ABSTRACT

While training has been a proven and heavily relied upon intervention to impart job-enabling information upon performers, its ability to positively affect job performance has been demonstrated to diminish over time. One intervention that has been adopted by performance technologists to provide ongoing support is an electronic performance support system (EPSS). The present study examined the effect of EPSS and training on user attitudes. Results revealed that participants receiving only EPSS and those receiving training and EPSS had significantly higher attitudes than participants who only received training. Recommendations on how to best combine and implement these performance interventions based on these data are discussed.
THE EFFECT OF PERFORMANCE SUPPORT AND TRAINING
ON PERFORMER ATTITUDES

While training has been a proven and heavily relied upon intervention to impart job-enabling information upon performers (Arthur, Bennett, Edens & Bell 2003; Burke & Day 1986), its ability to positively affect job performance has been demonstrated to diminish over time. According to a study conducted by the Research Institute of America, performers retain only 58 percent of the content delivered by training interventions just 33 minutes after course completion (Snipes 2005). Retention continues to decline from there. After the second day, just 33 percent of the information learned in training is retained. Three weeks later, only 15 percent can be recalled. Rackham (1979) found that 87 percent of the learning acquired from training is lost within 30 days if it is not supported by an additional intervention.

One intervention that has been adopted by performance technologists to provide support is an electronic performance support system (EPSS). EPSS provide users with “individualized on-line access to the full range of…systems to permit job performance” (Gery, 1991, p.21). In other words, performance support systems seek to provide the right information to the right user at the right time.

Past research has examined on the intersection of these two fields. Bastiaens, Nijhof, Stremer, and Abma (1997) explored the effectiveness of different combinations of computer-based and paper-based performance support with computer-based and instructor-led training. The researchers found that participants preferred paper-based forms of performance support over electronic versions as well as instructor-led training over computer-based training. They found no significant difference on test achievement scores, performance, or sales results over a one
year period. Mao and Brown (2005) conducted a study comparing the effect of instructor-led training and performance support on learning how to use Microsoft Access®. The researchers found that users provided with an EPSS performed significantly better on an achievement test than those provided with training. They found no significant difference between the two groups on a procedural task. Nguyen and Klein (2008) examined the effect of training and performance support individually and as combined interventions. They reported that participants who received only EPSS and both training and EPSS together performed significantly better on a procedural task than those who received just training.

These findings provide some evidence to support the widely held belief that, by implementing a performance support intervention, one can reduce or perhaps even eliminate the amount of training that is necessary to address a performance problem (Chase 1998; Desmarais, Leclair, Fiset & Talbi 1997; Foster 1997). However, they do not provide any evidence-based guidelines to assist performance technologists to determine when a particular problem can be safely addressed by just training, EPSS, a combination of EPSS and training, and what proportion of those two interventions may be required.

The following research study sought to address this gap by exploring the following research question: What combination of performance support and training do users prefer? By revealing performers’ attitudes towards these two interventions, the psychological factors that influence the use of such systems to support performance should be revealed.
METHOD

Design and Participants

This research study employed an identical design to the study previously reported by Nguyen & Klein (2008). A posttest-only, control group design was used. Participants were randomly assigned to one of three treatment groups: Training-only, EPSS-only, Training & EPSS. One group received training prior to completing the performance task. Another group had access to an electronic performance support system (EPSS) while completing the task but did not receive any prior training. A third treatment group received both the pre-task training as well as access to the EPSS. The primary dependent measure was user attitudes.

Seventy-eight employees from multiple companies completed the study. Some participants were identified by their direct managers at various companies. Additional volunteers for the study were also solicited from local chapters of the American Society for Training & Development (ASTD) and the International Society for Performance Improvement (ISPI). Participants involved in the study represented a broad array of educational backgrounds: 39 obtained a masters degree, 28 held a bachelor’s degree, six obtained a doctoral degree, three were high school graduates, and two held an associate’s degree. The participants represented a diverse range of job roles: 33 were involved in the education and training industry, 16 identified themselves as software developers or IT professionals, 15 were in human resources, six were involved in manufacturing, three worked in customer service, and five worked in other professions.

Materials
Materials in this study included a tax software application, web-based training course, performance support system, task scenario, post-task attitude survey, and interview questionnaire.

