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Post-Training Support for Learning Technology

Sam Snoddy, Jr., Cloudcroft Schools
David G. Novick, University of Texas at El Paso

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Post-Training Support for Learning Technology

Sam Snoddy, Jr.
Cloudcroft Schools
P.O. Box 198
Cloudcroft, NM 88317
+1 (505) 682-3336

ssnoddy@cmsbears.org

David G. Novick
Department of Computer Science
The University of Texas at El Paso
El Paso, TX 79968-0518
+1 915-747-6952

novick@cs.utep.edu

ABSTRACT

To examine the effects of post-training support, we studied the introduction of new gradebook software in a public high school. The school's 108 faculty members received training on the software, and approximately half of the faculty received post-training support for eight weeks. The study measured the faculty's current computer usage, usage of earlier versions of the software, and their perceived skill levels in using the software. The data suggest that the faculty members who received post-training support maintained and raised their skill levels, while unsupported faculty had their skill levels decline.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: Use interfaces – Training, help and documentation, theory and methods.

General Terms

Documentation, Management, Human Factors

Keywords

Training, post-training support, documentation.

1. INTRODUCTION

As the roles of technical communicators broaden, we become increasingly concerned with the overall effectiveness of the use of documentation. Accordingly, this paper examines the effects of post-training support when introducing new computer software into a work setting.

Training, documentation and the application's user interface represent allocations of effort of interaction-support resources. The part allocated to training is substantial. In 2000, for example, organizations in the U.S. spent an estimated \$54 billion on training, and 99 percent of these organizations trained their employees to use computer applications. Not only must organizations commit funds to technology and training, but they must also be able to commit enough time for the prospective users to be trained. And given the trend toward minimal documentation,

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along with most users' antipathy toward using documentation at all, support for users in the form of training is becoming all the more important.

The education sector, in particular, faces numerous obstacles to the integration of technology in the workplace. Three key obstacles are lack of release time for educators to train, inadequate or inferior training, and the lack of technical, curricular and administrative support. While post-training support is considered a necessary step in the training process, little research has been conducted to assess its contribution to the training outcome. Post-training support is defined here as the follow-up activities that aid trainees in the retention of skills or the knowledge gained from their initial training with, for example, a new computer application.

In this paper, we review prior research in post-training support, report the results of a empirical, on-site study, and discuss the implications of our results.

2. RELATED WORK

The life cycle of training has three distinct phases: initiation, formal training, and post-training [10, 5]. The initiation phase is described as identifying training needs, developing training methods, designing the training environment, selecting the trainees, grouping the trainees, and training the trainers. The formal training phase is where the actual training occurs. The last phase, post-training, is where the training evaluation occurs, skill transfer measured, and post-training support is provided for the trainees. If the goal of training is the retention of new skills and knowledge, and the increased usage of the technology, then the value of each phase of technology training should be weighed against its overall contribution to the outcome of the training process.

Most post-training research has focused on evaluation and immediate results from the training [5]. However, learning does not stop after the formal training has ended. Some studies indicated that approximately 50 percent of the trainees did not use the software or retain the skills after eight weeks [10, 11, 15]. Initial training strategies may have been successful, but if the users do not remember or use the skills afterwards, the value of the training comes into question. Post-training support might be an effective way to help users with issues after the initial training. Several of the studies (e.g. 10, 13, 12] have indicated that a needed line of research is to examine post-training strategies and support mechanisms and how they might affect long term usage.

While the post training phase have been typically used to measure the skill levels or knowledge transfer after the training [5, 9], if organizations believe that training is a long-term investment in the productivity of its workers, then support mechanisms need to be in place to support the momentum and growth of learning [7]. Once training is completed, users enter the next phase and should begin using the new technology. There are several problems that, however, may contribute to the lack of use. Once the novelty of the system wears off, motivation levels can drop and use of the system can decline quickly [6]. If an organization does not commit enough resources to support the training and the integration of the new system, the system may not be perceived as a high [8].

A successful technology integration plan must include post-training support because it has been suggested that follow-up support can maintain the initial momentum of the training until long-term habits are established [7]. Otherwise, if timely error recovery is not provided, frustration levels may increase and early rejection may result [6]. In particular, post-training support has been identified as a step in the retraining of educators [17].

