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Technology Integration Proficiency Scale - Construction and Validation

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Abstract

This study attempted to examine the validity and reliability of the Technology Integration Proficiency Scale (TIPS) of secondary school teachers. Previous instruments have sought to separately measure teacher technology use, self-efficacy, attitudes, or beliefs. In contrast, the TIPS attempts to measure teacher technology integration, which encompasses technology use in the teaching process,self-efficacy related to technology integration, performance outcome expectations, self- evaluative outcome expectations, social outcome expectations, interest and barriers to technology integration in the teaching-learning process.Item analysis supported the original subscales.The subject experts reviewed the Content Validity. The final questionnaire consisted of 44 items andthe data was collected from 392 secondary school teachers belonging to two different academic streams i.e. science/mathematics (162) and social science/ languages (230). The Cronbach's Alpha for Technology Integration Proficiency of teachers was calculated to be 0.92. Results indicate that the TIPSprovides a reliable and multi-dimensional measure of technology integrationproficiency of the teachers.

Introduction

With the advent of various formats of Information and Communication technology (ICT), the world is shrinking at a rapid pace. Today, ICT serves as a major factor in shaping the new global economy and producing fast changes in the society. There is a widespread acknowledgement that ICT can be used to enhance both learning and teaching in one go. It has great potential to transform the ways in which the teachers teach and the students learn. ICT provides an array of powerful tools that can help in transforming the present isolated, teacher-centred and text-bound classrooms into technology enriched, student-focused and interactive knowledge environments. As a learning tool, ICT gives some good opportunities in terms of the learning efficiency and quality. It provides opportunities for greater flexibility, interactivity and accessibility for engaging teaching and learning at the individual,

group, and societal levels. No doubt, ICT has a unique and unusual place in the classroom as an educational innovation (Rastogi and Malhotra, 2013).

Technology has greatly amplified the value of digital classroom resources of every institution. Typically, the Internet has altered the teaching-learning paradigm and brought challenges to all students, educators and school administrators. With the nearly ubiquitous access to the Internet, the promise of technology to enhance learning is greater than ever. Likewise, revolutionary developments in technology are bringing radical changes in the way learners gain information. Thus, classroom teachers need to provide student enriched learning opportunities and experiences, which replicate the skills of 21st century education (Robles, 2012).

There is a need for designing a comprehensive framework for defining and understanding technology integration proficiency of teachers. Such framework should prescribe essential dimensions of technology integration proficiency with regard to teachers' use of computers in teaching-learning process.

Definitions of Teacher's Technology Integration Proficiency

In order to discuss the issue of teachers' usage and ability in technology integration, three issues need to be clarified. First, technology integration proficiency is different from computer proficiency, with the former including more complicated aspects such as pedagogical considerations. Second, ability and usage are different entities, although they could be influenced by similar factors such as beliefs and attitudes. Third, teachers who have the ability to integrate technology into teaching may not be able to do so in their classes because of barriers such as the lack of functional equipment, appropriate software, students' ability, and school curriculum.

Dockstader (1999) indicated that integrating technology in the classroom is a complex process that includes (a) learning the technology, (b) using technology in the teaching and learning process, and (c) integrating technology to enhance student learning.

Pantasiz (2002) indicated that technology-enabled learning is becoming an integral part of the learning process because the power of technology leverages information to eliminate the one-size fits all approach and customizes content to meet individual needs and learning styles.

Although technology integration is generally understood as the existence of technology in the classrooms, actually the main problem should focus on integrating technology to teaching process, learning experiences, and curriculum. 'Integration' which is a word derived from Latin means completeness and wholeness or including technology in the teaching and learning process by making basic components come together and eliminating artificial differences (Earle, 2002). Technological practice not only enhances students' gain of learning and understanding but it also increases their willingness to learn, which is necessary for learning, promotes collaborative learning and contributes to improvement of problem solving skills (Schacter and Fagnano, 1999).

Technology integration is a multidimensional construct. According to Liu and Velasquez- Bryant (2003), it is made up of four dimensions: (1) planning, (2) designing, (3) implementation, and (4) evaluation.