**Tax software application.** A web-based software application based on a corporate tax return form was used by all participants in the study. As part of the process to submit a tax return, companies are required to submit data regarding revenue, profit, costs, and other financial information. While these data are typically recorded on paper-based forms, participants in this study were asked to record data and calculations into an online tax form as illustrated in Figure 1.

In addition to the tax form, a web-based training course was used to teach processes, procedures, and principles that are required as part of the corporate tax preparation task. If the participants were assigned to the Training-only or Training & EPSS groups, then the tax software application required them to complete the web-based training activity before attempting the corporate tax performance task.

The web-based training course included nine introductory screens, forty-nine information screens, twenty-four practice screens, and five concluding screens. In total, the course included 87 screens and took approximately one hour to complete. The course was divided into five modules; each one addressed a specific instructional objective. Each module began with an introductory screen informing the learner of the objective for the module. In addition, this screen referenced a diagram of the corporate tax process which served as an advance organizer for the content (see Figure 2). Each line in the tax form was addressed by one or more instructional screens. Instructional screens included a brief amount of content which includes tax concepts, rules, procedures that must be completed in tax form and examples where relevant. After the
instructional sequence, each module provided scenario-based practice activities with the exception of Module 1 which provided matching and multiple-choice practice activities for factual objectives. All practice activities included appropriate feedback for correct responses or remediation feedback for incorrect responses.

*Insert Figure 2 about here*

*Performance support system.* The tax software application was also equipped with a performance support system for participants in the EPSS-only and Training & EPSS treatments. The EPSS is illustrated in Figure 3. The EPSS used was a context-sensitive help system which was found in previous studies to be an effective method to deliver on-the-job support (Bailey, 2003; Nguyen, Klein, & Sullivan, 2005). The opening screen of the tax software application provided a brief set of instructions demonstrating how to access the support system. Help buttons in the form of a question mark were inserted throughout the tax software application. When participants clicked on the buttons, their request was recorded in a database and a new window opened displaying support information associated with the task.

*Insert Figure 3 about here*

To avoid any effects due to content differences between the training and EPSS, the content used for the EPSS was derived from the training course. Web-based training courses can be developed into modular, reusable learning objects. These learning objects are granular components of a training course such as individual modules, lessons, screens, practice activities, or media elements. These objects can exist independently from the original training course, which then allows them to be accessed as isolated single learning offerings or be combined in different ways to create new training courses. These information objects were linked directly to individual help buttons embedded in the tax software application. By using this approach,
identical components from the web-based training course could be reused for performance support purposes. Since the actual learning objects were identical between the two treatments, any differences due the quality of the content could be eliminated.

Task scenario. The task scenario portrayed a realistic issue that a new employee might face. It included information that a manager might furnish to a new finance employee in preparing federal tax submission for a company. Corporate tax preparation was chosen as the basis of the scenario because of the complexity of the task.

Figure 4 shows an excerpt of the task scenario text. The first section prompted the participant to imagine having recently been hired as a financial analyst for a small manufacturing company. The second portion of the task scenario contained an e-mail that was sent to the participant from the imaginary new manager. In the e-mail, the manager asked the participant to prepare a tax return for the company. To support this task, the e-mail contained detailed financial information including income, expenses, payroll, and other company information. The participant used these data and any training and support information to complete the tax return using the tax software application.

Insert Figure 4 about here

Post-task attitude survey. An eight-item attitude survey was administered after participants complete the task. The survey is shown in Figure 5. The survey was divided into three sections: usefulness of training and support, quantity of learning, and satisfaction with the system.

Insert Figure 5 about here

The first section of the survey examined the usefulness of the training and support content. The first question asked participants how easy it was to find the information they
needed to perform the task. The second question examined whether participants felt training and support content had the appropriate level of detail.

The next section addressed the quantity of learning provided for the task. The third question asked participants if the amount of training provided was sufficient to complete task. The fourth question asked participants if the amount of help during the task was sufficient.

The third set of questions gauged the participants’ satisfaction with the system. The fifth question asked participants if they felt confident completing the task. The sixth question examined whether the participants would like to use software applications such as the one demonstrated in the study in the future and the seventh question asks if they would recommend one for their organization.

