

Engaging Students (and Teachers!) in Learning Mathematics Using the TPACK Framework

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Academic Excellence & Spiritual Vitality

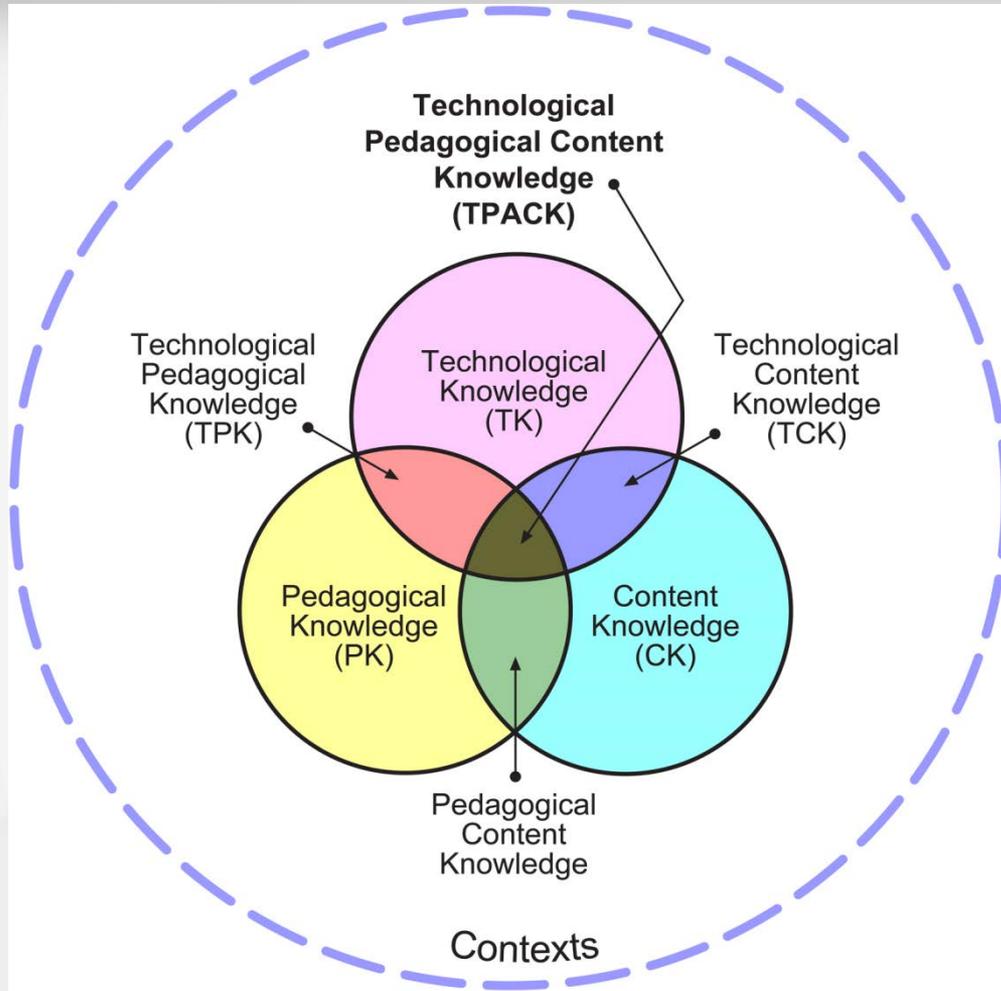
Sharing Technology Experiences

Guiding Questions:

- 1) What access do you have to content-specific math technology?
- 2) How do you currently use technology in teaching math?



What is TPACK?



