

TPACK Model - ICT Based Teaching Learning

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Abstract

The need for effective technology integration into education is crucial to ensure that the student pedagogical framework has long-lasting skill development for instructors. Without which, institutional development, the need for proper integration of technology and training of educators to superficially enhances their traditional classroom. One important integration model for tech in the author has discussed the characteristics and applications of the technology integration model in mathematics for standard VII using TPACK has been presented. This will be helpful for teachers.

Keywords: Pedagogy, Teacher Education, Technology, TPACK, Lesson plan

Introduction

“It is not about the technology; it's about sharing knowledge and information, communicating efficiently, building learning communities and creating a culture of professionalism in schools. These are the key responsibilities of all educational leaders.”

– Marion Ginapolis

Technological literacy has become a fundamental focus within the contemporary classroom. The integration of technology into a traditional learning environment helps develop meaningful learning experiences and cultivates positive perspectives and relationships with technology. Though technology has become essential within most of the classrooms and merged into curriculum standards, the integration of technology and technology frameworks or models compete with barriers and limitations based on preconceived perceptions of technology, school culture, and access to technology. It is also presumed, that the sheer presence of digital tools will improve education.

The trendsetters of this framework, Mishra and Koehler, observed that, in the present-day the technology was treated as if it is separate from teaching and learning. Teachers in the



Professional Development workshops were instructed to use some particular software or app, but how to fit it into our classroom is rarely discussed. This had a negative impact on teaching. They claimed that the lack of awareness of TPACK keeps technology separated and leads to four problems with using technology in the classroom. First, due to the rapid changes in technology it is extremely difficult to keep up with all the latest advancements and apps. The second problem is that software is planned for business and not for education. Thus, the students are learning how to use the program and not learning the content of the class. The third problem with keeping technology separate is the situational nature of the classroom. A teacher can adjust a lesson to make sure it meets the needs of the specific group of students, but the instructional video cannot. It's the same video every time it is played. Fourth, keeping technology separate, places an emphasis on “what” not “how.” From the teacher’s perspective the lesson becomes about what technology are we going to use today, what does it say, what skills does it require, instead of how can I teach my students.

This is where the TPACK framework comes into focus and is important. Mere adding a Learning Management System (LMS) to class strategy will not enhance learning. Thus, TPACK shows that there’s a relationship between technology, content, and pedagogy, and the purposeful blending of them is key.

TPACK Framework

TPACK stands for Technological Pedagogical Content Knowledge. It is a theory that was developed to explain the set of knowledge that teachers need to teach their students a subject, teach effectively, and use technology. TPACK is a technology integration framework that identifies three types of knowledge instructors need to combine. For successful EdTech integration—technological, pedagogical, and content knowledge (TPACK).

Technological Knowledge

The Technological Knowledge (TK) is a fascinating part of this model because it is hard to define due to the constant change of new and emerging technologies. Due to the changing dynamics of the technology accessible to learners and teachers, it is important



that educators have a broad understanding of the available technologies and emerging technologies and how they can be productively integrated within their curriculum (Mishra & Koehler, 2006).

Pedagogical Knowledge

Pedagogical Knowledge (PK) refers to the way in which the educator presents content to their students in an effective way and addressing challenges or misconceptions from the learner. Mishra and Koehler describe the pedagogical context as, “knowing what teaching approaches fit the content, and likewise, knowing how elements of the content can be arranged for better teaching” (2006, p.1027).

Content Knowledge

Content Knowledge (CK) is exactly what the term suggests which is the actual knowledge about a specific field or subject matter (Mishra & Koehler, 2006). Educators are expected to be experts in the field of study they teach and the scope of complexity of which it is presented to the learner. Educators must have the fundamental backgrounds and understandings for their specific field of study otherwise there could be a misrepresentation or communication of the facts thereby confusing or misleading their students (Ball & McDiarmid, 1990).

The TPACK model is expressed through an overlapping Venn diagram where the various knowledges cumulate in the optimal experience where pedagogical, content, and technological knowledges are balanced in the TPACK structure. Each knowledge component has a very important role in the successful integration of technology within the classroom.

First overlap: Pedagogical Content Knowledge. This overlap reminds us that, as teachers, we design lessons based on how students can best learn our specific course material.

The second overlap area created is Technological Content Knowledge. TCK is how the technology influences the content.



The third overlap area created by our Venn diagram is Technological Pedagogical Knowledge. TPK highlights the area where technology and pedagogy influence each other. Incorporating technology into the classroom often causes a change in how the material is taught.

Mathematics Lesson Plan : Lesson Description

The lesson is for students of grade VII

Topic: Types of Triangles

Objectives: Students will understand and determine triangles and its classifications based on their attributes.

Original Lesson Plan

- a. The teacher will introduce the topic, triangles by asking students their familiarity with that word and later will show to them triangles and identify their features.
- b. Students will be the one to define the properties of the shown figures. The teacher will then show the definition projected through PowerPoint for students to be used in the activity.
- c. Next, the teacher will introduce the software called GeoGebra and will be demonstrating how to use it using the PowerPoint.
- d. Students will be put into groups of four and start solving the problems provided by the teacher.
- e. The students will be given a worksheet that contains specific measures of sides and angles. Students need to determine the kinds of triangles after they have put together the sides and angles.
- f. The software allows students to measure angles and lines.