The final question prompted participants to rate the amount of time they spent learning how to perform the task as about right, too much or too little. The Cronbach’s alpha reliability coefficient was .81 for the attitude survey.

Post-task interview questionnaire. A 10-item questionnaire was used to interview selected participants one to five days after they completed the research study. The questionnaire is shown in Figure 6. The interview questions were divided into three sections: the first three questions were targeted for participants who completed the study in the training-only and training & EPSS groups, questions 4-6 targeted participants who completed the study in the EPSS-only and training & EPSS treatment groups, and questions 7-10 were common questions for all participants who completed the research study.

Criterion Measures
The primary measure in this study was the users’ attitudes towards the performance support and/or training intervention provided.

User attitudes. The eight-item survey shown in Figure 4 was administered to measure participant attitudes towards the effectiveness of the training and support interventions provided in aiding them to complete the task. For most questions, respondents used a 4-point Likert scale (4 = strongly agree, 1 = strongly disagree) to rate their attitudes regarding the effectiveness of the interventions. On question 8, respondents were asked to rate the amount of time they spent learning how to perform the task. As a result, respondents were provided with only three options: about right, too much, and too little. The internal consistency reliability of this survey was determined using a Cronbach Alpha procedure.

To collect qualitative data regarding user attitudes, seven participants from each of the three treatment groups were selected to participate in post-task interviews. Interview participants were identified using interest data collected using a pre-task demographic survey. In an attempt to ensure that the participants’ comments were recent and relevant, participants were interviewed one to five days after they participated in the study. Study participants were sent hyperlinks to view the web-based training course and/or performance support system based on their treatment group. The researcher collected participant feedback using the post-task interview questionnaire. These data were compiled and used to inform the data from the user attitude survey.

Procedures

Since the participants in the study worked in different companies and were geographically dispersed, various corporate training managers and local chapters of ASTD and ISPI were asked to recruit participants from their respective organizations. An email invitation was sent to study participants. The email instructions directed participants to the location of the
research study on the Internet. Prior to the assignment of treatments, participants completed a demographic survey that was used to screen for prior knowledge of corporate tax preparation. Any individual currently working in a finance-related role, with a finance-related degree, or with tax or accounting certifications was not selected to participate in the study.

If the participant did not have any finance background, the system randomly assigned them into one of three treatment groups (Training-only, EPSS-only, Training & EPSS) and displayed the appropriate intervention. Participants were not aware that they were assigned to a different treatment group or that their system was configured with a different training or EPSS intervention. If the participants were part of the Training-only group, they were first directed to take the web-based training course. If the participants were part of the EPSS-only group, the opening screen of the tax software application was presented providing a brief set of instructions demonstrating how to access the support system. If the participants were part of the Training & EPSS group, they first took the training course and were then provided with the performance support system instructions. Once the participants completed the task and submitted the tax information, they were automatically directed by the system to complete the user attitude survey.

Data Analysis

Multivariate analysis of variance (MANOVA) was conducted on a portion of the data from the attitude survey, followed by univariate ANOVAs where appropriate. A chi-square test was conducted on non-parametric data from the attitude survey. A Cronbach Alpha procedure was conducted on the user attitude data to compute the reliability of the post-task survey.
RESULTS

User Attitudes

Survey data. The primary research question investigated the effect of EPSS and training interventions on the attitudes of participants. An eight-item survey was administered after completion of the tax procedure task. The first seven items included a four-point Likert-type scale for participants to respond to statements about the training and performance support interventions (4=strongly agree, 1=strongly disagree). Data reported in Table 1 reveal that the average overall attitude rating was 3.07 for the training & EPSS group, 2.59 for the EPSS-only group, and 1.91 for the training-only group.

A 3 x 7 MANOVA was conducted on these seven items to test for significant differences. The overall means were significantly different across the three treatment groups, Wilks’ $\Lambda = .18$, $F (18, 134) = 13.14$, $p < .01$. The strength of the relationship between the treatments and user attitude scores was strong, $\eta^2 = .57$.

