Teachers' attitudes play a critical role in the effectiveness of technology. The Technology Attitude Survey (TAS) was developed to assess teachers' attitudes toward the general use of technology as an educational tool in the classroom. Reliability and validity of the TAS were investigated. A small pilot study showed high reliability. Pretest and posttest data were then collected from 86 foreign language teachers participating in a training program on the use of technology to enhance foreign language instruction. A single underlying factor explained item intercorrelations. Reliability for the measure was high. Validity was supported by moderate correlations with the computer competency scale of the Teacher Effectiveness Scales. The TAS appears to be a reliable measure of teachers' attitudes toward technology. The Scale is attached. (Contains two tables and eight references.) (Author/SLD)
TEACHERS' ATTITUDES TOWARD TECHNOLOGY: 
PSYCHOMETRIC EVALUATION OF THE TECHNOLOGY ATTITUDE SURVEY

Terry A. McFarlane  
University of Colorado at Denver

Kathy E. Green and Eleanor R. Hoffman  
University of Denver

Funding for this project funded was provided by the U.S. Department of Education. The grant was entitled "Training Teachers to Strengthen Foreign Language Instruction through Technology," grant number R215D30039. The authors wish to express their appreciation to Jackie Dobrovolny for her helpful comments on earlier drafts of this paper.

Abstract

Teachers' attitudes play a critical role in the effectiveness of technology. The Technology Attitude Survey (TAS) was developed to assess teachers' attitudes toward the general use of technology as an educational tool in the classroom. Reliability and validity of the TAS were investigated. A small pilot study showed high reliability. Pretest and posttest data were then collected from 86 foreign language teachers participating in a training program on the use of technology to enhance foreign language instruction. A single underlying factor explains item intercorrelations. Reliability for the measure was high. Validity was supported by moderate correlations with the computer competency scale of the Teacher Effectiveness Scales (TES). This new scale is a reliable measure of teachers' attitudes toward technology.
Tremendous advances in technology lead today's classrooms to little resemble the classrooms of several decades ago. Technology represents not the singular addition of a computer in the corner of the room but a major shift in the philosophical approach to education as well as the topology of a classroom. Most people involved in education welcome the promise of a better education that technology brings. Students are eager to manipulate the icons and images on a computer screen. Administrators and policy makers are anxious to promote the educational opportunities saturated in the most up-to-date technology that their schools and programs provide. Teachers are swiftly becoming managers of classroom technology. A critical juncture in whether or not technology will successfully enhance the educational process is the attitude of the teacher using the technology. This attitude has remained relatively unexamined.

Although many technological applications in education are computer-based, for example hypermedia, interactive media, adaptive media, and discursive media (Laurillard, 1993), their potential for classroom use projects the idea that technology is much more than groupings of terminals, processors, keyboards, and mice. Their seemingly endless possibilities alone can be intimidating. However, according to Laurillard, education is interactive and therefore, for most technological applications currently available, the teacher is an essential part of the educational process. He or she provides instrumental feedback at several points in the process to ensure that learning is taking place.

Teachers' attitudes toward computers have been assessed on a number of occasions under varying circumstances. Lowther and Sullivan (1994) indicated that teachers' attitudes toward computers and the use of computers vary greatly. A review by Kluever, Lam, Hoffman, Green, and Swearingen (1994) revealed that attitudes toward computers have distinct evaluative and
affective components. The Computer Attitude Scale (CAS) developed by Loyd and Loyd (1985) is useful but limited to teacher attitudes toward computers. Lowther and Sullivan (1994) acknowledge as important teachers' needs, wants, beliefs, and practices, as well as variations in classroom settings in developing technological solutions for them. They designed a survey to assess teacher and educational technologist perceptions toward educational technology. One of the five scales of the survey includes five items on computers and media. Four of the five items elicit strength of agreement responses to statements regarding computer-related instruction and the fifth to media-related instruction, such as film and video. This survey, too, is limited in its application to attitudes of teachers to technology in general.

Davis (1993) developed a Technology Acceptance Model (TAM), which has proved useful in explaining and predicting attitudes toward technology in the business world. His model assumes that one's attitude toward technology comprises two components. The first component is usefulness, which is defined as the degree to which a person believes that using a particular system will enhance job performance. The second component is ease of use, which is defined as the degree to which a person believes using a particular system is free of effort. His model was supported by the results of his study and validated in a separate study by Szajna (1994). As it applies to the educational process, his model does not account for an aspect which may influence teachers' attitudes toward technology. That aspect is whether or not a technological application facilitates learning. His model provides meaningful insights into the components that comprise attitudes toward technology but misses the educational utility dimension as a model of teachers' attitudes toward technology.

