

# Thinking Creatively with Transmedia About Matter: Developing TPACK through Multimodal Design

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**Abstract:** TPACK calls for teachers to develop knowledge that integrates technology, pedagogy, and content knowledge. Technological knowledge includes not just knowing how to use new digital technologies, but also how to create and communicate various forms of meaning. In this paper, we describe how transmedia design—the creation of a set of media products centered on a single theme—can support the development of TPACK. We do this through examining the transmedia design experiences of a 5th grade science teacher.

## Introduction

The Technological Pedagogical Content Knowledge framework (TPACK) calls for teachers to develop knowing that integrates technology, pedagogy, and content knowledge (Mishra & Koehler, 2006). We often think of technological knowledge as knowing how to operate technologies, such as hardware or software. However, what is valuable about technological knowledge is the ability to use it to create and communicate new forms of meaning. For example, Cope and Kalantzis (2015) described the need for multiliteracies, where meaning is made not only through verbal means, but also through images, gestures, sounds, interactions, and more. This call for the development of multiliteracies stems from the media rich (online) environment we operate in today, particularly as more of daily life has moved online. Thus, developing multiliteracies should be a central part of technological knowledge. In this paper, we describe how designing transmedia spaces—a variety of media forms centered on a topic—can support the development of both TPACK and multiliteracies. We illustrate this by exploring one teacher's experiences engaging in transmedia design.

The role of technologies in the production and representation of knowing is not a new concept. This idea was embedded in Mishra and Koehler's (2006) initial presentation of TPACK. Mishra and Koehler explained, "Although technology constrains the kinds of representations possible, newer technologies often afford newer and more varied representations and greater flexibility in navigating across these representations" (p. 1028). One might consider the core of TPACK being the ability to use technologies to represent and communicate to support learning in a content area.

One approach that emphasizes the selection and use of multiple technologies is through the creation of transmedia spaces. Transmedia describes the relationships between various forms of media. For example, the Star Wars movie franchise includes not only movies, but also books, cartoons, action figures, TV series, and even a theme park. The multiple forms of media integrate to create an imaginary universe. Similarly, transmedia approaches can immerse learners in a topic and support rich learning experiences (see, for example, Pasnik & Llorente, 2013).

To create a transmedia space, designers must select and utilize media formats (and related technologies) that best support various perspectives on a concept. For example, understanding the experience of an earthquake may be best expressed through a virtual simulation, illustrating the scientific properties may be better represented through an animation, and describing historical consequences of earthquakes may call for an interactive timeline. Selecting and developing the appropriate media requires not only knowledge of the media types, but also facility with various technologies as well as a deep understanding of content and pedagogy.

In this paper, we describe one teacher's experience in transmedia design. In a reflection of the design experience, Tracey stated, "I enjoyed thinking creatively with transmedia about matter." She reported that designing

a transmedia learning space led to a shift in how she conceptualized teaching science. The deepening of pedagogical content knowledge came from thinking about “how [to] transform matter into these different art forms and these different media.” Next, we explore Tracey’s experience in more depth to better understand how creating transmedia products led to deeper PCK and the connection to TPACK. Tracey’s work, as well as examples of transmedia learning spaces can be found on this [Wakelet \(https://wke.lt/w/s/DurUdi\)](https://wke.lt/w/s/DurUdi).

## Context

Tracey, a fifth grade science teacher, participated in a master’s level instructional media design course centered on creating transmedia learning spaces. Class members were asked to choose a topic of interest and create 7-10 media products on that topic, as well as a web page that brought the products together. Throughout the term, class members created drafts of products for reflection and feedback.

Class members participated in three synchronous video conference sessions. In the first, the instructor met with each student to help them develop their initial project plans. In the second and third, groups of 3-6 students and the instructor reflected on products of each participant. These sessions were modeled after the Critical Response Process (CRP), a creative feedback approach created by choreographer Elizabeth Lerman (*Critical Response Process*, 2017). This process centered on reflection by focusing on meaning and exploring products through questioning. Elements of CRP were also applied to asynchronous discussion boards students used to share and give feedback on their products. The discussion formats were meant to support deep reflection on how various media forms might represent and support learning on the topic.

Tracey’s transmedia products focused on “Matter Mania Friends:” “Mikie Molecule, Wendi Waters, Callie Carbon, and Phillippe’ Foode”. Products included a book (“Photosynthesis Party”) that combined pictures, drawings, and icons; trading cards of each character and facts about the character; an Instagram account of Mikie Molecule; coloring pages; a web page of related resources; a hand-made Mikie doll, and clothing designs. You can explore the Matter Mania Friends universe at <https://1f89osbha5.mobirisesite.com/>.

In the following sections, we alternate perspectives to tell Tracey’s story (in italics) and illustrate the close relationship between transmedia and TPACK. Ultimately, designing a transmedia learning space not only helped Tracey develop TPACK, but it also enriched her pedagogical content knowledge (PCK).

## Creating Matter Mania Friends: PCK → TPACK

In this first section, we describe how Tracey’s PCK influenced how she designed the Matter Mania Friends. First, Tracey describes her creation process. Then we bring in other sources, including data from course activities, to further explore the movement from PCK to TPACK.

