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# STEP—A System for Teaching Experimental Psychology using E-Prime

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Students in psychology need to learn to design and analyze their own experiments. However, software that allows students to build experiments on their own has been limited in a variety of ways. The shipping of the first full release of the E-Prime system later this year will open up a new opportunity for addressing this problem. Because E-Prime promises to become the standard for building experiments in psychology, it is now possible to construct a Web-based resource that uses E-Prime as the delivery engine for a wide variety of instructional materials. This new system, funded by the National Science Foundation, is called STEP (System for the Teaching of Experimental Psychology). The goal of the STEP Project is to provide instructional materials that will facilitate the use of E-Prime in various learning contexts. We are now compiling a large set of classic experiments implemented in E-Prime and available over the Internet from http://step.psy.cmu.edu. The Web site also distributes instructional materials for building courses in experimental psychology based on E-Prime.

The teaching of Experimental Psychology is at a crossroads. In order to learn what it means to conduct empirical research in psychology, students need to be able to design and analyze their own experiments. However, despite a massive investment in personal computer technology on the university level, the tools that allow students to build their own experiments are inadequate in a variety of ways. This means that few students end up learning what the science of psychology is really all about. Only by building, running, and analyzing their own experiments can students understand basic principles of experimental design and the way in which theories can be subjected to empirical tests.

During the period between 1987 and 1995, there were 10 major attempts to address aspects of this problem through the building of experiment generation (EG) systems. These included B/C Power Lab, ERTS, MacLaboratory, MEL, MacProbe, MindLab, MPS, PsychLab, PsyScope, and SuperLab. Among the top 10 EG systems, the 3 that have achieved the largest acceptance nationally and internationally are MEL, PsyScope, and SuperLab. Although SuperLab is easy to learn, its ability to create high-quality reaction time experiments with complex design features is limited. MEL was limited to the DOS platform and had no graphic user interface. PsyScope was the first EG system that allowed advanced undergraduates and graduate students to build complex, high-quality experiments without programming. Vaughan and Yee (1994) provided tutorial materials for PsyScope (http://psyscope.psy.cmu.edu and http://cogito.hamilton.edu). Unfortunately, PsyScope runs only on Macintosh and has no commercial basis that would fund further development or porting to Windows.

E-Prime is a joint effort by the developers of the earlier MEL and PsyScope systems, working in the commercial framework of Psychology Software Tools (PST) in Pittsburgh, Pennsylvania. It is the first industrial strength, commercial EG system. Supported by its tutorials, visuals, and wizards, a beginning user can design a new E-Prime experiment in an average time of 80 min. Because E-Prime is likely to emerge as the standard for building experi-

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ments in psychology, we have constructed a Web site to support its deployment in a variety of educational contexts. The Web site also provides links to additional materials for other EG systems and on-line experiments (see below). We call this system STEP (System for Teaching Experimental Psychology). STEP provides E-Prime–based materials that give the student direct contact with experimentation on three levels: lower division, upper division, and graduate. Let us look at how STEP can make use of E-Prime on each of these levels.

### Beginning Undergraduates

Psychology is the largest undergraduate major in the United States, and much of the curriculum in psychology focuses on experimental research design and analysis. At the level of introductory psychology, students often use microcomputers to run themselves as subjects in classic experiments designed to demonstrate a variety of basic psychological phenomena. Student packages for this level include MEL Lab, MacLaboratory, PsychLab, and others. James St. James is currently adapting the earlier MEL Lab package to run with a new student version of E-Prime that will be marketed in the same price range as the MEL Lab package. Because it will include a nearly full version of E-Prime, the new ClassMate package will give the student more control over experimental design than was available earlier in MEL Lab. However, at the beginning undergraduate level, most students are content to run experiments in a fairly "canned" form. ClassMate allows them to make certain tightly specified alterations to the experiment and then encourages them to note the results that these changes produce. However, at this level, no higher level of control of experimental design is assumed.

### Advanced Undergraduates

At the advanced level, students need to move beyond running canned experiments and learn how to build new experiments to test their own experimental ideas. Because most psychology students are not expert computer programmers, they are unable to program new experiments from scratch. This puts students in the position of chemistry students working without Bunsen burners or geology students working without maps and compasses. In many cases, the only way in which advanced undergraduates can engage in the research enterprise is to sign up as apprentices in a large laboratory project conducted by a faculty sponsor. In this role, the student may learn a great deal about one small part of the overall project, such as experiment running or data analysis, but may fail to acquire a good understanding of the overall process of designing new empirical research.