Studies related to Technology Integration Proficiency

Bostancıoğlu and Handley (2018) developed and validated a questionnaire for evaluating the EFL 'Total PACKage': Technological Pedagogical Content Knowledge (TPACK) for English as a Foreign Language (EFL). It involved creation of an initial item pool based on a review of the literature on Pedagogical Content Knowledge (PCK) and the use of technology in EFL; evaluation of the content validity of the initial items with a panel of 36 international experts in computer-assisted language learning and exploration and validation of the underlying factor structure through the administration of the questionnaire to 542 EFL practitioners and Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). A six-factor solution, comprising PCK, TK, CK, Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPCK), emerged from the EFA and was subsequently confirmed through CFA. The results provided support for approaches to English language teacher education which attempted to integrate TK, PK, and CK, rather than introduce them separately, and which highlighted the ways in which emerging and established technologies could be employed to represent language and provide opportunities for communication that are known to promote language acquisition.

Teo et al. (2018) examined intentions of English teachers in China to use technology in their classroom teaching. Based on the technology acceptance model, eight variables including perceived usefulness (PU), perceived ease of use (PEU), attitude toward use, behavioral intention (BI), computer self-efficacy (CSE), technology complexity (TC), facilitating conditions (FC), and constructivist

teaching beliefs (CTBs) were incorporated to examine relationships among these variables. Data were collected from 183 English teachers at 5 Chinese universities via a self-report questionnaire and analyzed using a structural equation model. Results indicated that the proposed model had a good fit. Three variables – PU, FC, and CTBs were found to be significant predictors of attitude toward use, while PEU and TC were not. Additionally, PU, CSE, and CTBs were significant antecedents for teachers' BIs to use technology. This study contributed to the understanding of technology acceptance theories by contextualizing the current study to Chinese educational context.

Buabeng-Andoh (2019) in his article, Factors that influence teachers' pedagogical use of ICT in secondary schools: A case of Ghana, perceived technology as a vital driving force for contemporary education. The Government of Ghana acknowledges the relevance of Information and Communication Technology (ICT) in education, and it has financed ICT in secondary schools. However, most instructors were unwilling to integrate ICT into their teaching. 376 teachers were randomly selected from 24 public and private schoolsto investigate the factors that influenced secondary school teachers' ICT usage in schools.The results showed that teachers' use of ICT was still confined to basic and traditional activities such as search for information, class presentation etc. Internal and external factors were found to influence teachers' ICT usage. Also, female teachers reported that they used ICT more than their male counterparts.

Hero (2019) studied the impact of technology integration in teaching performance of Social Studies teachers and found that for all the seven indicators of teaching performance measured namely; content knowledge and pedagogy, learning environment, diversity of learners, curriculum and planning, assessment and reporting, community linkages and professional engagement, and personal growth and professional development, Social Studies teachers were described as very satisfactory. Using regression analysis, the results of the study proved that technology integration exerted a significant impact on teaching performance. And among the six dimensions of technology integration, viz.; technology operations and concepts; planning and designing learning environments and experiences; assessment and evaluation; productivity and professional practices; social, ethical, legal, and human issues and planning of teaching according to individual differences and special needs, the best predictor was productivity and professional practices.

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Study

Given the importance of teachers' Technology Integration Proficiencyto the successful infusion of computers into the curriculum, the purpose of the study was therefore to design a comprehensive framework for understanding Technology Integration Proficiency of teachers, and use this framework to study teachers' current Technology Integration Proficiencyin all the related areas.

While the state of educational infrastructure and several other pertinent factors vary drastically across various schools in private, public and state government school systems in different regions of the country. Government Schools in Chandigarh, owing to inherent design, missionand objectives maintain considerable uniformity in its functioning. Hence, from the perspective of the present study, Government Schools' teachers provided an ideal population. The implications of the study could be generalized to design recommendations for formulating policies and strategies at national and international level.

In the present study, the term Technology Integration Proficiency means the ability to align technologies to specific learning goals, choose technologies for various phases of the learning process, and select appropriate technologies to address issues and needs. For the present study Technology Integration Proficiency of teachers, is operationalized in sevenareas namely, Technology use in the teaching process, Self- efficacy related to Technology Integration, Performance Outcome expectation, Self- Evaluative Outcome Expectations, Social Outcome Expectations, Interest, Barriers to Technology Integration in the teaching-learning process.