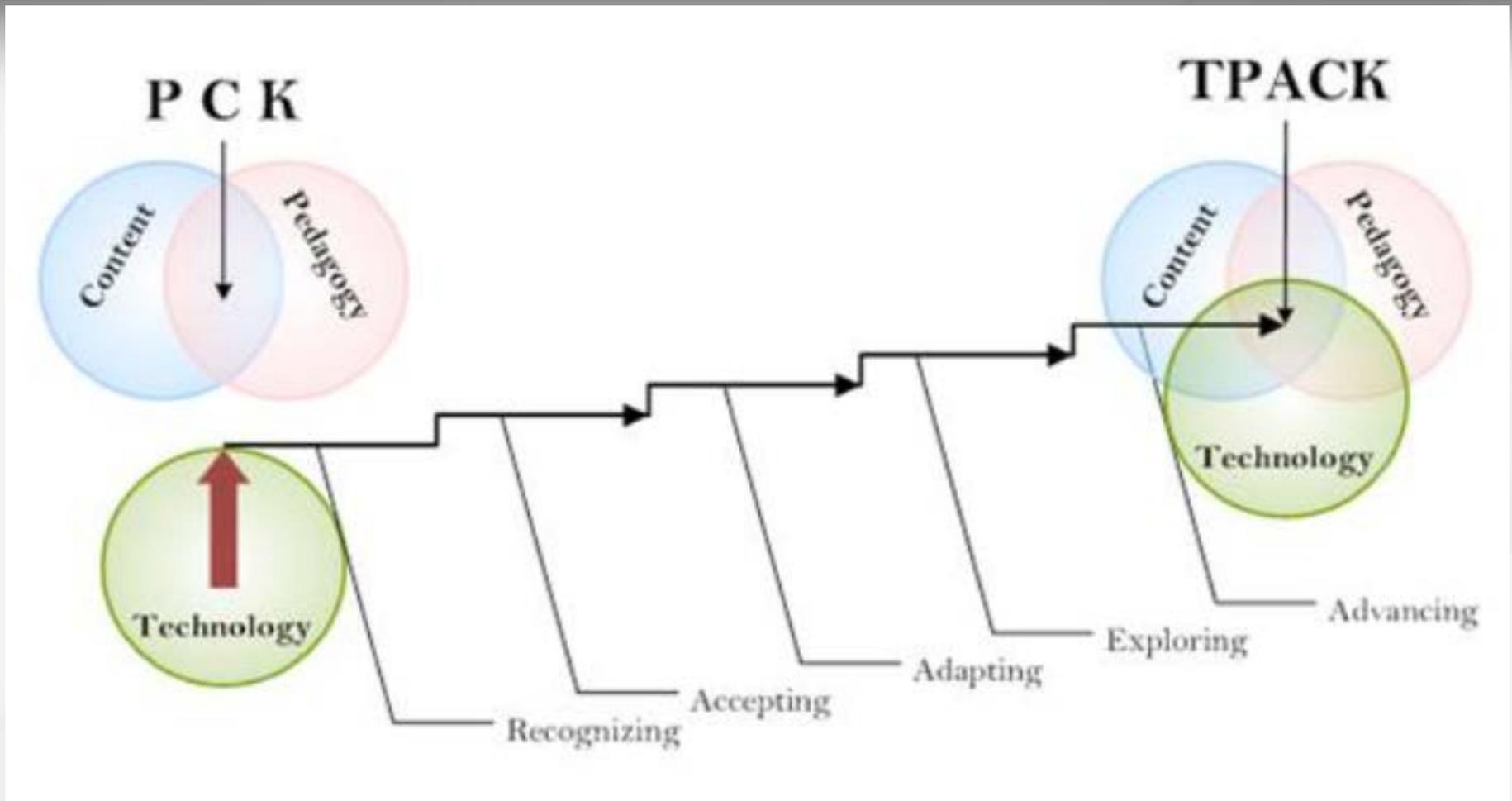
**Technology,
Pedagogy,
And
Content
Knowledge**

Why TPACK?

- TPACK emphasizes the purpose for incorporating technology; knowledge of students' understandings, thinking, and learning; knowledge of curriculum and materials that integrate technology; and instructional strategies and representations that impact the teaching and learning of mathematics with technology (Neiss, 2005; Neiss et al., 2009).
- TPACK is considered a useful organizational structure to define what teachers need to know in order to effectively integrate technology in mathematics teaching and learning (Archambault & Crippen, 2009).



Five-Stage Development Process to Integrating TPACK in Math



Five-Stage Development Process to Integrating TPACK in Math

Stage 1: Recognizing (*knowledge*)

ability to use technology & recognize the alignment of technology with mathematics content; do not yet integrate the technology in teaching & learning of mathematics.

Stage 2: Accepting (*persuasion*)

form favorable or unfavorable attitudes toward teaching & learning mathematics with an appropriate technology.