Follow-up one-way analyses of variance revealed significant differences between treatment groups on all seven of the survey items. Post-hoc tests were conducted on these items. Pairwise comparisons revealed 20 significant differences between groups. On six questions, participants in the EPSS-only group and those in the training & EPSS group had significantly more positive attitudes than participants in the training-only group. In addition, participants in the training & EPSS group had significantly more positive attitudes than those in the EPSS-only group on four questions.
The eighth item on the survey included three choices that measured the participants’ perception towards the amount of time they spent learning how to perform the tax scenario. The response frequency for this item is shown in Table 2. The table reveals that a total of 38 participants (49%) thought that the amount of time they spent learning was about right, 23 participants (29%) thought that they had spent too little time, and 17 (22%) thought that they had spent too much time. Closer examination of the data shows that the majority of participants in both the training & EPSS group (81%) and in the EPSS-only group (65%) thought that the time they spent learning how to do the task was about right. Meanwhile, no participants in the training-only group indicated that the amount of time they spent learning how to perform the task was about right. Sixteen participants in the training-only group (62%) thought that they spent too much time learning while the remaining ten participants (38%) thought that they did not spend enough time. A chi square test revealed that the difference in proportions between the treatment groups was significant, $\chi^2(2, N = 78) = 9.00$, $p < 0.05$.

*Insert Table 2 about here*

*Interview data.* Seven participants from each treatment condition were interviewed to determine their opinions of the program ($n = 21$). User interview responses to the ten questions are summarized and presented in Table 3.

*Insert Table 3 about here*

Participants who received training as part of their treatment were first asked what they liked about the web-based training course. Six of the 14 training participants indicated that they liked the practice activities. Four participants identified the tax process flow diagram used at the beginning of each of unit of instruction as a helpful advanced organizer.
When asked about what they did not like about the web-based course, six participants who received training indicated that they did not like the tax topic used as the basis of course. Five participants complained that the course had too much detailed information.

Training-only and training & EPSS group participants were then asked to explain how they proceeded through the training course. Seven participants indicated that they started out reading the pages of the course thoroughly at first but then skimmed the content as they progressed through the course. Four participants reported that they selected topics that they felt were important and read them thoroughly, while they skimmed less meaningful topics. Three participants admitted that they skimmed through the course without reading the topics thoroughly. In addition, eight participants added that they proceeded through the course in a linear fashion.

Participants who received the EPSS as part of their treatment were asked what they liked about the online help system. Six of the 14 EPSS participants indicated that they liked the fact that support information was available at the point of need. Five participants liked the fact that they did not have to remember the information required to complete the tax preparation task.

When asked about what they did not like about the EPSS, eight participants felt that the online help system did not provide information that was detailed enough to support successful completion of the task. Two participants found the information unclear, and two others complained that they did not like the topic of the tax scenario.

EPSS-only and training & EPSS group participants were then asked to explain how they decided to use the online help system during the task. Eight participants reported that they used the EPSS when they did not know the answer. Five participants indicated that they used the EPSS when they felt they knew the answer but wanted to validate their assumptions.
All 21 interview participants were then asked if they felt that sufficient learning support was provided to help them complete the task. Eight of 14 training participants indicated that they could not remember enough information from the training course to successfully complete the tax preparation scenario. Five of 14 EPSS participants felt that they did not have enough support as the help content did not provide enough detail. Three of 14 EPSS participants found the learning support sufficient. Five participants from all 21 interviewees reported that the topic of taxes was confusing to them.

When asked what motivated them to complete the tax scenario, 15 of 21 interviewees across all treatment groups noted that they wanted to help the lead researcher complete the study. Meanwhile, five indicated that their preference to complete any task that they start.

Participants were asked to identify any issues that they may have experienced while completing the study. While most participants did not identify any problems, five participants mentioned that they have difficulty focusing on the tax scenario due to distractions in their work environment such as email, phone calls, and interruptions from co-workers. Two EPSS participants pointed out that content in one of the help screens in the EPSS disappeared after 30 seconds. In addition, two training participants complained that they attempted to return to the web-based training course for reference while they were completing the tax preparation task and lost all of their data in the process. One participant noted that a popup blocker installed on their computer prevented the online help windows from appearing at first, and the participant corrected the issue.

Finally, participants were asked for recommendations to improve the current research study. Fifteen of the 21 interviewees did not offer any suggestions. Four participants suggested that the research be focused on a topic that would be more meaningful to potential participants.
One participant suggested that the EPSS be changed from an online help system to a wizard that automated the tax preparation task. Another participant noted that research in industry is typically conducted using survey instruments that participants can spend a short amount of time completing. The participant did not realize that they would be asked to complete a task.
DISCUSSION

Several key themes can be interpreted from the results of the attitude survey and participant interviews.