The studies reviewed have typically measured skill levels immediately after the training and some have measured usage levels weeks after the training [10, 11, 15]. While usage of the new technology is an important fact, the amount of use does not necessarily relate to the quality or depth of use. Just because a person sits in front of a computer for a longer period of time does not necessarily mean they are accomplishing more than a person who uses the computer for less time. It could just mean that they required more time to complete a series of tasks. Ideally, a successful training would mean that a user would be more efficient and spend less time on the computer to accomplish tasks. A more descriptive approach might be to measure an individual's skill levels over the post-training period.

Assuming that trainees leave the training with the knowledge and skills necessary to use the new technology, the question then becomes "What factors can contribute to them maintaining those skills and continue using the system?" While many of the studies [e.g. 10, 13, 12] found that post training support is necessary, little research has been conducted to verify that post-training support can encourage trainees to maintain or increase their skill levels after training or promote more use of a system.

3. HYPOTHESES

As discussed in the previous section, our research goal is to determine the factors that contribute to users maintaining their newly learned skills and continuing to use the system. From this question, we developed five hypotheses based on the assumption that post-training support will affect the skill levels of trainees and the usage of the system well after the conclusion of the formal training.

3.1 No Post-training Support and Perceived Skill Loss

Previous studies [10, 11, 15] have measured post-training usage levels and have shown a decline in usage levels after the

training. Based on the assumption that no use of a new technology would lead to skill loss, we hypothesized that:

H1: Trainees who do not receive post-training support will decrease in their perceived skill level.

We expected that trainees without support will have a decrease in program usage, and therefore a loss of skill level. Since this is a work setting, the trainees believed their job evaluations would reflect their usage of the program. Also, the software also offers many useful features that when used correctly should also encourage use. Therefore, the degree of non-use is expected to be less than the 50 percent seen in previous studies.

3.2 Post-training Support and Perceived Skill Maintenance

Based on the assumption that skill level is dependent upon use of a system, we hypothesized that:

H2: Trainees who receive post-training support will maintain or increase their perceived skill level.

With post-training support provided for eight weeks after the initial training, it is expected that the trainees will at least maintain their perceived skill levels. Because they know that help is readily available, they should be more willing to experiment or even push the limits of their knowledge and thereby practice with all the features of the system taught in the training. If an error occurs, they know that help is available. With a weekly reminder, participants might be motivated, in a non-threatening way, to keep using the software.

3.3 Post-training Support: Study group versus Control Group

Based on the assumption that post-training support is a significant factor in the training process, we hypothesized that:

H3: Trainees who receive post-training support will have a higher level of perceived skill retention than trainees who do not receive post-training support.

If the training and the post-training support are effective, it is expected that there will a significant difference between the study group and the control group. With support provided, the study group should be able to work past problems that may have normally stalled their progress in using the software. Because the members of the study group know that support is readily available, they may be more likely to try out new features of the software and practice all of the skills learned during the training. With the control group, it is expected that without regular support or tutoring, they will be less likely to use the program for fear of making mistakes or encountering errors from which they cannot recover. Without immediate support, it is expected that they will be less willing to take chances and learn new skills or push the limits of their knowledge.

3.4 Control Group and Decreased Usage

Previous studies [10, 11, 15] reported a significant decrease in computer usage after training, and it has been shown that successful training does not ensure later use of the system [13]. While this study is being conducted in a work setting,

the participants are being allowed a two month practice period before mandatory use. We therefore hypothesized that:

H₄: Trainees who do not receive post-training support will decrease in their use of the software.

Evaluation of work performance can encourage some trainees to use the software, but since post-training support is not immediately available it is expected that some of the users will attempt to reject the new system. Without immediate support or weekly reinforcement, a decline in usage is expected.

3.5 Study Group and Increased Usage

One of the goals of post-training support is to sustain the amount of usage once training is completed. If the availability of post-training support can lower frustration levels, help with speedier error recovery, and encourage further use, then we hypothesized that:

H₅: Trainees who receive post-training support will maintain or increase their use of the software.

It is expected that the trainees with support will attempt to keep using the software. With the knowledge that help is immediately available, they should be more willing to attempt more tasks and utilize a wider range of skills taught during the training.

