Supportive Growth Mindset Interventions and Elementary Mindset Mathematics Teaching Materials

Yu-Liang (Aldy) Chang
Professor, Department of Education, Teachers College, National Chiayi University, Taiwan

Su-Chiao (Angel) Wu
Department of Early Childhood Education, Teachers College, National Chiayi University, Taiwan

Abstract:

The main objectives of this three-year qualitative research project were to furnish the targeted elementary mathematics teachers with essential knowledge and abilities of supportive growth mindset interventions and conduct experimental interventions in their classrooms. A "explanatory and descriptive" case study was employed in this study. Three elementary mathematics teachers and their students at higher grade levels (i.e. 5th and 6th grades) of a public elementary school in southern Taiwan participated in the design and implementation (experiment) process in this study. There were five elementary mathematics teachers engaging in professional development programs. Data were collected via semi-structured classroom observations, individual and group interviews (to teachers and students), and diverse types of documents (such as teachers' teaching plans, reflection notes, students' learning profiles), and then analyzed qualitatively by template and editing analytic strategies to reach the objectives.

Based on the implementation and revision process of the mindset mathematics teaching and learning activities, an "efficacious strategies of mindset mathematics teaching materials (ES-MMTM)" was generated and applied for designing and implementing (experimenting) all mindset mathematics teaching and learning modules. There were six core strategies (with 13 sub-strategies) in ES-MMTM: using numbers with an open mind; designing visible learning tasks; operating teaching aids or objects through an inquiry-based activity; applying multiple methods, paths, and representations in designing learning tasks; giving equitable opportunities for students to engage in the learning process; employing formative assessment to measuring students' mindset development. Here are some examples: 1. Visual learning activities were employed to promote students' learning and understanding; for instance, a series of continuously evolving graphics were provided for stimulating their learning motive and assisting them to think and discuss in small groups. 2. Having students explore the mathematical concepts by manipulating teaching aids first, and then discussing how to solve the mathematical problems. 3. Using multiple strategies, paths, and representations while designing the instructional activities, such as: using journals or figures to record and/or present their thinking or problem-solving process; using color codes to highlight different ideas or solutions; providing diverse inquiry-based learning tasks (individual and group). 4. Providing equitable opportunities to learn (engage), for example: teaching and encouraging students to use "reasoning" while learning mathematics, and arranging group tasks for them to practice the reasoning ability; designing game-based learning tasks to downplay competition; having students to conduct research activities (e.g. investigation).

Finally, these teachers work collaboratively and produce three mindset mathematics teaching modules: area of parallelogram, triangle and trapezoid (fifth grade), sector (sixth grade), shape relationship and surface are of cylinder (sixth grade). Each module has been implemented (experimented) by three teachers (in two years), and then modifications and adjustments were made based on the professional dialogue process after the experiment. In addition, the core strategies (in