Framing Instructional Technology Through the TPACK Framework Model

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Doctorate in Educational Technology Leadership

EDTC 810 – Statistics for Educational Research

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February 10, 2022

Introduction

This literature review is a compilation of five peer-reviewed journal articles centered on the TPACK framework model. This review analyzes methodological and statistical breakdowns that are used to affirm and validate findings and results. A total of five articles were reviewed with a discussion on their "participants, sample size, constructs, their data collection instrument and analytical techniques." For validation and reliability, descriptive statistical data, such as mean, standard deviation, range, were executed. Still, to validate, inferential statistical calculations, tests, such as Cronbach's alpha, t-test, and correlation coefficient, were applied. A discussion of the methodological and statistical content of these articles is argued below.

Methods

The first article is "TPACK Development in Science Teaching: Measuring the TPACK Confidence on In-service Science Teachers." The second article is "Technological and Pedagogical Content Knowledge: The Development and Validation of an Assessment for Preservice Teachers." The third article is "Development of Survey of Technological, Pedagogical, and Content Knowledge (TPACK)." The fourth article is "Differentiation between TPACK level in Junior and Senior Preservice Teacher to Design Science Lesson." The fifth article is "How useful are our Models? Preservice and Practicing Teachers Evaluation of Technology Integration Models." While the first article is a mixed methods research whereas a questionnaire combines close and open-ended questions, the second and third article are simply quantitative. The fourth article uses a mixed methods research that combines a survey and lesson plans. The fifth

article is purely quantitative. Nothing was qualitative with the involvement of interviews, but two mixed and three quantitative research methods.

Participants

In every case, the participants were teachers. There were variations with the topics, the cases, the objectives, and the contents. The first article had its focus on in-service science teachers. However, the second article centered on “all content areas.” In general, the articles were about the TPACK framework model that revolves around the concern of “the technological, pedagogical, and content knowledge” a teacher should have or should devote the self onto. While the first article’s intention was to “measure teachers’ confidence” in the aforementioned constructs, the second article needed to find a means to “assess” where a teacher is in reference to the TPACK knowledge. The second and third article had similar objectives: “means to assess teachers.” The fourth article’s objective was to prepare teachers. However, the fifth article was to evaluate the models that teachers use and are trained into.

Sample size

Sample sizes vary with a meaningful range. The smallest size was fifteen teachers to the greatest size, 324 teachers. The first article dealing with in-service teachers had only fifteen compared to the third article that had 345 participants. The second article and the fifth article had 124 and 129 participants, respectively. The fourth article was the median with 48 participants. Across the board, the participants were males and females. The third article had the greatest percentage of males set at 193, about 56%. The participants of the fourth article were parted between “junior and senior incoming teachers.” To maximize results and

participation, the fifth article designed its sampling as a focused group, the only focused group among the articles.

Variables

By comparison, there are similarities and differences among the variables. The core topic being TPACK, all five of the articles have variables that relate to the TPACK concept. The first article restricts its constructs to the basic four such as "technological pedagogical content knowledge, technological pedagogical knowledge, technological content knowledge, and technological knowledge." However, the second article embraces the entire set such as "technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK)." Instead of variables or constructs, the third article refers to this same list of items as "subscales," but adds and removes nothing from the seven sets. Nevertheless, article four has nine variables added to the list such as "way of thinking, way to develop understanding, sufficient knowledge, and learning experience." Article five is the outlier that has variables that do not relate to the pool. Its variables are "type of technology integration models that are valuable, participants' attitudes toward theory and technology for experienced and new teachers, theoretical values that are important, models that align with values, and the benefit of the visual appeal of a model." Article five is not a documentation on the TPACK framework, but a link to technological models.

Data collection instrument

With a mixture in methodology, there was a mixture in data collection instruments. Article one had a survey questionnaire with Likert scale and open-ended questions. Articles two had a more extensive survey with 75 questions compared to article one that had only thirty-one questions. However, article two was Likert scale close – ended quantitative questions. Article three had a survey, but article four, being quantitative-qual, had teachers' lesson plans added to its survey. Article five was also quantitative with the administration of a survey. In total, there were five surveys, one set of lesson plans, and some open-ended questions.

Data analysis techniques

Data analysis techniques were descriptive, inferential, and theoretical statistical coded constructs. For article one, mean and standard deviation "values," descriptive statistical documentations, were calculated to confirm or to reject the hypotheses on the research. The means and standard deviation formula was calculated for each one of the four variables: "TK, TPK, TCK. And TPACK." These techniques were utilized for triangulation and to remove doubts and negative interrogation on the results. As an inferential statistical technique, to confirm the findings on the measurement of teacher's confidence, Cronbach's alpha was calculated "to determine the internal consistency reliability for the variables" (Graham et al. 2009). Paired-samples t-test was administered to affirm the results "between the pretest and the posttest." "Effect sizes" were calculated to document cases of "significant results" whether "moderate at about .50 or above to large at about .80" (Graham et al. 2009). These measurements were applied to confirm that the foundation for "TPACK begins with technological knowledge (TK)." Followed is TPK, the second strongest link. In addition, article two uses other inferential statistics such as "the Kaiser-Guttman rule to identify and deals with

problematic items that should be dropped to maintain leverage coefficient reliability" (Schmidt et al. 2010). "The Pearson product-moment correlations" were also used. These measurements were actuated to indicate the worthiness of the "survey items and the reliability of the survey" overall. Article three used "the Kaiser-Meyer-Olkin (KMO) and the Bartlett's Test of Sphericity (BTS)." Article four was descriptive with comparative mean values. Article five was descriptive with mean, standard deviation and inferential with not only Cronbach's alpha but with "one-way analysis of variance with dependent and independent variables" to corroborate the research constructs.

Validity and Generalizability

All five of the articles sought to establish validity and generalizability. Two of the articles hired "experts to revise their survey" to "ensure" that the items are properly measuring the "constructs'' and that the surveys and methods are replicable with the promise of the same results. All five of the studies are built on concept-related literature reviews to support the need for the research. Four of the studies use inferential statistics, reasoning, and deductibility through "paired-sample t-tests, effect size measurement, and Cronbach's alpha" to indicate "positive correlations and significance increase in the scores." Survey items in the articles were "weighted" singularly. "One-way analysis tests with dependent and independent variables" were calculated for overall data validation. Participants' selection for survey completion through sampling was also an important factor into the validation of the studies. The studies were designed with "focused sampling'' as a means to make sure that there was validation in the findings (Kimmons at al. 2018).

Conclusion

As shown above, five articles were studied. Their methods were quantitative and mixed methods. Every one of the articles discussed an aspect of the TPACK framework model. The participants were in-service and preservice teachers to ensure that there was validation. Surveys and other qualitative techniques were used to collect data. Except for one article, all the variables were related to the TPACK concept. A variety of descriptive and inferential statistical techniques were used for validity and generalizability.

Reference List

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