4. METHOD

Some of the previous studies [13, 1] indicated that research in this area should be conducted in a work environment because the findings should be more applicable; one of the goals of technology-training research is for the application of the successful training techniques in a work environment. Training in a simulated environment can test certain aspects of training, but the findings are only from controlled conditions. So to test our hypotheses, we conducted an empirical study at Irvin High School in El Paso, Texas. Irvin, which is one of eleven high schools in the El Paso Independent School District, has a student population of approximately 1900 and a faculty of 126 teachers. There are approximately 500 multimedia computers on campus, giving Irvin a 4:1 ratio of students to computers, which is more than double the state average of 9:1 [16].

Within Irvin, over 90 percent of the classrooms have a multimedia computer with Internet access. There are a total of 12 computer labs, or classrooms, with 25 to 30 computers in each. One of the computer labs is available to students at most times during the day. For the 2001-2002 school year, Irvin dedicated 15 hours of technology training for every teacher, which translates to almost 1900 person-hours committed to learning to use new technologies.

For the purpose of this research, we studied the effect of training for a software system adopted by Irvin High School to be used by the teachers. An eight-week post-training support period was chosen since several of the studies (Olfman & Bostrom, 1988; Olfman et al., 1989; Shayo et al., 1996) have noticed a marked drop-off in skill retention and technology use two months after the training.

4.1 Subjects

The El Paso Independent School District mandated the use of a district purchased gradebook application. All schools within the district were instructed to begin using the software in the 2001-

2002 school year. Irvin High School wanted to provide training on use of the software for all teachers within the school. Before this mandate, teachers used handwritten gradebooks, computer spreadsheets, other computer gradebook programs, and previous versions of the gradebook software. The teachers' computer experience ranged from complete novice to expert. All participants included in the study had a computer in their classroom and the gradebook software installed on it one month prior to the training. The faculty were informed that mandatory use of the software was to begin in the next semester. The training was to take place two months prior to mandatory use. All Irvin teachers were required to participate in the training. Of these 126 teachers, 108 teachers actually participated.

4.2 Materials

There were several materials used in this training. The software, computers, training manuals, and skill assessment survey all needed to be prepared prior to the training.

The goal of using this software was to increase the teachers' productivity. Correct use of the InteGrade Pro 8.0 software would allow teachers to perform many bookkeeping tasks with much greater speed and accuracy. Some of the features allow for regular class roster updates from the administrative computers, immediate student averages, detailed progress reports for the parents via paper or e-mail, and easy calculation of semester grades and attendance summaries. The software company provided no training on the system other than a built-in tutorial and an Internet newsgroup site dedicated to supporting users.

The skill-assessment questionnaire consisted of three parts: current computer usage, experience with previous versions of InteGrade Pro software, and perceived competency on the skills covered in the training. Each of the sections was constructed as a Likert-type survey and loosely based on self-efficacy tests used in previous studies [3, 15, 14]. Specifically, the participants rated how well they believed they could perform a specific set of tasks. The scores from each section were then derived from the sum of the participant's answers within a section. The computer usage items were selected from the list of technology skills expected from new teachers. The participants were asked to record the frequency of using the basic components of the software system. The skill survey section measured 26 basic skills taught in the training.

As recommended by Bohlen and Ferratt [3], the training was conducted in a computer lab on campus. There were enough computers for every participant to use. The trainer used an In-Focus projector to enable the participants to follow along with the demonstrations.

The manual supplied with the software was a computer database with a limited question-asking interface. When printed, the manual is 191 pages long. From the pre-assessment interviews, it was determined that most teachers were unwilling or unable to use the on-line interface. Only one teacher in the training requested the full printed version. Previous manuals put out by other schools were 37 to 90 pages long. Following the recommendations from other studies [4, 2], the trainer designed an eight-page manual. The manual was designed so that related skills would fit on a single page with step-by-step instructions and screen shots. The screen shots were heavily relied upon so that the

trainees would have visual clues to determine if they were proceeding correctly.

4.3 Procedures

The prime consideration in this training was that all the teachers complete the training with the minimum skills necessary to use the gradebook software successfully. This was a work environment, and the teachers' work evaluations depended partially upon their participation and use of this software.

4.3.1 Initiation Phase

The goals of the initiation phase were to assess the needs of the intended trainees and to determine what equipment, materials, time, and money are necessary to conduct the training.

