

# The Technology Proficiency Self-Assessment Questionnaire (TPSA): Evolution of a Self-Efficacy Measure for Technology Integration

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**Abstract:** The Technology Proficiency Self-Assessment (TPSA) questionnaire has been used for 15 years in the USA and other nations as a self-efficacy measure for proficiencies fundamental to effective technology integration in the classroom learning environment. Internal consistency reliabilities for each of the five-item scales have typically ranged from .73 to .88 for preservice or inservice technology-using teachers. Due to changing technologies used in education, researchers sought to renovate partially obsolete items and extend self-efficacy assessment to new areas, such as social media and mobile learning. Analysis of 2014 data gathered on a new, 34 item version of the TPSA indicates that the four established areas of email, World Wide Web (WWW), integrated applications, and teaching with technology continue to form consistent scales with reliabilities ranging from .81 to .93, while the 14 new items gathered to represent emerging technologies and media separate into two scales, each with internal consistency reliabilities greater than .9. The renovated TPSA is deemed to be worthy of continued use in the teaching with technology context.

**Keywords:** Technology proficiency, self-efficacy, teacher competencies

# 1 Introduction

The Technology Proficiency Self-Assessment (TPSA) questionnaire has been used for 15 years in studies regarding technology integration in the classroom in the USA and other nations (Christensen, Knezek, 2001; Morales, Knezek, Christensen, 2008; Gencturk, Gokcek, Gunes, 2010). The instrument was originally developed by Ropp (1999) to measure teacher confidence (self-efficacy) when using technology for educational purposes. The TPSA, as refined by Christensen, Knezek and Ropp (Knezek, Christensen, Miyashita, Ropp, 2000), measured four types of technology proficiencies: using electronic mail, using the World Wide Web, using technology applications, and teaching with technology. Each area was represented by five items, rated on a scale of 1 = strongly disagree to 5 = strongly agree. These areas were based on the International Society for Technology in Education (ISTE) standards that existed at the time of the instrument's development (ISTE, 1993; ISTE, 2007).

## 2 Discussion

### 2.1 Grounding in Self-efficacy

Self-efficacy is the concept that provides the underlying rationale for the TPSA. Self-efficacy is based on Bandura's (1977, 1986) social development theory, and is sometimes defined as the expression of beliefs of individuals related to their own capacity to perform a certain behavior (Gencturk, Gokcek, Gunes, 2010). As reported by Gencturk, Gokcek, and Gunes (2010), teachers with higher self-efficacy are more ambitious and passionate in their teaching (Tuckman, Sexton, 1990), while Collis (1996) observed that the teacher shapes "... the success or eventual lack of success in any computers-in-education initiative" (p. 22). Henson (2003) found that teacher efficacy is an important component of a classroom teacher's success or failure. The authors of this paper have proposed an operational definition of self-efficacy as *confidence in one's competence*.

### 2.2 Reliability and Validity for 20-Item TPSA

A study using 1999 and 2000 classroom teacher data in the USA state of Texas yielded reliability estimates (Cronbach's Alpha) ranging from  $\alpha = .73$  (Email), to  $\alpha = .87$  (Integrated Applications) (Christensen, Knezek, 2001, p. 37). These reliability estimates fell in the range of "respectable" to "very good", accord-

ing to guidelines provided by DeVellis (1991, p. 85). For the 2004 Texas data set gathered by Morales (2005), subscale reliability estimates ranged from .73 to .88, very close to those reported for previous studies. Cronbach's Alpha for the total 20-item scale was .93 ( $N=877$ ). Gencturk, Gokcek, and Gunes (2010) reported a total scale (20 item) reliability of  $\alpha = .94$  for primary school teachers ( $n = 205$ ) in Turkey, very close to the internal consistency reliability ( $\alpha = .93$ ) reported by Morales (2005) for teachers in the USA and Mexico. The 20 items included in Version 1.0 of the TPSA are listed in Table 1.

### **2.3 Refinement Process**

Beginning in 2012, Christensen and Knezek drafted item revisions aimed at renovating the TPSA while Christensen and Williams (2014) explored extensions of self-efficacy measures into emerging domains such as social media and mobile learning. The new 34-item version of the TPSA was administered to 72 preservice and inservice teachers during 2014 for the primary purposes of verifying the reliability of the revised, original scales, and to explore constructs emerging from the additional 14 items added in the area of emerging technologies and media. Cronbach's alpha for the revised versions of the original four scales were found to be: 1) Email = .85 (Items 1–5); 2) WWW = .87 (Items 6–10); 3) Integrated Applications = .81 (Items 11–15); and Teaching with Technology = .84 (Items 16–20). These fall in the range of “very good” to “excellent” according to guidelines by DeVellis (1991). Items with wordings different from those indicated in Table 1 were: 3. Create a distribution list to send e-mail to several people at once (“Nickname or alias” has been replaced with “distribution list”); 6. Use an Internet search engine (e.g., Google) to find Web pages related to my subject matter interests (“Infoseek or Alta Vista” has been replaced by “Google”); 11. Use a spreadsheet to create a bar graph of the proportions of the different colors of M&Ms in a bag (“Pie chart” had been replaced by “bar graph”); 12. Create a newsletter with graphics (“and text in three columns” has been omitted from the question); and 13. Save documents in formats so that others can read them if they have different word processing programs (e.g., saving Word, RTF, or text) (“Clarisworks” has been omitted). All other items from the original 20 remained unchanged.