Too much training. It is clear that Training-only participants were generally less satisfied with their treatment than other groups. During follow-up interviews, six participants said they felt overwhelmed by the amount of information or detail provided in the training course. The web-based training course used in this study included 87 navigation, instructional, practice, and transitional screens. Participants spent an average of 38 minutes and 44 seconds reviewing the content in the training course prior to completion of the tax procedure. This volume of information likely contributed to the lower attitudes of the training-only group. One participant noted, “It was very easy to get lost in the explanations.” Because of the overwhelming amount of information, some participants found it difficult to remember the content when they were asked to complete the tax preparation task. “It was difficult for me to fill out all of the information in the form because I could not remember all the details [from the training course].” Another participant complained, “This is one of the problems I have with typical training. Sometimes I miss details that are critical. It’s hard to differentiate what’s important from what I already know.”

A few Training-only participants even asked for some type of support system to provide information during task completion. Typical responses were: “It would have been nice to have some cheat sheet to find the things that I remembered reading, but I didn’t remember what the details were” and “I think the biggest thing [that would have assisted me in this task] would be some type of help during the task because the steps can get rather convoluted.”
One side effect of the overwhelming amount of information provided during training was the participants’ tendency to process the information at a superficial level. Findings revealed that 13 of 21 participants interviewed admitted that they skimmed through portions of or, in a few cases, all of the training course. One participant noted, “I started out reading everything and then towards the end, or for specific sections, I found myself skimming.” Another participant flatly stated, “I didn’t pay attention to the last half of the training course.”

When asked if their course-taking habits in the study were different than what they do in a normal work or training setting, participants felt that their behaviors were typical. “I approached this [training course] the way as I would normally.” Others provided more insight into their online training habits. “In general, I usually go through it fairly quickly. I tend to skim and read things at a high-level.” One participant admitted, “When I take required courses, I sometimes skip to the end to get credit and meet the requirements.” Another participant felt that the amount of content was problematic. “I found myself skimming through some of it just because there was no way I could possibly remember all of the detail.”

The strengths of training. Despite calls from certain authors (Chase 1998; Desmarais et al 1997; Foster 1997) to reduce or eliminate training, participants did identify attributes of their training intervention that seemed to add value. Some participants commented that they liked the tax process flow diagram that was used at the beginning of each of unit of instruction. The process served not only as an advanced organizer for the training course but also as a guide or checklist for the participants as they completed the task. Others indicated that, more than any other aspect of the training course, the practice activities helped to prepare them to perform the tax procedure. Due to the high amount of user control provided by EPSS, it would be difficult to
provide performers with comparable prior knowledge about the process or opportunities to practice the task if a training intervention was not provided.

*Not enough support.* While Training-only participants complained that they received an overwhelming amount of information, eight participants who received EPSS felt that the system did not provide information that was detailed enough to support successful completion of the task. This finding is particularly interesting as the content delivered to participants in both the training and EPSS treatments was identical. This suggests that while the volume of information delivered during pre-task training should be minimized, access to support content during job performance should be much broader.

**Recommendations for Training and Performance Support Interventions**

Based off the findings of this study, several recommendations can be offered to assist performance technologists when implementing training and performance support as performance interventions.

1. *Limit the amount of information delivered during training.* Participants reported feeling overwhelmed by the quantity of content they received and skimmed through the training course as a result. Performance technologists and instructional designers should carefully identify the content to be delivered using a training intervention in the analysis phase. Two potential factors to consider are *frequency* and *criticality*.

*Insert Figure 7 about here*

As shown in Figure 7, tasks and information that are used frequently and are mission critical should be delivered primarily through a training intervention. If such content was not mastered prior to task performance, it is likely that the performer would not be able to complete the task correctly potentially harming themselves, others or even the
organization as a whole. Tasks and information that performers do not routinely work
with and are not critical to the organization would likely to serve as distracters in a
training intervention. As such, they can be safely delivered exclusively through
performance support. Objectives that are either high-frequency/low-criticality or low-
frequency/high-criticality should also be trained, although the level of mastery required
may be variable. Since such tasks may not be performed routinely or the consequences
of error significant, it is also important to provide redundant performance support. By
doing so, performers can refresh what they may have learned during training while on the
job.