The current paper addressed the psychometric quality of the Technology Attitude Scale
(TAS). The TAS was developed to assess teachers' attitudes toward technology in general. The TAS differs from Loyd and Loyd's CAS because it assesses a teacher's attitude toward numerous technologies rather than just computers. The TAS differs from Lowther and Sullivan's scale because it generalizes to all technologies useful in the classroom rather than just computers, film, and video: The TAS differs from Davis' TAM because it includes the educational utility component considered important to teachers' attitudes.

Method

Subjects

This study was accomplished as part of a project entitled Technology Training for Foreign Language Teachers (TTFLT). The purpose of the project was to demonstrate an effective, university-based program to train K-12 foreign language teachers in state-of-the-art technology for foreign language classroom instruction. The study was carried out in two stages. During the first stage the instrument was administered to a small cadre of 17 foreign language instructors before and after their participation in the training program. In the second stage the instrument was administered to 86 foreign language instructors before and after their participation in the training program. Of the 86 instructors, 13 were men (16%) and 73 were women (84%) from 36 schools throughout the greater Denver metropolitan area.

Instruments

The Technology Attitude Scale (TAS) is an instrument developed by program staff as an evaluation measure for the TTFLT project. The TAS consists of 20 items with responses provided on a seven-point Likert scale, ranging from "Not True" to "Very True."

The Teacher Effectiveness Scales (TES) contain a total of 40 items. One scale is a
computer competency scale. It consists of 22 items and addresses the use of computers in the
classroom. Reliability for the computer competency scale is .96 for the current sample. The other
scale is a classroom management scale. It consists of 18 items and addresses general classroom
teacher competencies. Reliability for the classroom management scale is .91. Teachers rate
themselves using a five-point Likert scale as unskilled, inconsistent, competent, highly skilled, or
at the mastery level for each item of each scale. This measure was included to provide an
indication of validity of the TAS.

Procedure

Instructors for the TTFLT project were K-12 foreign language teachers. Seventeen
foreign language resource teachers from Denver were trained in a series of nine monthly
workshops during the first year of the project. Nine of these 17 resource teachers comprised the
initial cadre of instructors who trained almost ninety teachers organized into six geographic
clusters during the second year of the project. To ensure a sufficient number of participants, the
project scope was expanded to include four suburban schools. The second year of the project
followed a similar format to the first although scheduling of the training sessions was more
flexible. Participants attended nine workshops and two full days of instruction at the University of
Denver. Content was "hands-on" training in the use of hardware and software. Teachers were
taught how to use word processing, graphics, database, spreadsheet, and animation software.
They were also taught how to use the following types of hardware: overhead projectors, VCRs,
laserdisc players, and camcorders. Finally, teachers were taught to use technology that combines
hardware and software: barcodes, scanners, networks, modems, printers, CD-ROM drives, LCD
palette units, MINITEL, digital cameras, and telecommunications equipment. Both the initial
cadre and the 86 foreign language resource teachers were given the Technology Attitude Scale and Teacher Effectiveness Scales as pre- and posttest measures as part of program evaluation. These instruments were administered in a group setting prior to the day’s training in September and again in May.

Results

Pilot Group.

During the first year of the TTFLT project, the Technology Attitude Survey (TAS) was administered to a small sample of foreign language teachers before and after they received program training. Cronbach alpha reliabilities for the TAS were .92 and .95, respectively, with no items identified as detracting from scale reliability. Thus, no changes to the scale were made prior to the second year of the project.

Full Study.

Principal components analyses were computed on pretest and posttest data collected from the 86 foreign language teachers who participated in the second year of the project. Results of the pretest data analysis suggest that a single dimension explains item intercorrelations. All but two items had factor loadings of .4 or greater. Analyses were rerun without those two items. The single dimension accounted for 43% of the variance. Reliability was .92. Principal components analysis of the posttest also showed high loadings on a single factor with one of the remaining 18 items falling slightly below .4. The single factor accounted for 32% of the variance. The reliability for the posttest data was .85. Pretest and posttest factor loadings on the unrotated first factor are presented in Table 1 as are the item-total correlations. Score distributions for items tended to be negatively skewed in both the pre- and posttest administrations. The test-
retest reliability for the TAS was .53, p<.001.