The training pre-assessment was developed through personal interviews with the teachers and discussions with the principal about his expectations. The trainer interviewed a third of the faculty, approximately 40 teachers. The final goals of the training were determined by the principal, the district mandated use of the software, and the current technology expertise of the faculty. From these interviews, the training materials were prepared. A minimal manual was constructed that covered all topics to be presented in the initial training. Every participant had a computer and a working version of the software installed in their room prior to the training. The participants were given one month to look at the program, experiment, and attempt to use it prior to the training. This was primarily to allow the faculty to gain familiarity with the program before the training and mandated use.

3.4.2 Formal Training

Because of time constraints, the initial training was limited to a single session of three hours. The faculty were trained in six subgroups of contained 15 to 25 teachers, for a total of 108 teachers. Groups were loosely based on their location within the campus with the goal of limiting group interaction during the post-training support period. However, due to schedule conflicts, many of the placements into sessions were determined by the teachers' availability to attend a training session. The actual placement of the teachers was determined by the principal's secretary, who arranged for substitutes to cover the teachers' absences and notified the teachers when to attend. The six training sessions spanned three days with two sessions per day. One session was conducted each morning for three hours and another session each afternoon for three hours. All the training was conducted in the same computer lab for all six groups. Every trainee had his or her own computer to practice with during the training. The teachers were provided with all the materials necessary for the training: their class roster, example gradebooks, blank disks, and a minimal manual.

The initial training on the software covered the basic skills necessary to begin importing class rosters, creating grade spreadsheets, entering assignments and grades, calculating averages, and print basic reports. Following the recommendations of Wiedenbeck et al. [19], exercises were used to illustrate important features of the software. The training participants were asked to follow along with the practice exercises covered by the trainer using the projector.

4.3.2 Post-training

Upon completion of the training, all participants were given a skill-assessment survey. The participants ranked their previous computer usage, their prior use of the gradebook software, and their perceived competency with the skills covered in the training. The subjects were told that the survey would not be released to their supervisors and that the specific information on each survey would be confidential. The only information that would be published would be the statistics generated from all of the surveys.

Out of the 108 participants, 104 completed the first survey. Three of the training sessions were placed into the control group and three sessions were placed into the study group. Because four more trainings were to be given during the school year, the training groups were used instead of randomly dividing the participants into the study and control groups. It might have been necessary to conduct more training sessions during the eight-week post-training period. With the groups intact, it would be possible to modify the trainings for the study and control groups. However, this later proved unnecessary as the next training during the post-training period did not cover the gradebook software.

During the eight-week post-training period, the trainer visited study group members for private instruction or to answer specific questions. Every week, the trainer would visit some members of the study group and ask the trainees if they had any follow-up questions. Participants were given the opportunity to discuss concerns and to ask for specific help or advice. When appropriate, the trainer would suggest additional features of the software to encourage exploration of the program. A record of the visits each week was kept so that the trainer could make sure the study group participants were visited on a regular basis (Table 1). Because of participant schedule conflicts with the trainer or limited availability, the trainer was not able to visit all study group members during the post-training period. All participants who were visited two or more times during the eight-week post-training period were included in the final study results.

Number of Visits	2	3	4	5
Members of Study Group	10	8	2	1

Table 1. Trainer Post-training Visits with Study Group

With the control group, the only help that was offered was reference to the manual or reference to the software Web site. The exception to this was if an emergency arose. Since this was a work environment, every attempt was made to ensure that both the control groups' and the study groups' emergencies were handled promptly. A serious error could represent the loss of hours of work and hundreds of students' grades.

Eight weeks after the training, all participants were given the same skills assessment survey, which marked the end of the study.

5. RESULTS

Out of the 104 participants who completed the first survey, only 52 successfully completed the second survey. The higher return rate in the first survey is due to the fact that the participants were asked to complete the first survey before leaving the training. In the second survey, participants were asked to complete the survey on their own time and return it to the trainer. Out of the 52 valid

surveys returned, 31 belonged to the control group and 21 belonged to the study group.

Group selection was primarily determined by teacher availability. Initially an attempt was made to group participants by location on campus to limit interaction between study and control group. Study and control group similarity was determined by comparing three separate scores determined from the self-assessment survey. Comparison between the study group and the control group showed no significant differences with respect to current computer usage, experience with earlier versions of the program, or their perceived skill level at the completion of the initial training.

