using the same hashtag. Teachers take turns hosting the monthly chats and, like PLTs, they often have a theme planned. In this case, chat members chime in with their own responses and ideas to the posed questions, often sharing resources in the limited character format. [Some people may choose to just lurk with the chat but still have the resources and ideas available.] These posts are searchable and publicly available for reference after that chat has ended. Other pertinent hashtags include: #statsed, #mathchat (math topics), #mtbos (Math Twitter Blogosphere), or #iteachmath (also for math teachers).

In general, the success of the statistics educator communities comes from the teachers themselves. Very few teacher preparation resources seem to be a substitute for the personal interactions that develop in these communities. More experienced teachers are able to impart advice and content knowledge; less experienced teachers bring new ideas and meaningful questions to the discussions. Members of the Spring 2016 M*f*A AP Statistics PLT all agreed with the statement: "I took away a practice or strategy that I feel will have an impact on the way I teach" in their evaluations (Math for America, 2016). In addition, one teacher wrote: "Although I have an extensive background in math, statistics is an area that I am not fully familiar with. Teaching a course in Statistics for the first time, this PLT proved invaluable to me as to how to structure the

course, what to emphasize in terms of detail, and how to model problem solutions that reflect good statistical practices." All teachers also indicated that the knowledge they gained from the PLT would be shared with at least one other teacher or colleague, indicating that work in these communities has a ripple effect beyond the communities themselves.

Support at the Post-Secondary Level

At the post-secondary level, the focus is two-fold; providing support for secondary instructors through formal coursework and workshops, and facilitating collaboration among colleagues across campus through faculty learning communities (FLCs). FLCs can help statistics faculty new to teaching or, for those who are coming from prior secondary teaching, make the transition to teaching statistics at the university level. An FLC can also be useful for faculty teaching common courses at a university, helping to discuss common issues and establish common practices for those courses. For example, Miami University had an FLC for faculty who taught the 25 courses with the highest student enrollment. Discussions included topics such as incorporating active student learning in large lecture classes, and assigning and grading meaningful work efficiently. Experiences in groups like these help faculty get acclimated to courses they're teaching for the first time and also help provide feedback on those courses. Such feedback can be used to make course improvements that will provide a better student experience. Many faculty enjoy being part of a smaller group with common goals, and getting the opportunity to collaborate with their colleagues.

Collaboration between secondary and post-secondary statistics teachers is yet another way to reinforce the sense of community support. At the annual AP Statistics exam reading, both statistics academics and teachers grade exam papers collaboratively. When not grading, there are many opportunities for professional development, conversations, and building relationships. Another example of community that involves both types of teachers are workshops targeting content knowledge development and pedagogical skills required to implement the Common Core Standards for Mathematics. In such workshops educators from both levels work together to create lessons, engage in classroom observations, conduct lesson studies, and dialogue about assessing student learning.

CONCLUSION

It is imperative that teacher support communities for statistics educators are implemented both at the secondary and post-secondary level. As the research suggests, these communities are crucial for recruiting new teachers, assisting teachers in their professional growth, and minimizing the attrition rate. For example, of the 1000 math and science teachers who are a part of MƒA, approximately 85% have at least five or more years of teaching experience (Math for America, 2017). Ideally, we believe these communities should embody the aspects of the examples given here: teachers should be involved heavily in their planning; goals should respect the limited amount of time teachers have; a good portion of the time should be devoted to reinforcing the human connections between teachers; and communities should be about giving and receiving feedback, in addition to content and resources. In any event, modeling future support communities on already successful programs will help to ensure they are beneficial and meet the needs of those involved.

REFERENCES

Cooper, S., Wilkerson, T. L., Eddy, C. M., Kamen, M., Marble, S., Junk, D., & Sawyer, C. (2011). Lesson study among mathematics educators: Professional collaboration enabled through a virtual faculty learning community. *Learning Communities Journal*, *3*, 21-40.

Cox, M. D. (2004). Introduction to faculty learning communities. *New Directions for Teaching & Learning*, *97*, 5-23.

Garfield, J., & Everson, M. (2009). Preparing teachers of statistics: A graduate course for future teachers. *Journal of Statistics Education*, *17*(2). Retrieved from http://www.amstat.org/publications/jse/v17n2/garfield.pdf

Math for America. (2016, June). *AP Statistics PLT professional development evaluations* [Electronic evaluations anonymously presented to PLT facilitators].

Math for America. (2017, September 12). *MfA Provides $15M to 1,000+ NYC Teachers in 2017* [Press release]. Retrieved from http://mathforamerica.org/news/m%C6%92a-provides-15m-1000-nyc-teachers-2017

Pearl, D. K., Garfield, J. B., delMas, R., Groth, R. E., Kaplan, J. J., McGowan, H., & Lee, H. S. (2012). *Connecting Research to Practice in a Culture of Assessment for Introductory College-level Statistics*. Retrieved from http://www.causeweb.org/research/guidelines/ResearchReport_Dec_2012.pdf

Podolsky, A., Kini, T., Bishop, J., & Darling-Hammond, L. (2016). *Solving the Teacher Shortage: How to Attract and Retain Excellent Educators*. Palo Alto, CA: Learning Policy Institute.

Rovai, A. (2002). Building sense of community at a distance. *International Review of Research in Open and Distance Learning*, *3*(1), 2-16.

Rumsey, D. (1998). A cooperative teaching approach to introductory statistics. *Journal of Statistics Education*, *6*(1). Retrieved from http://www.amstat.org/publications/jse/v6n1/rumsey.html

Strauss, V. (2017, September 18). Where have all the teachers gone? *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/answer-sheet/wp/2017/09/18/where-have-all-the-teachers-gone/?utm_term=.ea6897a4af69

Sutcher, L., Darling-Hammond, L., and Carver-Thomas, D. (2016). *A Coming Crisis in Teaching? Teacher Supply, Demand, and Shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.

Wenger, E., & Snyder, W. (2000). Communities of Practice? The Organizational Frontier, *Harvard Business Review, 78*(1), 139-146.