Table 1: Technology proficiency self-assessment questionnaire version 1.0

Scales	TPSA Version 1.0 Items
Email	<b>I feel confident I could...</b>
	1. send e-mail to a friend.
	2. subscribe to a discussion list.
	3. create a “nickname” or an “alias” to send e-mail to several people at once.
	4. send a document as an attachment to an e-mail message.
World Wide Web	5. keep copies of outgoing messages that I send to others.
	6. use an Internet search engine (e.g., Infoseek or Alta Vista) to find Web pages related to my subject matter interests.
	7. search for and find the Smithsonian Institution Web site.
	8. create my own World Wide Web home page.
	9. keep track of Web sites I have visited so that I can return to them later. (An example is using bookmarks.)
Integrated Applications	10. find primary sources of information on the Internet that I can use in my teaching.
	11. use a spreadsheet to create a pie chart of the proportions of the different colors of M&Ms in a bag.
	12. create a newsletter with graphics and text in 3 columns.
	13. save documents in formats so that others can read them if they have different word processing programs (eg., saving Word, ClarisWorks, RTF, or text).
	14. use the computer to create a slideshow presentation.
Teaching with Technology	15. create a database of information about important authors in a subject matter field.
	16. write an essay describing how I would use technology in my classroom.
	17. create a lesson or unit that incorporates subject matter software as an integral part.
	18. use technology to collaborate with other interns, teachers, or students who are distant from my classroom.
	19. describe 5 software programs that I would use in my teaching.
	20. write a plan with a budget to buy technology for my classroom.

Factor analysis (principal components, varimax rotation) was applied to the data for the 14 items gathered to represent emerging technologies and media, in order to determine if identifiable constructs emerged from this set. Data from the 72 subjects completing surveys in 2014 were used in this analysis.

Two factors were extracted based on the eigenvalue > 1 criteria, accounting for 69 % of the common variance in the data. The eight items loading most strongly on the first extracted factor are listed in factor loading order in Table 2. These focus on using emerging technologies and media for teacher professional development and instruction. Internal consistency reliability for this scale was found to be  $\alpha = .93$  for this set of data.

Table 2: Teacher Professional Development and Instruction Items ( $\alpha = .93$ , 8 items)

Item	Factor Loading
30. I feel confident that I could download and read e-books.	.91
31. I feel confident that I could download and view streaming movies/video clips.	.88
32. I feel confident that I could send and receive text messages.	.82
29. I feel confident that I could download and listen to podcasts/audio books.	.74
34. I feel confident that I could save and retrieve files in a cloud-based environment.	.72
23. I feel confident that I could create a wiki or blog to have my students collaborate.	.62
24. I feel confident that I could use online tools to teach my students from a distance.	.61
27. I feel confident that I could use mobile devices to connect to others for my professional development.	.61

The six items loading most strongly on the second extracted factor are listed in factor loading order in Table 3. These focus on using emerging technologies and media to promote student learning. Internal consistency reliability for this scale was found to be  $\alpha = .90$  for this set of data.

### 3 Conclusion

Analyses of TPSA data have led the authors to conclude that the original 20-item instrument remains functional and worthy of use on a broad scale after 15 years, while the 14 new emerging technology items included on Version 2.0 of the TPSA address two measurement domains. Additional research with a larger sample is planned to determine if either of the two new constructs identified for

emerging technologies are strongly related to the four constructs represented by the traditional four assessment scales.

Table 3: Emerging Technologies for Student Learning items ( $\alpha = .90$ , 6 items)

Item	Factor Loading
22. I feel confident that I could use social media tools for instruction in the classroom (ex. Facebook, Twitter, etc.).	.83
25. I feel confident that I could teach in a one-to-one environment in which the students have their own device.	.83
21. I feel confident that I could integrate mobile technologies into my curriculum.	.82
26. I feel confident that I could find a way to use a smartphone in my classroom for student responses.	.80
28. I feel confident that I could use mobile devices to have my students access learning activities.	.76
33. I feel confident that I could transfer photos or other data via a smartphone.	.62

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## Biographies



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