5.1 No Post-training Support and Perceived Skill Loss

Our first hypothesis that without practice or use of the system, perceived skill levels would decline. A paired t-test on the control group's first skill assessment survey and the eight-week skill assessment survey showed that the difference between the means was significant and that Hypothesis 1 is supported by the data. The paired t-test compared the 27 skill item responses between the two sets of surveys.

	First post-test	Eight-week post-test	Control Group (One-tailed)
Mean	2.612	2.492	t Critical = 2.485
Variance	0.077	0.032	t = 4.114

Table 2. Results of H₁. Averages of 26 items; 1=novice; 5=expert. Significance set at the $\alpha=0.01$ level with df = 25, $p<0.01$.

5.2 Post-training Support and Perceived Skill Maintenance

Our second hypothesis was that participants who knew that post-training support was available would be more likely to use more of the software. A paired t-test on the study group's first skill assessment survey and the eight-week skill assessment survey indicated that the difference between the means was significant and that H₂ is supported by the data. The paired t-test compared the 27 skill item responses between the two sets of surveys.

	First post-test	Eight-week post-test	Study Group (One-tailed)
Mean	3.070	3.251	t Critical = 2.485
Variance	0.0893	0.110	t = 3.739

Table 3. Results of H₂. Averages of 26 items; 1=novice; 5=expert. Significance set at the $\alpha=0.01$ level with df = 25, $p<0.01$.

5.3 Post-training Support: Study group versus Control Group

Our third hypothesis was that post-training support would lead to a significant difference in the outcome of the training process. After the completion of the second skill assessment survey, a paired t-test between the control group and the study group indicated that the difference between the means was significant and that Hypothesis 3 is supported by the data.

	Control Group	Study Group	Study vs. Control (One-tailed)
Mean	64.806	84.524	t Critical = 1.676
Variance	1220.028	629.562	t = 2.321

Table 4. Results of H₃. Sum of 26 items; 1=novice; 5=expert. Significance set at the $\alpha=0.05$ level with df = 50, $p<0.05$.

5.4 Control Group and Decreased Usage

Our fourth hypothesis was that there would be a significant decline in technology usage after the training. From the first post-tests and the eight-week post-tests of the control group, a paired t-test on the amount of computer usage showed that the difference between the means was not significant and therefore H₄ is not supported by the data. It should be noted that prior to the training 12 of 31 participants, 39 percent, tried using the software. After the post-training period of eight weeks, 16 of 31 participants, 52 percent, were using the software.

	First post-test	Eight week post-test	Control Group (One-tailed)
Mean	2.177	2.5	t Critical = 2.82
Variance	0.205	0.364	t = -6.202

Table 5. Results of H₄. Averages of 10 items; 1=never; 7=several times a day. Significance set at the $\alpha=0.01$ level with df = 9, $p>0.01$.

5.5 Study Group and Increased Usage

Our fifth hypothesis was that post-training support would encourage more use of the software after the training. From the first post-tests and the eight-week post-tests of the study group, a paired t-test on the amount of computer usage showed that the difference between the means was significant and therefore Hypothesis 5 is supported by the data. It should be noted that prior to the training 8 of 21 participants, 38 percent, tried using the software. After the post-training period of eight weeks, 18 of 21 participants, 86 percent, were using the software.

	First post-test	Eight week post-test	Study Group (One-tailed)
Mean	2.657	3.133	t Critical = 2.82
Variance	0.759	1.533	t = 3.034

Table 6. Results of H₅. Averages of 10 items; 1=never; 7=several times a day. Significance set at the $\alpha=0.01$ level with df = 9, $p<0.01$.

5.6 Additional Analysis

A regression analysis was performed on the control group's previous program usage and post-training perceived skill level and on the study group's previous program usage and post-training perceived skill level. Both groups' regressions show a positive correlation between previous program usage and skill level. However, there is a stronger correlation with the control group's regression, which seems to indicate that the control groups skill level was more dependent upon their previous use of the program.

	Control Group	Study Group
R Square	0.471	0.350
Adjusted R Square	0.453	0.316
Standard Error	25.842	20.754
Observations	31	21

Table 7. Regression Analysis. 26 items; 1=novice; 5=expert.