2. Provide performers with robust practice during training that incorporates the EPSS.
Practice has been regarded as a powerful instructional method (Merrill & Salisbury 1984,
Vinsonhaler & Bass 1972). Participants in this study confirmed that the practice
provided them an opportunity to prepare for and build confidence towards successfully
completing the task. If possible, performance technologists and instructional designers
should incorporate any performance support systems that will be available to performers
on the job into training practice activities, particularly those activities that may require
the performer to solve realistic problems. This will provide the performers the
opportunity to learn how to use the EPSS in a safe environment and potentially increase
adoption as performers may experience firsthand value of using the system to solve
problems.

3. Make training materials available for performance support. In the current study,
participants became familiar with the support content during the training treatment but
were not able to accurately recall the information that they learned. Those provided with
both training and EPSS could quickly access the information through the performance support system allowing them to refresh or validate what they learned during the training phase. One participant noted, “I could cross-check whatever I was putting in the item, I could feel confident that it was hopefully the right stuff.” Extending this practice to other performance problems could benefit the performer.

4. **Provide access to a broader range of content for performance support.** While performance technologists should strive to minimize training content to objectives high in frequency or criticality, they should at the same time maximize the amount of relevant support content available to performers on the job. As shown in Figure 8, EPSS content can be considered the superset of information required for task performance while training can be a carefully prescribed subset of that body of information (in addition to instructional methods that may not be relevant for performance support such as introductory materials, practice, assessment, etc).

*Insert Figure 8 about here*

It is important to note, however, providing a dearth of performance support information without regard to limiting the scope or providing integrated, intuitive ways to access the information could also negatively affect performance and attitudes. A performance technologist must still be judicious in selecting the appropriate EPSS type and support content to address a particular performance problem.

**Limitations**

Several limitations should be considered when interpreting the results of this study. The task used in this research was tax preparation which is largely a procedure supported by requisite background facts, concepts, and principles. One potential limitation is that these findings may
not extend well to other work contexts. In addition, some participants complained that they did not like the topic of tax preparation which may have negatively impacted their attitudes from the outset.

Another limitation is that the study employed an extrinsic context help EPSS (Gery 1995). This extrinsic performance support system was selected for use in this study based off its demonstrated strength in previous research (Bailey 2003; Nguyen, Klein & Sullivan 2005). If a different type of EPSS was used, such as an external search engine or intrinsic automated wizard, participant attitudes could be affected.

Finally, the training intervention used in this study was a web-based training course that participants completed individually with minimal supervision or control. If another method to deliver training was adopted, such as instructor-led or peer training, participant attitudes could once again be affected.

Future Research

While the results of the current study support the notion that one should strive to rely less on training and more on performance support interventions for content of certain frequency and criticality, this practice could create a new problem of information overload during job performance instead of during training. To mitigate such issues, additional research should focus on how to best present performers EPSS content, techniques to present text-based information, navigation strategies, and the efficacy of rich media such as audio and video for performance support.

The availability of content originally designed for training to be used for performance support also creates instructional design and development challenges. Research on how to best
design materials for reuse across training and EPSS would ensure its effectiveness for both interventions.

Conclusion

While training and performance support may have been initially conceived to be mutually exclusive interventions, the current study provides insight into performers’ attitudes towards both and how they each potentially be combined into an effective solution to address problems before and during job performance.
REFERENCES


FIGURES

Figure 1. Software application.

Figure 2. Web-based training course.

Figure 3. Electronic performance support system.

Figure 4. Task scenario.

Figure 5. Post-task attitude survey.

Figure 6. Interview questionnaire.

Figure 7. Training and performance support matrix.

Figure 8. The relationship between training and performance support content.
FIGURES

**Figure 1.** Software application.

![Image of a software application]

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2005
Figure 2. Web-based training course.
Figure 3. Electronic performance support system.
Get graphic from PIQ

Figure 4. Task scenario.
This brief survey is the last part of the study. It will be used to compare your preferences between different types of learning support.