*The things we study in fifth grade science are either too small to be seen or too big to comprehend for most adults, let alone fifth graders. We study atoms and molecules, how matter moves through different systems on earth, energy, and space. Thinking about making concrete and tangible media items from this content helped me design media that made the invisible visible and the abstract concrete for my students.*

*I designed Mikie Molecule to be a fun character that students could connect with to help them “see” how atoms and molecules connect to make different forms of matter. I got the idea from an activity in the curriculum. We draw a matter chart that shows how atoms make molecules, molecules combine to make substances, substances combine to make mixtures, and matter is made of mixtures. It’s a simplistic chart, and it conveys what I need it to for students to understand the concept, but having a 3D Mikie Molecule doll, I thought, would make the concept even more meaningful and fun, so I designed and then actually made Mikie. He sits on the fridge in my classroom. The kids love him. I brought him out when we drew our chart this year. Mikie seemed to get the students more engaged in the concept.*

*I love alliteration, probably because I have a background in English education which led me to name my main characters : Mikie Molecules, Wendi Waters, Callie Carbon, and Phillippe’ Foode. Mikie Molecules is made of different types of atoms to make him one molecule. Wendi Waters is a girl since I think of water as being feminine because of the way it moves and its fickle nature. Wendi is made from one oxygen atom and two hydrogen atoms just like real water molecules. Callie Carbon is one atom. She is loud and the life of the party since carbon is in all living things. Callie is a feminine character because women create life and humans are sometimes referred to as carbon-based lifeforms. Phillippe Foode is shaped like a triangle because this shape reminds me of the food and energy pyramid. He has big muscles to remind students that we get energy and strength from the food we eat.*

## Analysis

Reflective discussions, both through video conference and in asynchronous discussion forums, highlight Tracey's thought processes as she created her transmedia space. In Tracey's first video conference, she shared her initial ideas for the project. She started with a clear goal based on her pedagogical content knowledge: she wanted to make science visible, real-world, and fun. She explained that "Sometimes kids are scared of science because you're trying to visualize some very abstract things that you can't see." In Tracey's teaching, she focused on concretizing concepts and helping students connect these concepts to their lived experiences. She had the same goals for her transmedia space.

Even during the initial video conference, Tracey had begun enacting her pedagogical content knowledge (science needs to be made concrete and connect to the real world) in the media she was creating. She created several characters to represent different forms of matter, like molecules, water, and carbon. These characters were carefully formed to reflect characteristics of the matter they represented.

Tracey also considered the type of media products that would enhance student's ability to connect science content to the real world. For example, to show students that matter moves, she considered a travel theme. Mikie Molecule might have an Instagram page to share his travels as he moved through the world. Callie Carbon and Wendi Water could travel together through the water cycle, a story that could be told through a book, video, or travel site. This idea became the story "Photosynthesis Party" which Tracey illustrated by combining her hand-drawn characters with photographs. The mixture of media reflected her desire to bring normally invisible elements into the real world. Tracey was drawing upon PCK to form the products of her transmedia space.

## Expansions: TPACK → PCK

Tracey's reflections on creating her transmedia space illustrate how her PCK influenced the media she produced. She chose forms of representations that would help students visualize matter and connect it to the real world. They would connect matter with movement and travel through Instagrams and stories. Then something unexpected happened: "thinking creatively with transmedia" led to a deepening of PCK. This is how Tracey describes it:

*Through this class project, I developed a more concrete view of my pedagogy (constructivist viewpoint) as I searched for technology and created media that would allow my students to "see" science. Creating this multimedia universe that students could use to explore matter and how it moves through Earth helped me solidify how my science content was connected and not many separate units. I remember sitting at the dining room table, working on some aspect of my project and I had this huge lightbulb moment and I finally saw how I could connect all this content together. I remember the sun was shining in and I was trying to figure out what I could do next, how could I connect what is matter and its properties to ecosystems, the systems of Earth, and patterns we see in the sky because of our perspective from Earth. The connection was my students. They are a part of everything we are studying. They are matter, their actions matter, where they are in life and on Earth matters and determines their perspective. If I could make my students "see" how they are a part of everything we are studying, it would connect them to the content and make it more meaningful.*

*Creating these media pieces somehow helped me see the big picture which was very empowering. I felt like I now had a stronger knowledge of my content and a pedagogy that could make my lessons more meaningful and engaging and I don't know if that would have happened if I would not have gone on this transmedia journey. Breaking down my content into these media pieces helped me "see" the whole.*

Although the course project was designed to support the development of media design skills, Tracey found that making several media products around a single topic led to new ways of thinking about science curriculum. She explained, I "have this one kind of vision now . . . all the concepts are kind of connected" and "it helped me think about ways to get my students to explore [science] deeper." Tracey's experience highlights the close relationship between TPACK and PCK; representing ideas with technologies not only draws upon PCK but also continues to develop PCK.

## Conclusion

This student's reflections show how a transmedia design experience can support the development of TPACK in a creative and powerful way. It illustrates an often unexplored dimension of TPACK, that of utilizing technology for multimodal representation, a practice that is particularly critical today as teachers create new materials for face-to-face, hybrid, and online learning. Although the tools teachers use to represent meaning will change, the need for teachers to connect these tools with content and pedagogy will continue.

## References

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