USING DESIGN-BASED RESEARCH TO EXPLORE A MODEL OF PROFESSIONAL DEVELOPMENT

Rachael Eriksen Brown
Penn State Abington
reb37@psu.edu

Chandra Hawley Orrill
UMass Dartmouth
corrill@umassd.edu

Kun Wang
UMass Dartmouth
kwang1@umassd.edu

Keywords: Professional Development, Research Methods

Professional development (PD) aims to support teachers in improving their teaching practices as well as strengthening their content knowledge. This poster shares how we are using design-based research (DBR; Cobb et al., 2003; Collins et al., 2004; DBRC, 2003) to create a model of PD that intends to engage teachers playfully in content and practice.

DBR is iterative research about an innovation as well as theory using input from stakeholders as well as systematic research questioning the theory and success of the innovation. In this case, we generated a working theory about teacher knowledge (Weiland et al., 2021) and through this we conjectured how to best engage teachers in learning. We first consulted with two advisory groups about what we call our Model of Coherent Learning for Teaching. One group was teachers and the other researchers. This stakeholder feedback led to a modification of the model to focus on content instruction (two-thirds) and applying learning to instruction (one-third). Next, we created a pilot PD experience to understand the innovation through capturing small group discussions during the PD. This led to our current understanding of our model.

The Model of Coherent Learning for Teaching includes three stages: Exploration, Connection, and Application. Exploration playfully engages teachers with focused mathematical ideas including conjecture testing and mathematical argument. This stage has been consistent in our PD work over the past decade and past research suggests this type of engagement is successful for teacher learning (Brown, 2009; Burke, 2017; Orrill & Brown, 2023). Connection is focused on mathematical structure and representation. This stage surfaced as necessary through analysis of video of the pilot PD. Finally, the Application stage is where teachers directly connect with practice by considering how we can support students to have similar experiences playing with content and representations. The final stage was suggested through our stakeholder feedback as well as through previous work where there was evidence that teachers struggled to do this with PD ideas (e.g., Orrill & Kittleson, 2015). Throughout, teachers are working in small groups and the facilitator leads full group discussions using questioning and highlighting key mathematical ideas.

This poster will highlight the evolution of the PD model as it is tied to iterations of DBR. This will include the current model, where it came from, and how we are using DBR to further develop it.

Acknowledgments

This material is based upon work supported by the National Science Foundation under Grants No. DRL-1125621, DRL-1621290, and 2201125. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

Brown, R. E. (2009). Community building in mathematics professional development. (Unpublished doctoral dissertation). University of Georgia, Athens, GA.

Burke, J. P. (2017). Case study of mathematical playfulness in an adult mathematics classroom setting. (Unpublished doctoral dissertation). University of Massachusetts Dartmouth, Dartmouth, MA

Cobb, P., Confrey, J., DiSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. Educational Researcher, 32(1), 9–13.

Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design research: Theoretical and methodological issues. Journal of the Learning Sciences, 13(1), 15–42.

Design-Based Research Collective (DBRC). (2003). Design-based research: An emerging paradigm for education inquiry. Educational Researcher, 32(1) 5–8. http://www.jstor.org/stable/3699927

Orrill, C. H., & Brown, R. E. (2023). Using design-based research to develop a professional development model. In M. J. Spector, B. B. Lockee, & M. D. Childress (Eds.), Learning, design, and technology. Springer. https://doi.org/10.1007/978-3-319-17727-4_177-1

Orrill, C. H., & Kittleson, J. (2015). Translating learning into practice: Considering the relationship between teachers' professional development and teaching. Journal of Mathematics Teacher Education, 18(3), 273-297. doi: 10.1007/s10857-014-9284-5

Weiland, T., Orrill, C. H., Nagar, G. G., Brown, R. E., & Burke, J. (2021). Framing a robust understanding of proportional reasoning for teachers. Journal of Mathematics Teacher Education, 24, 179-202. https://doi.org/10.1007/s10857-019-09453-0