1. It was easy to find the information I needed to complete the tax scenario.
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

2. The learning support provided was at the appropriate level of detail to aid in completing the tax scenario.
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

3. I received enough training to successfully complete the tax scenario.
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

4. I received enough help to successfully complete the tax scenario.
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

5. I felt confident that I could successfully complete the tax scenario.
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

6. In the future, I would like to use learning support such as the one demonstrated in this study.
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

7. I would recommend the type of learning support used in this study to my organization to help employees perform better.
   - Strongly agree
8. The total amount of time I spent learning how to perform the tax scenario was:
   - Too little
   - About right
   - Too much

*Figure 5.* Post-task attitude survey.
Interview questions for treatment groups receiving Training (Training-only, Training & EPSS)
Procedure: Provide interview participants with a link to the web-based training course, ask them to launch the course, and then ask the following questions.
1. What did you like about the training course?
2. What did you not like about the training course?
3. Explain how you went through the course.

Interview questions for treatment groups receiving EPSS (EPSS-only, Training & EPSS)
Procedure: Provide interview participants with a link to the tax software with EPSS, ask them to launch the application, and then ask the following questions.
4. What did you like about the online help?
5. What did you not like about the online help?
6. Explain how you used the online help.

Interview questions for all treatment groups
7. Did you feel the learning support help you complete the task? Why?
8. What motivated you to complete the task?
9. What kinds of issues did you run into while trying to complete the research study?
10. What would you recommend changing to encourage people to complete a study like this in the future?

Figure 6. Interview questionnaire.
Figure 7. Training and performance support matrix.
Figure 8. The relationship between training and performance support content.
### Table 1

**User attitude scores by treatment**

<table>
<thead>
<tr>
<th>Item</th>
<th>Training-only (n=26)</th>
<th>EPSS-only (n=26)</th>
<th>Training &amp; EPSS (n=26)</th>
<th>Overall Means (n=78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was easy to find the information I needed to complete the tax scenario.</td>
<td>1.73&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.62&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>3.15&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>2.50</td>
</tr>
<tr>
<td>The learning support provided was at the appropriate level of detail to aid in completing the tax scenario.</td>
<td>1.54&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.58&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>3.12&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>2.41</td>
</tr>
<tr>
<td>I received enough training to successfully complete the tax scenario.</td>
<td>2.27&lt;sup&gt;db&lt;/sup&gt;</td>
<td>1.92&lt;sup&gt;dc&lt;/sup&gt;</td>
<td>2.77&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>2.32</td>
</tr>
<tr>
<td>I received enough help to successfully complete the tax scenario.</td>
<td>1.77&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.96&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.44</td>
</tr>
<tr>
<td>I felt confident that I could successfully complete the tax scenario.</td>
<td>2.04&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.54&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.85&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.47</td>
</tr>
<tr>
<td>In the future, I would like to use learning support such as the one demonstrated in this study.</td>
<td>2.23&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.81&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>3.35&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>2.79</td>
</tr>
<tr>
<td>I would recommend the type of learning support used in this study to my organization to help employees perform better.</td>
<td>1.77&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>3.12&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.31&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.73</td>
</tr>
</tbody>
</table>

**Overall Means**

<table>
<thead>
<tr>
<th>Training-only (n=26)</th>
<th>EPSS-only (n=26)</th>
<th>Training &amp; EPSS (n=26)</th>
<th>Overall Means (n=78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.91</td>
<td>2.59</td>
<td>3.07</td>
<td>2.52</td>
</tr>
</tbody>
</table>

**Note:** Items were measured on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree).

<sup>a</sup> Significant difference between Training-only and EPSS-only at \( p < .01 \)

<sup>b</sup> Significant difference between Training-only and Training & EPSS at \( p < .01 \)

<sup>c</sup> Significant difference between EPSS-only and Training & EPSS at \( p < .01 \)

<sup>d</sup> Significant difference between Training-only and EPSS-only at \( p < .05 \)
Table 2

*User attitude frequencies for time spent learning how to complete the task*

<table>
<thead>
<tr>
<th>Rating</th>
<th>Too little</th>
<th>About right</th>
<th>Too much</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training-only</td>
<td>16</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>EPSS-only</td>
<td>4</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Training &amp; EPSS</td>
<td>3</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>38</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>
Table 3