Table 1. Unrotated Factor Loadings and Item-Total Correlations

<table>
<thead>
<tr>
<th>Item</th>
<th>Pretest Loading</th>
<th>Pretest Item-Total Correlations</th>
<th>Posttest Loading</th>
<th>Posttest Item-Total Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.58</td>
<td>.60</td>
<td>.65</td>
<td>.45</td>
</tr>
<tr>
<td>2</td>
<td>.81</td>
<td>.81</td>
<td>.71</td>
<td>.61</td>
</tr>
<tr>
<td>3</td>
<td>.72</td>
<td>.70</td>
<td>.74</td>
<td>.68</td>
</tr>
<tr>
<td>4</td>
<td>.58</td>
<td>.56</td>
<td>.65</td>
<td>.37</td>
</tr>
<tr>
<td>5</td>
<td>.56</td>
<td>.56</td>
<td>.68</td>
<td>.21</td>
</tr>
<tr>
<td>6</td>
<td>.81</td>
<td>.77</td>
<td>.75</td>
<td>.50</td>
</tr>
<tr>
<td>7</td>
<td>.67</td>
<td>.53</td>
<td>.68</td>
<td>.47</td>
</tr>
<tr>
<td>8</td>
<td>.64</td>
<td>.42</td>
<td>.68</td>
<td>.51</td>
</tr>
<tr>
<td>9</td>
<td>.59</td>
<td>.65</td>
<td>.65</td>
<td>.49</td>
</tr>
<tr>
<td>10</td>
<td>.77</td>
<td>.65</td>
<td>.55</td>
<td>.40</td>
</tr>
<tr>
<td>11</td>
<td>.74</td>
<td>.71</td>
<td>.63</td>
<td>.61</td>
</tr>
<tr>
<td>12</td>
<td>.64</td>
<td>.63</td>
<td>.38</td>
<td>.35</td>
</tr>
<tr>
<td>13</td>
<td>.78</td>
<td>.59</td>
<td>.52</td>
<td>.47</td>
</tr>
<tr>
<td>14</td>
<td>.60</td>
<td>.36</td>
<td>.71</td>
<td>.46</td>
</tr>
<tr>
<td>17</td>
<td>.53</td>
<td>.53</td>
<td>.44</td>
<td>.42</td>
</tr>
<tr>
<td>18</td>
<td>.64</td>
<td>.62</td>
<td>.73</td>
<td>.60</td>
</tr>
<tr>
<td>19</td>
<td>.84</td>
<td>.78</td>
<td>.71</td>
<td>.51</td>
</tr>
<tr>
<td>20</td>
<td>.59</td>
<td>.51</td>
<td>.57</td>
<td>.49</td>
</tr>
</tbody>
</table>

Eigenvalue 8.05 5.79
% Percent Variance 44.70 32.20
Reliability .92 .85

Support for validity was evidenced by significant correlations among the pre- and posttest TAS scores and the pre- and posttest computer competency scale scores on the Teacher Effectiveness Scales (Table 2). As anticipated, correlations among the pre- and posttest Technology Attitude Survey and the general classroom management scale of the Teacher Effectiveness Scales were not significant at pretest and substantially lower than the correlation with computer competency at posttest. As a further note, TAS scores were correlated with
ratings of whether a teacher's school would provide sufficient funds to maintain interest in
technology, \( r = .36, p < .001 \), and whether teachers' see themselves as a resource for other
teachers, \( r = .33, p < .05 \). No significant differences were found in TAS scores between males
and females or among schools.

<table>
<thead>
<tr>
<th>Table 2. Correlations between TAS and TES pre- and posttest factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology Attitude Survey (TAS)</strong></td>
</tr>
<tr>
<td>Pretest</td>
</tr>
<tr>
<td>Teacher Effectiveness Scales (TES)</td>
</tr>
<tr>
<td>Pretest</td>
</tr>
<tr>
<td>Computer Competency</td>
</tr>
<tr>
<td>Classroom Management</td>
</tr>
<tr>
<td>Posttest</td>
</tr>
<tr>
<td>Computer Competency</td>
</tr>
<tr>
<td>Classroom Management</td>
</tr>
</tbody>
</table>

\*p<.05 **p<.01

Discussion

The results of this study indicate that the Technology Attitude Survey is a reliable measure
of teachers' attitudes toward technology in general. This study also found support for the validity
of the TAS. Moderate correlations were found between the TAS and the computer competency
scale of the Teacher Effectiveness Scales at both pre- and posttest.

The Technology Attitude Survey demonstrates that a single factor underlies the attitudes
measured. This is at variance with Davis's (1993) two-factor Technology Acceptance Model.
The constructs assessed by each measure are not the same. Davis's model seems to measure the
reasons people have a positive or negative attitude toward technology; technology is useful or
not useful and technology is easy or not easy to use. The TAS assesses the positive and negative aspects of one's attitude toward technology.

