Classroom Teaching Research for All Students

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The theme of the Discussion Group was promoting classroom teaching research through the exploration of effective instruction strategies to support mathematics learning for all students, including struggling, special needs, and excelling students, as well as between different educational systems and cultures.

The presentations of the Discussion Group focused on three aspects: (1) Framework of classroom teaching research; (2) Examples of classroom teaching research by scholars and teacher researchers; (3) Technology in classroom teaching research. The Discussion Group discussed the classroom teaching research framework that focuses on linking research to classroom practice, making classroom research applicable and making sense to classroom teachers (Wu, 2016). All presentations have shown classroom teaching research plays a key role in understanding how to support effective mathematics classroom teaching and learning. A case study by Cheng (2016) addressed the features of expert secondary mathematics teachers' verbal presentation in Chinese mathematics classroom as using precise language, transition and variation strategies to help students well understand the clue and the purpose of teaching.

An (2016) introduced a Model-Strategy-Application-Reasoning (MSAR) approach in teaching and learning mathematics, addressed the conceptual framework of the MSAR, demonstrated examples of the effects of the MSAR approach on the third graders' mathematics learning in US, and discussed the benefits of using the MSAR for diverse student groups. Chen, An, Cheng, and Sun's presentation (2016) demonstrated five types of modeling by Chinese 3rd Graders resulting from use of the MSAR for two-digit number multiplication in China: repeated model, area model, set model, and tree diagram model.

The teacher-researcher has a pivotal role in classroom teaching research. A teacher-researcher, Dunia Zeineddine (2016) demonstrated a video lesson that

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showed how to teach geometry to struggling students with limited language skills by incorporating NCTM's Orchestrating Discussion, which promotes understanding of concepts, engages students in mathematical discourse, and teaches the geometric vocabulary in a supportive classroom environment. Siemssen and Sahr (2016) demonstrated how the use of technology that students already own, such as cell-phones, can be used to motivate students to learn rigorous mathematics. Middle school students from an economically disadvantaged district in Texas were challenged to investigate new topics in mathematics and use free or low cost technology to create presentations. For this project, the teacher served as a mentor while the students took full control over both the topic of study and the method of presentation. Topics chosen by the students included statistics, trigonometry, calculus, matrices, forensic analysis, and code breaking. Visuals included board games, graphic novels, 2D and 3D models, and videos. Several videos were presented, including a Sci-Fi movie trailer depicting exponential growth, a super hero using geometry to teach others how to dance, and a music video that explored calculus and trigonometry. Using their own technology, the students were able to produce projects that were both creative and showed deep understanding of complex mathematics.

Siemssen and Sahr's example shows that technology is an increasingly important area in classroom teaching research. Lee (2016) discussed a study on using an online teaching approach for college student mathematics learning in US. János (2016) demonstrated how to using Eye Tracking technology and other biometrical tools in learning process observation and classroom teaching research in Hungary. Such international perspectives in classroom teaching research was also demonstrated by Cao (2016) using examples from Chinese mathematics classrooms.

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