Summary of participant post-task interview responses

<table>
<thead>
<tr>
<th>Item</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview questions for training-only and training &amp; EPSS groups</td>
<td></td>
</tr>
<tr>
<td>1. What did you like about the training course?</td>
<td></td>
</tr>
<tr>
<td>Practice activities</td>
<td>6</td>
</tr>
<tr>
<td>Tax process flow diagram</td>
<td>4</td>
</tr>
<tr>
<td>Navigation</td>
<td>2</td>
</tr>
<tr>
<td>Explanation of navigation</td>
<td>1</td>
</tr>
<tr>
<td>Organization</td>
<td>1</td>
</tr>
<tr>
<td>2. What did you not like about the training course?</td>
<td></td>
</tr>
<tr>
<td>Tax topic</td>
<td>6</td>
</tr>
<tr>
<td>Too much detail</td>
<td>5</td>
</tr>
<tr>
<td>Did not provide a job aid</td>
<td>2</td>
</tr>
<tr>
<td>Could not apply the learning immediately</td>
<td>1</td>
</tr>
<tr>
<td>Too much information</td>
<td>1</td>
</tr>
<tr>
<td>3. Explain how you went through the training course.</td>
<td></td>
</tr>
<tr>
<td>Proceeded through course in a linear fashion</td>
<td>8</td>
</tr>
<tr>
<td>Read each topic thoroughly at first, skimmed towards the end</td>
<td>7</td>
</tr>
<tr>
<td>Read certain topics thoroughly, skimmed other topics</td>
<td>4</td>
</tr>
<tr>
<td>Skimmed all topics</td>
<td>3</td>
</tr>
<tr>
<td>Interview questions for EPSS-only and training &amp; EPSS groups</td>
<td></td>
</tr>
<tr>
<td>4. What did you like about the online help?</td>
<td></td>
</tr>
<tr>
<td>Information available at point of need</td>
<td>6</td>
</tr>
<tr>
<td>Did not have to remember the information</td>
<td>5</td>
</tr>
<tr>
<td>Information chunked</td>
<td>2</td>
</tr>
<tr>
<td>Did not have to learn the information in a training course</td>
<td>1</td>
</tr>
<tr>
<td>5. What did you not like about the online help?</td>
<td></td>
</tr>
<tr>
<td>Information did not provide enough detail to support successful task completion</td>
<td>8</td>
</tr>
<tr>
<td>Information was not clear</td>
<td>2</td>
</tr>
<tr>
<td>Tax topic</td>
<td>2</td>
</tr>
<tr>
<td>Could not use external sources for information (IRS, Google)</td>
<td>1</td>
</tr>
<tr>
<td>Wait time while help content loaded</td>
<td>1</td>
</tr>
<tr>
<td>6. Explain how you used the online help.</td>
<td></td>
</tr>
<tr>
<td>Used when did not know the answer</td>
<td>8</td>
</tr>
<tr>
<td>Used to validate prior knowledge</td>
<td>5</td>
</tr>
<tr>
<td>Used for each line item</td>
<td>1</td>
</tr>
</tbody>
</table>
Interview questions for all participants

7. Did you feel the learning support help you complete the task? Why?
   - No, could not remember information from training 8
   - No, not enough detail in help 5
   - No, tax content was confusing 5
   - Yes, prefer to learn by doing 3

8. What motivated you to complete the task?
   - Want to help lead researcher 15
   - Want to complete any tasks that are started 5
   - Want to figure out the task 1

9. What kinds of issues did you run into while trying to complete the research study?
   - No issues reported 11
   - Distractions in work environment 5
   - Information on certain help screens disappeared after 30 seconds 2
   - Went back to training course and lost data in tax software 2
   - Popup blocker prevented help screens from opening 1

10. What would you recommend changing to improve this study in the future?
    - No suggestions provided 15
    - Select a different topic that is more valuable to participants 4
    - Change online help to an automated wizard 1
    - Conduct survey research 1
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Summary: Frank Nguyen is an Assistant Professor in the Educational Technology program at San Diego State University. He has managed learning and performance strategies for various Fortune companies. He is co-author of Efficiency in Learning (Jossey Bass, 2006) and has written articles on eLearning, instructional design and performance support.