Stage 3: Adapting (*decision*)

engage in activities that lead to a choice to adopt or reject teaching & learning mathematics with technology

Five-Stage Development Process to Integrating TPACK in Math

Stage 4: Exploring (*implementation*)

actively integrate teaching & learning of mathematics with technology

Stage 5: Advancing (*confirmation*)

evaluate the results of the decision to integrate teaching & learning mathematics with technology

Descriptors for Major Themes in Math Teacher TPACK Development Model

Theme	Descriptors
Curriculum & Assessment	<ul style="list-style-type: none"> • Curriculum, the treatment of the subject matter • Assessment, assessing the students' understandings
Learning	<ul style="list-style-type: none"> • Focus on subject matter (i.e., learning of mathematics topics) • Demonstration of conceptions of how students learn (development of students' thinking skills)
Teaching	<ul style="list-style-type: none"> • Focus on subject matter (i.e., learning of mathematics topics) • Instructional approaches • Classroom environment • Professional development
Access	<ul style="list-style-type: none"> • Usage (whether or not students are allowed to use technology) • Barriers (how teachers address barriers to technology integration) • Availability (how technology makes higher levels and more mathematics available for investigation for greater numbers of more and more diverse students.

Mini-Lesson: Elementary

Technology: Geometer's Sketchpad (GSP)

Pedagogy: Whole group directed instruction, small group discussion, and individual exploration

Content Knowledge: Models of Multiplication (Jumping, Grouping, and Area)



Mini-Lesson: Middle Grades

Technology: Excel

Pedagogy: Whole group data collection and individual exploration

Content Knowledge: Statistics (measures of central tendency and data displays)



Mini-Lesson: High School

Technology: GeoGebra (GGB)

Pedagogy: Whole group directed instruction, small group discussion, and individual exploration

Content Knowledge: Exploring Transformations (reflections, rotations, translations, glide-reflections)

Available at: <http://www.maa.org/publications/periodicals/loci/resources/exploring-geometric-transformations-in-a-dynamic-environment-activity-1-exploring-reflections>

Additional Technology Resources

Trimble (formerly Google) Sketch Up:

<http://www.sketchup.com/download>

Google Earth Download:

<http://www.google.com/earth/index.html>

National Library of Virtual Manipulatives

<http://nlvm.usu.edu/>

Shodor Interactivate

<http://www.shodor.org/interactivate/>

National Council of Teachers of Mathematics (NCTM) Illuminations

<http://illuminations.nctm.org/>



Additional Technology Resources

Texas Instruction (TI) Education Activities Exchange

http://education.ti.com/educationportal/activityexchange/activity_list.do?cid=us

TI-Nspire Document Player

<http://education.ti.com/calculators/products/US/document-player/>

Grapher Software

<http://www.padowan.dk/>

When Will I Use Math? We Use Math.org

<http://weusemath.org/>

Get the Math

<http://www.thirteen.org/get-the-math/>



Additional Technology Resources

Mathematics Assessment Project

<http://www.map.mathshell.org/materials/index.php>

PhET Interactive Simulations

<http://phet.colorado.edu/en/simulations/category/math>

Wolfram CDF Player – Demonstrations Project

Download for CDF Player: <http://www.wolfram.com/cdf-player/>

Demonstrations Project: <http://demonstrations.wolfram.com/>

Illustrative Mathematics

<https://www.illustrativemathematics.org/>

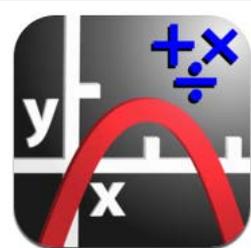


Free Apps for Number & Operations

Basic Math

Free GraCalc

Pocket CAS Lite



TouchCalc

Math Drills Lite

Number Line



Math Ninja

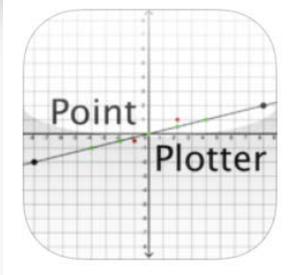
King of Math

Number Pieces



Free Apps for Algebraic Thinking

Point Plotter



Quick Graph



Formulas Free



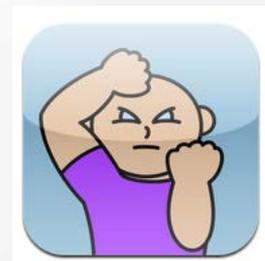
Equation Solver



Trinomial Factoring



Algebra Champ



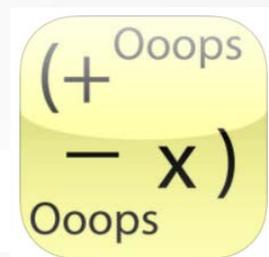
7th Grade Math



Exponents



Ooops



Free Apps for Geometry

iFormulas



Units



Fast Fractals



tangram!



Geoboard



Geometry Pad



Isosceles: Geo Sketchpad



References

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