4.5 Summary

The data from the study showed a significant gain in perceived skill with the post-training support group while the control group with out post-training support showed a significant amount of perceived skill loss. The difference between the study and control groups' perceived skill levels was also significant, thus suggesting that post-training support was a factor in perceived skill retention and the lack of post-training support was a factor in perceived skill loss. From the comparisons of post-training computer usage, levels of use in both the control and study groups did not decline. While the data on the control group's usage did show a slight increase in use, the change was not significantly different. The results from the study group's usage did show a significant increase in use. It should be noted that prior to the training 38 percent of the study group tried using the software. After the post-training period of eight weeks, 86 percent of the study group were using the software. With the control group, prior to the training, 39 percent of the participants tried using the software and after the post-training period 52 percent of the participants were using the software. We note, though, that all of these results are based on the post-training survey, which was completed by only about half of the study's participants. There is a possible self-selection bias among the completers of the survey. At the same time, the significance of the results with relatively low N suggests that, for these participants, the effects are robust.

6. DISCUSSION

The results of this study show higher level of skill retention and usage levels than found in earlier studies. This could partially be due to the fact that this study was conducted in a work setting and that the participants' evaluations would reflect their participation. Shayo et al. [15] indicated that usage was linked to evaluation, which seems to be reflected here.

Both groups showed slight increases in the level of program usage, however neither was statistically significant. What is significant is that no decline in usage was evident, only a decline in perceived skill levels. It was expected that the control group's usage would decline. The lack of decline could be related to the belief of the trainees that their performance evaluations would be linked to use of the program.

An interesting observation is that the regression analysis indicated that the control group's skill level is more strongly correlated with the previous program usage than with the study group's skill level and program usage. The data would seem to indicate that the control group relied more heavily upon their prior experience to sustain their skills.

One of the difficulties in this study was the isolation of the control and study groups. Groups were loosely chosen by geographic location on the campus or by department in an effort to keep groups from interacting. For a true randomization, the participants in the control and study groups should have been randomly

selected from all of the sessions. Initially, this study was designed to be conducted on two separate campuses to completely isolate groups, but this approach was deemed to be infeasible.

This research was conducted to develop a better understanding of the role post-training support plays in the retention of newly acquired technology skills. The primary question was, "Does post-training support contribute to the retention of skills?" From the data, the group who received post-training support definitely perceived their skills higher than those who did not receive the support. The findings also seem to indicate that further learning did occur in the support group while skill levels in the control group seemed to decline.

Although the post-training support seemed to make a difference between the study and control groups, the reasons for this difference are not known. One possibility is arises from social information processing theory [20, which suggests that significant individuals within social groups can influence attitudes and behaviors. Regular interactions with significant individuals might lead to a change in system use. Also, participants in the study group may have tried harder because they knew that someone was available to answer questions or remedy problems if they arose and thereby reduce their frustration levels. Reminding the trainees on a weekly basis to use the software in a non-threatening manner may have encouraged them to use the software more.

5.1 Limitations

The external validity threats of interaction of selection and treatment were minimal. Any significant level of interaction should have only weakened the statistical differences between the two groups. The validity threat of experimenter expectancies could not be ruled out. However, a good trainer would attempt to motivate his or her audience, and this threat should be minimal. Since some of the trainees had previous training on similar software, the external validity threat of the interaction of history and treatment could not be ruled out.

5.2 Implications for Future Work

Only skills that were taught in the training session were measured. Some of the trainees developed new skills outside of the training. These skills were not measured, but it would be interesting to find out if their new skill development was significant.

Other post-training support studies might look at what amount of time spent by a trainer makes a substantial impact of the long-term training outcomes. This would be a useful statistic to compute support needs for a given population. Knowing a group's size might allow you to calculate the amount of support needed for that population. This line of research would be very challenging because the differing complexity of applications might also modify the depth of support required.

While prior research [10] found that actual testing of the subjects would be more ideal than just using self-assessments, actual testing of subjects in a work setting is not always practical without interfering with the work. It might be an interesting line of research to develop transparent testing software that could track a primary software's usage and possible errors committed by users. By transparent, we mean a program that runs concurrently with a primary program and can monitor the usage without noticeable interference by the user.

This would allow trainers to accumulate more valid statistics without creating a greater burden upon the trainees.

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