Chapter 2
How Do We Measure TPACK?
Let Me Count the Ways

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ABSTRACT
In this chapter we reviewed a wide range of approaches to measure Technological Pedagogical Content Knowledge (TPACK). We identified recent empirical studies that utilized TPACK assessments and determined whether they should be included in our analysis using a set of criteria. We then conducted a study-level analysis focusing on empirical studies that met our initial search criteria. In addition, we conducted a measurement-level analysis focusing on individual measures. Based on our measurement-level analysis, we categorized a total of 141 instruments into five types (i.e., self-report measures, open-end questionnaires, performance assessments, interviews, and observations) and investigated how each measure addressed the issues of validity and reliability. We concluded our review by discussing limitations and implications of our study.

INTRODUCTION
I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind.—William Thompson Kelvin

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In this chapter we review a wide range of approaches to measure Technological Pedagogical Content Knowledge (TPACK). In the first section we provide a brief overview of the TPACK framework and discuss the need for the current review. In the second section, we identify recent empirical studies that utilized TPACK assess-
ments. We categorize these approaches into five
types, and investigate how the researchers address
issues of validity and reliability. We end the chapter
with a set of summary conclusions, a discussion
on limitations and implications of our review for
future research on TPACK assessment.

Research on the role and impact of technology in
education has often been criticized for being
a-theoretical in nature, driven more by the pos-
sibilities of the technology than broader or deeper
theoretical constructs and frameworks. Accord-
ingly, the preponderance of work in educational
technology has consisted of case studies and
examples of best practices and implementation
of new tools. Though such case studies can be
informative, the lack of broader theoretical or ex-
planatory conceptual frameworks prevents us from
identifying and developing themes and constructs
that would apply across cases and examples of
practice. Over the past few years there has been
a considerable interest in the Technological Peda-
gogical Content Knowledge (originally TPCK,
now known as TPACK, or Technology, Pedagogy,
and Content Knowledge) Framework for effective
technology integration (American Association of
Colleges for Teacher Education (AACTE), 2008;
Koehler & Mishra (2009); Mishra & Koehler,
2006; Niess, 2007). The TPACK framework
connects technology to curriculum content and
specific pedagogical approaches and describes
how teachers’ understandings of these three
knowledge bases can interact with one another to
produce effective discipline-based teaching with
educational technologies. The TPACK framework
has had a significant impact on both research and
practice in the area of educational technology.

Theoretical frameworks, such as TPACK, play
an important role in guiding observation. Quoting
Chalmers, a philosopher of science, Mishra and
Koehler (2006) write:

… “Precise, clearly formulated theories are a
prerequisite for precise observation statements.”
(p.27) In other words, observation statements
cannot be made without using the language of
some theory and in turn, these theories determine
what is investigated. Thus, frameworks play an
important role by guiding the kinds of questions
we can ask, the nature of evidence that is to be
collected, the methodologies that are appropriate
for collecting this evidence, the strategies available
for analyzing the data and finally interpretations
we make from this analysis. (p.1039)

The TPACK framework functions as a “con-
ceptual lens” through which one views educational
technology by drawing attention to specific aspects
of the phenomena, highlighting relevant issues,
and ignoring irrelevant ones. In this view, the
framework functions as a classification scheme
providing insight into the nature and relations-
ships of the objects (and ideas and actions) under
scrutiny.

Providing a framework, however, is not
enough. Frameworks have to be examined within
the real world, where it becomes critical to de-
velop sensitive instruments and measures that
are both consistent with the theory and measure
what they set out to measure. Since the TPACK
framework was first published in Teacher College
Record (Mishra & Koehler, 2006), researchers
have been developing a wide range of TPACK
instruments to measure whether their TPACK-
based interventions and professional develop-
ments efforts have developed teachers’ TPACK
(Graham et al., 2009; Guzey & Roehrig, 2009).
The move towards measuring TPACK is notable
as a shift from the conceptual to the empirical. As
researchers began to focus on empirically testing
the effect of their TPACK-based treatments, the
issue of how to accurately capture their subjects’
levels of understanding in TPACK became more
important.

Despite the abundance in studies involving
the use of TPACK measures in recent years (Gra-
ham, Cox, & Velasquez, 2009; Jamieson-Proctor
et al., 2007; Mueller, 2010; Robertshaw, 2010;
Schmidt et al., 2009), little effort has been made
to provide a comprehensive account of TPACK
measures in a systematic manner. This situation