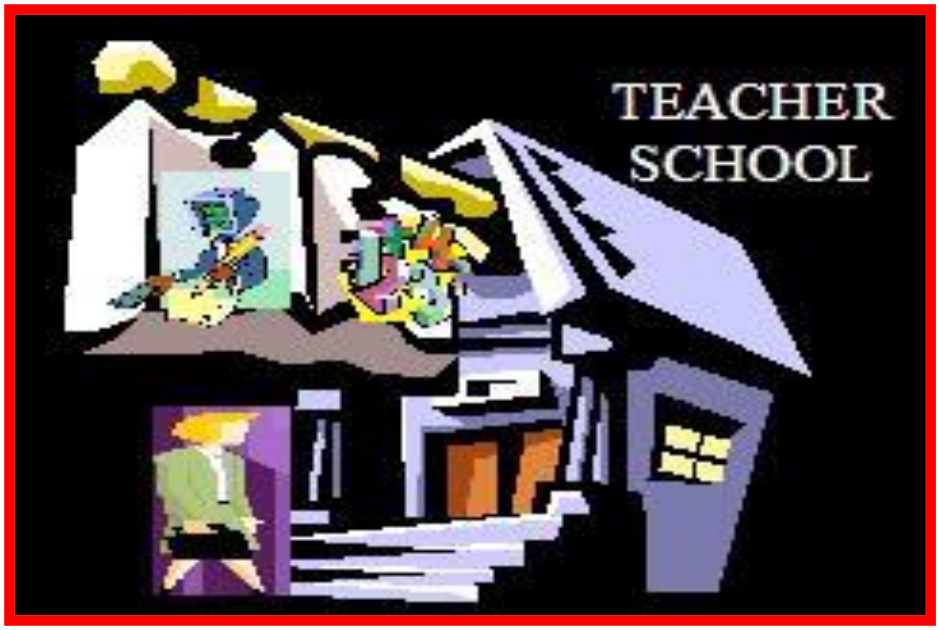
Math Teacher Education: *Learn More, Do More, The TPCK Way*



The mathematics teacher with TPCK (Technology Pedagogy Content Knowledge) is a chess player. The constantly evolving trends during a chess game changes the roles of the interdependent pieces; involving a persistent need to rework proficiency with the different pieces just as the mathematics teacher has to continually reason logically and progressively with current tools. If "TPCK is a way of thinking strategically while involving in planning, organizing, critiquing, and abstracting" (Niess. 2008:224) to fulfill teaching and learning needs with today's technologies, the teacher makes preparations to face challenges, systematizes approaches, consistently does analysis or appraisals of situations, and condenses information by updates. Hence, for the mathematics teacher, to learn more is to do more. With TPCK, it is learning more and doing more with technology in a meaningful context.

Taking the cue from this standpoint, pre-service and in-service mathematics teachers have to be educated with the TPCK model regularly. Considering the importance of experiencing the progression of mathematical inquiry in assimilating technology with pedagogy and content, these programs are designed generally to include discussions of the latest issues in mathematics and technology, Internet browsing for navigational and research purposes, simple programming, exploring mathematical softwares, problem solving with technology, and even showcasing video vignettes. These set up are intended to accomplish investigative learning to foster ease and insight on the use of technology in mathematics; to exemplify the proper uses of reputable and new applications of technology within the mathematics context; to guide teachers in making practical but sensible determination as to the suitability of the technology in the teaching and learning of mathematics; and to give teachers the chance to acquire and expand their technological skills to improve the understanding of mathematics.

Adhering to Grandgenett's "successful mathematics teacher education program" (2008: 161-162), examples are drawn for each attribute in the following chart:

Grandgenett's Attributes	Examples
1. Encourages "imaginative openness" for classroom experimentation in using technologies for learning mathematical content.	Teachers are given confidence to model the use of recent but well regarded technologies and allow their students to manipulate or navigate their features before using them with the mathematical content.
2. Does not overly separate technology, content, and pedagogy across coursework of teachers.	Teachers are taught to incorporate Computer Algebraic Systems (CAS) in algebra to explore equations, Sketchpad in geometry to investigate Pythagorean Theorem, and Fathom in Statistics to analyze statistical data.
3. Carefully selects the TPCK-related examples or problems that would be included in a methods class or other programs.	Teachers are trained to solve mathematical problems with technology. The use of calculator to tabulate numerical values, plot graphs, formulate and manipulate equations to understand the nature of quadratics through problem solving.
4. Represents an important framework for restructuring the professional development experiences for teachers.	Teachers are encouraged to develop adaptable methods while realizing the affordances and constraints of not just the technologies but also of the teaching and learning environments.
5. Recognizes that not all strategies work for all students and considers cultural relevance to reach all students.	Teachers are made aware of cultural diversity in the student body. Teachers experience online collaboration and gain resources on the web for multicultural themes and applications in mathematics.
6. Acknowledges that not all effective uses of technology are tied directly to content and pedagogy.	Teachers learn to recognize that productivity applications such as word processors and PowerPoint presentations are not mathematical tools but can be useful in communicating the mathematics.
7. Promotes "demonstrated caring" among teachers of mathematics that focuses on students as individuals to encourage them to take intellectual chances.	Teachers are shown video clips or presented with classroom vignettes to exemplify scaffolding with the use of technology.

As mathematics dynamically transforms with the developments in technology, the mathematics teacher with TPCK incessantly strives to keep up with these changes. Strengthening these core values of TPCK, the National Technology Leadership Coalition (NTLC), which umbrellas educational technology associations and teacher educator organizations in specific content areas; endeavors to concentrate technology knowledge (TK) with the pedagogy content knowledge (PCK) of the teacher educator organizations in a subject area by setting standards, endorsing TPCK practice, and advancing research on the judicious use of TPCK. Its mathematics wing is known as the Association of Mathematics Teacher Educators (AMTE).

With teacher education programs emphasizing on the TPCK approach, the mathematics teacher becomes well-rounded, fully informed, adaptable, and effective. It just proves to say that to learn more is to do more with the TPCK way.

References:

Blubaugh, W. L. (2009). A course for pre-service mathematics teachers that focuses on mathematics and the integration of technology. *Mathematics and Computer Education*, 43(1), 41-46.

Bull, G., Bell, L., & Hammond, T. (2008). Advancing TPCK through collaborations across educational associations. *Handbook of Technological Content Pedagogical Knowledge (TPCK) for Educators*, New York: Routledge, 273-287.

Elliott, R., Kazemi, E., Lesseig, K., Mumme, J., Carroll, C., & Kelley-Petersen, M. (2009). Conceptualizing the work of leading mathematical task in professional development. *Journal of Teacher Education*, 60(4), 364-379.

Grandgenett, N. (2008). Perhaps a matter of imagination: TPCK in mathematics education. *Handbook of Technological Content Pedagogical Knowledge (TPCK) for Educators*, New York: Routledge, 145-165.

Niess, M. (2008).Guiding preservice teachers in developing TPCK. *Handbook of Technological Content Pedagogical Knowledge (TPCK) for Educators*, New York: Routledge, 223-250.