Method

Sample

Thirty-seven government model schools out of 114 were randomly selected from U.T. Chandigarh, provided they had computer and Internet facility. From these thirty-seven schools, 392 secondary school teachers were selected belonging to two different academic streams i.e. science/mathematics and social science/ languages. The number of secondary school teachers belonging to the science / mathematics were 162 and those of social science/ languages were 230.

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Construction of the Questionnaire

Items for the preliminary draft of the scale were developed after consulting available literature on Technology Integration Proficiency of teachers and experts of various educational institutions.

For the first Try out, the Technology Integration Proficiency scale was administered to 100 secondary and senior secondary school teachers of Chandigarh. On the basis of the value of t-ratio, 11 items were retained and 47 items were deleted, as they did not discriminate even at 0.05 level of confidence.

Items for the second draft of the scale were redrafted after consulting available literature on Technology Integration Proficiency of teachers and experts of various educational institutions.The subject experts assessed the Content Validity and their suggestions were incorporated. The redrafted scale was administered to 50 secondary school teachers of Chandigarh. Then, for each of the 58 items, t-ratio was computed for the higher and the lower groups to find out discriminatory power of each item. On the basis of the value of t-ratio, 44 items were retained and 14 items were deleted. The final draft of the scale comprised of 44 items.The Cronbach's Alpha for Technology Integration Proficiency of teachers, using TIPSwas calculated to be 0.92. Thus, the final 44-items questionnaire consisted of a 5-point scale to measure teachers' current technology integration proficiency regarding Technology use in the teaching process(Items 1-9), Self- efficacy related to Technology Integration (Items 10- 14), Performance Outcome expectations (Items 15-20), Self- Evaluative Outcome Expectations (Items 21-27), Social Outcome Expectations (Items 28-32), Interest (Items 33-39) and Barriers to Technology Integration in the teaching-learning process (Items 40-44), as seen in Table No. 4.1. Elevenitems (i.e., Item Nos. 7,14,20,29,33,34,40,41,42,43,44) were negative items.

Table 1: Distribution of items of Technology Integration Proficiency scalein various domains after calculating t-ratio

Domain	**Item No.**
Technology use in the teaching process.	From 1to 9
Self- efficacy related to Technology Integration	From 10 to 14

Performance Outcome expectations	From 15 to 20
Self- Evaluative Outcome Expectations	From 21 to 27
Social Outcome Expectations	From 28 to 32
Interest	From 33 to 39
Barriers to Technology Integration in the teaching-learning process	From 40 to 44
TOTAL	44

Administration of Questionnaire

After seeking permission from the Director, School Education, Sector -9, U.T., Chandigarh and the Principals of respective schools, the questionnairewas given to each selected teacher in the free periods. The teachers were given a week's time to fill-in the questionnaire as per the instructions provided therein and the filled-in questionnaires were collected from the teachers on the agreed dates.

Scoring

The teachers were asked to indicate the perception of their Technology Integration Proficiency by encircling one number against each of the forty four statements on a five point Likertscale: 1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree and 5= Strongly Agree. The final score of respondents on the scale was sum of their ratings for all of the items.On the contrary for negative items, score of 1 was given for strongly agree, 2 for agree, 3 for uncertain, 4 for disagree 5 for strongly disagree.

Content Validity

The questionnaire was sent for review to a panel of four experts to assess the content and face validity. The panel comprised of three experts from the College of Education and one from a senior secondary school. The panel comprised three content experts in the fields of educationand psychology and one expert in educational assessment. Each expert panelist was handed a copy of the instrument to review and return the instrument in four days. The original instrument was modified according to the feedback received from the experts regarding its size, language difficulty level, order of sections and instruction for the convenience of respondents. After incorporating the experts' review, the revised instrument was taken to experts again for re-examination to fix any issue. The final instrument was piloted to check practicality, language issues and difficulty level of the instrument; it did provide useful information about instructions for the respondents while responding to the pilot questionnaire (Fraenkel, Wallen, & Hyun (2012). The piloted survey tested the responses on SPSS to determine internal consistency of the instrument through Cronbach's Alpha coefficient. The Cronbach's Alpha of the pilot instrument produced an overall reliability of 0.92.

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