A limitation of this study was the sample used. The number of participants in the project was small. They were predominantly female foreign language instructors from mostly urban schools in the Denver area. Their willingness to participate may signify a different population than random sampling might yield.

There are few, if any, psychometrically sound measures of teachers' attitudes toward technology in general. Of those existing measures, most focus on the computer or video and film technologies in the classroom. The Technology Attitude Survey shows promise as a measure either to identify training needs or to evaluate formal training. It may also be used as an index of teacher support prior to implementation of a technology change effort.
References


TECHNOLOGY ATTITUDE SCALE

Below is a series of statements. There are not correct answers to these statements. They have been set up in a way which permits you to indicate the extent to which the idea expressed is true or not true of you. Please use the following scale:

1 = Not all true of me.  
7 = Very much true of me.

By technology, we mean computers, CD-ROMs, laserdisc players, databases, etc.

NAME: ____________________________
SCHOOL: __________________________

<table>
<thead>
<tr>
<th>Statement</th>
<th>NOT TRUE</th>
<th>VERY TRUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowing how to use technology is a necessary skill for me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. I like using technology.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. I feel confident with my ability to learn about technology.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. Working with technology makes me nervous.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. I now use my knowledge of technology in many ways as a teacher.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. I like using technology in my work.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. I wish I could use technology more frequently.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. Technology makes me feel stupid.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9. A job using technology would be very interesting.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>10. I don’t expect to use technology much at work.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>11. I’m not the type to do well with technology.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>12. I feel uncomfortable using most technology.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>13. Working with technology is boring.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>14. Learning about technology is a worthwhile and necessary subject for all prospective teachers.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>15. It is important to know how to use technology in order to get a teaching position.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>16. I know that if I work hard to learn about technology, I will do well.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>17. I am able to do as well working with technology as my fellow TTFLT teachers.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>18. I think using technology will be difficult for me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>19. Technology makes me feel uneasy and confused.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>20. Once I start using technology, I will find it hard to stop.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
I. DOCUMENT IDENTIFICATION:

Title: Teachers' attitudes toward technology: Psychometric evaluation of the Technology Attitude Survey

Author(s): Terry A. McFarlane, Kathy E. Green, Eleanor R. Hoffman

Corporate Source: University of Denver

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, Resources in Education (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce the identified document, please CHECK ONE of the following options and sign the release below.

Level 1

Check here

Sample sticker to be affixed to document

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Sample
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Level 2

Sample sticker to be affixed to document

"PERMISSION TO REPRODUCE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY
Sample
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Sign Here, Please

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Signature: Terry A. McFarlane
Printed Name: Terry A. McFarlane
Address: 5960 S. Vivian St.
Littleton CO 80127

Position: doctoral student
Organization: CU-Denver
Telephone Number: (303) 904-4542
Date: Mar 30, 1997
February 21, 1997

Dear AERA Presenter,

Congratulations on being a presenter at AERA\(^1\). The ERIC Clearinghouse on Assessment and Evaluation invites you to contribute to the ERIC database by providing us with a printed copy of your presentation.

Abstracts of papers accepted by ERIC appear in *Resources in Education (RIE)* and are announced to over 5,000 organizations. The inclusion of your work makes it readily available to other researchers, provides a permanent archive, and enhances the quality of *RIE*. Abstracts of your contribution will be accessible through the printed and electronic versions of *RIE*. The paper will be available through the microfiche collections that are housed at libraries around the world and through the ERIC Document Reproduction Service.

We are gathering all the papers from the AERA Conference. We will route your paper to the appropriate clearinghouse. You will be notified if your paper meets ERIC’s criteria for inclusion in *RIE*: contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality. You can track our processing of your paper at http://ericae2.educ.cua.edu.

Please sign the Reproduction Release Form on the back of this letter and include it with two copies of your paper. The Release Form gives ERIC permission to make and distribute copies of your paper. It does not preclude you from publishing your work. You can drop off the copies of your paper and Reproduction Release Form at the ERIC booth (523) or mail to our attention at the address below. Please feel free to copy the form for future or additional submissions.

Mail to: AERA 1997/ERIC Acquisitions  
The Catholic University of America  
O’Boyle Hall, Room 210  
Washington, DC 20064

This year ERIC/AE is making a Searchable Conference Program available on the AERA web page (http://aera.net). Check it out!

Sincerely,

[Signature]

Lawrence M. Rudner, Ph.D.  
Director, ERIC/AE

---

\(^1\)If you are an AERA chair or discussant, please save this form for future use.