Lesson Plan using TPACK

Content Knowledge (CK)

What is to be taught and what is the teacher's knowledge of the topic? For this lesson, an in-depth understanding of attributes of each type of triangle, its kinds and properties. The lesson will mainly focus on attributes of each triangle, its kinds and properties. By working together and focusing on their roles, students will be able to identify special attributes of each shape and to categorize shapes with common attributes.

Pedagogy Knowledge (PK)

Teachers understanding of the best practices for teaching specific content to the specific students. The main pedagogy of this lesson is cooperative learning. Cooperative learning is a teaching strategy that allows students with different abilities to work together to improve their understandings of a subject. It is different from "working with partners" because this strategy also focuses on improving students' social skills. Each student will be assigned a job and will be graded based on the participation and performance.

Technology Knowledge (TK)

What digital tools are available to the teacher, which the teacher is well versed to use, and which would be most appropriate for the lesson at hand? For this lesson, students will need to label a diagram and present, so the ability to fill in blanks with an answer key, find images from the internet, create slides, etc. are important.

GeoGebra, a Dynamic Mathematical Software. The technology of this lesson is GeoGebra. It is a mathematics software for all levels of education. For this activity, students are going to use a tool, one of its features, to measure angles and lines. Since GeoGebra allows users to construct, students have opportunities to interact with their groupmates. At the same time, it provides a platform for users to share their works to each other. It allows students to view and learn from others' works. It also allows teachers to get example or get inspired by others' works.



Once the stock of the primary forms of knowledge, the focus should be on where they intersect. While the ultimate goal is to be viewing your lesson and strategy through the lens of TPACK, or the centre of the model where all primary forms of knowledge blend together, taking a moment to consider the individual relationships can be helpful.

TPACK: Pedagogical Content Knowledge (PCK)

Understanding the best practices for teaching specific content to the specific students.

Define: Cooperative learning is the best strategy for learning Math.

Describe: In this activity, cooperative learning will be used. Cooperative learning is a strategy that focuses on academic achievement and the development of social skills. In this activity, students will be put into groups of four. Each team member has a job: a recorder, who records and reports the discussion; a leader, who asks questions and helps the group to achieve goals; an information giver, who has the textbook and finds information from it; and a researcher, who does the experiment in this activity. In order to learn and get full points, team members need to interact with each other and make sure every team member understands the materials.

Support: (findings from the research studies on cooperative learning) The teacher should be well versed with cooperative learning strategies as well as the research on success of using cooperative learning for mathematics learning

TPACK: Technological Content Knowledge (TCK)

Knowing how the digital tools available can enhance or transform the content, how it's delivered to students, and how your students can interact with it.

Define : The TCK of this lesson is using GeoGebra to understand each kind of triangles has its own attributes and some of them share the same attribute.

Describe: GeoGebra is a Dynamic Mathematical Software (DMS) for all types of learners. It provides different functions for students to enhance their understandings of mathematical concepts and to “allows users to construct interactive representations of points and lines (Boo and Leong, p.3).” This activity focuses on the attributes of each



shape. Students can measure the lengths of each side and the degree of each angle to prove what kind of quadrilateral it is. It can help students to fully understand some special attributes of a kind of triangle. At the end of the activity, students can upload to the discussion board using PowerPoint for other users to view. It shows that this software not just focus on the interaction in the classroom but also interaction within the community.

Support: The teacher should be well versed with GeoGebra and have some knowledge on the research on GeoGebra on success of using it for mathematics learning (findings from the research studies on GeoGebra).

TPACK: Technological Pedagogical Knowledge (TPK)

Understanding how to use your digital tools as a vehicle to the learning outcomes and experiences you want.

Define: The TPK of this lesson is using GeoGebra to facilitate cooperative learning approach.

Describe: In this activity, students will use GeoGebra to understand the attributes of each triangle. This software provides opportunities for users to make conjectures and to understand mathematical concepts through interaction. At the same time, using cooperative learning approach with this software not only can provide enough space for students to learn but also ensure they participate.

TPACK: Technological Pedagogical and Content Knowledge (TPACK)

Define: Using GeoGebra with cooperative learning can help students to build a strong foundation of Geometry.

Describe: In this activity, students are going to use GeoGebra software to understand some attributes of different classifications of triangles. In this activity, each student is required to work with their group mates and is assigned a role. In order to receive full points, students need to play their roles well and demonstrate a fully understanding of the topic.



Conclusion

TPACK is a crucial part of the education system today as it incorporates the growing demand on the use of technology in the classroom as well as continuing the focus on the content and how we teach it. Thus, it sets up education for the future as well as setting up the students for their future. It is important for the teacher to be completely up to date and knowledgeable with the curriculum and the components of TPACK to effectively incorporate it into their lessons. As far as the students are concerned the students of the millennium work better through technology and quite often find the content and direct teaching quite stale. Thus, by adding the technology component to the already existing TPACK model the students become more engaged in their learning. It is important to recognize that the TPACK model represents an ideal scenario. In order to come close to achieving this within a classroom, the standards for integration have to be achievable. Incorporating technologies that are inexpensive or free to the user, as well as ones that are intuitive and easy to learn, are the basis of effective integration of tech-tools inside the classroom. It is vital for educators to examine and assess technology-based tools before implementing them into their classroom to ensure that learning is enhanced through the use of technology.

“Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is most important.” --Bill Gates

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