The solution to this problem is to teach advanced undergraduates how to build their own experiments. During the 1999–2000 school year, we taught courses in experimental design at Carnegie Mellon University and George Mason University that were based on E-Prime. The materials used in these courses are now available for downloading from http://step.psy.cmu.edu. They include the course syllabi, specific laboratory projects, lessons in statistical analysis, and discussion of issues in experimental design. Three features of E-Prime make it particularly useful as a framework for courses of this type. First, the user interface presents a fairly transparent view of the underlying research design. The overall experimental structure is exposed in hierarchical form in the Structure View window, illustrated in Figure 1. The Structure View is an outline of the experiment, similar to that in Windows Explorer. This view encodes the way in which objects are embedded in blocks and trials.

For a view of the factorial structure of the specific stimuli in trials, the user can rely on the TrialList, illustrated in Figure 2. The representation of factorial structure given by the TrialList is similar in some ways to the Factor Table of PsyScope, although it does not represent factorial crossing as clearly. Future versions of E-Prime will attempt to implement a representation closer to that in PsyScope.

The third important visual representation that E-Prime provides is the Trial Procedure (TrialProc) window, which displays events across a time line. The iconic metaphor of a time line is used to represent temporal sequence at three levels of the experiment: the session, the block, and the trial. Figure 3 provides an example of what the TrialProc window might look like after three events have been configured. Here the events include the presentation of a fixation point, presenting the stimulus and getting a response, and then providing feedback.

To extend the program, the user can also enter an event called an InLine Object. For example, in Figure 3, the user could insert an event between the stimulus and the feedback that would keep a counter of the number of correct answers. The E-Basic code attached to this object would be the following:

```
If (Stimulus.CollectedKeys = Stimulus.CorrectKeys)
Then
    NNumCorrect = nNumCorrect + 1
    End If
```

Two final components of E-Prime are particularly important in the context of advanced classes in experimental psychology. These are the two data analysis modules, E-Merge and E-DataAid. With these tools, the student can go directly from data collection in E-Prime to statistical analysis in a program such as StatView without having to write out and reformat separate data files. However, to do this successfully, the instructor needs to guide the student through the process. The STEP home page provides tutorial materials that show how this is done.

### Graduate Students

The problems facing graduate students in experimental psychology are similar to those facing advanced undergraduates. They also need to be able to build computerized experiments, and they also often have no training in computer programming. However, graduate students are typically interested in more advanced forms of design and more complex systems for data analysis. As a result, they are willing to devote more time to learning special-purpose programs designed to facilitate their re-

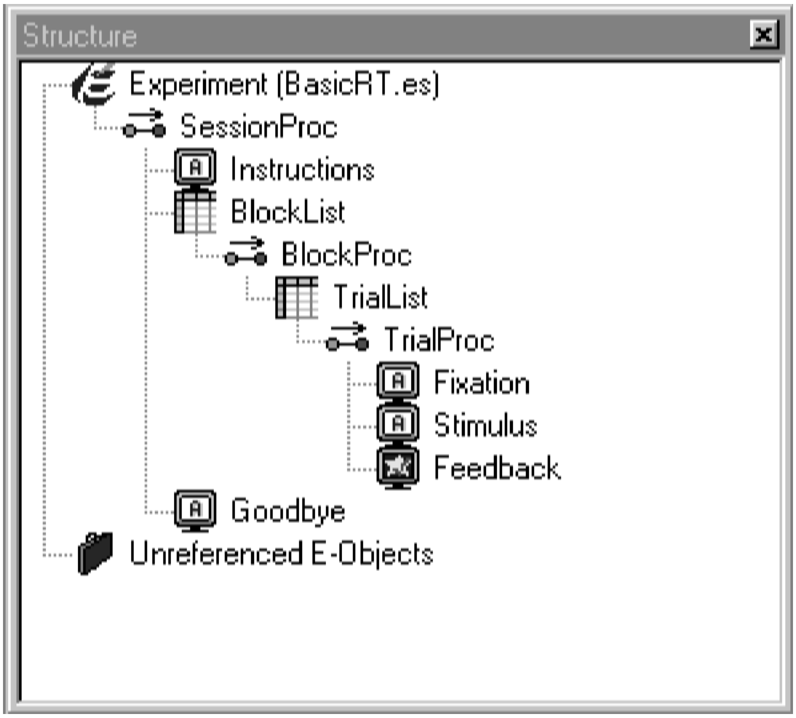


**Figure 1. The Structure View Window.**

search projects. In the context of E-Prime, this means that graduate students will often want to learn how to use E-Basic to modify and extend the power of basic E-Prime tools. Although E-Prime is programmed in C++, it actually builds up a script in the E-Basic programming language for each individual experiment. This script can be viewed, edited, and modified in various ways.

In courses at Carnegie Mellon that taught the use of E-Prime, we found that students with a background in programming were quick to make use of the facility for in-

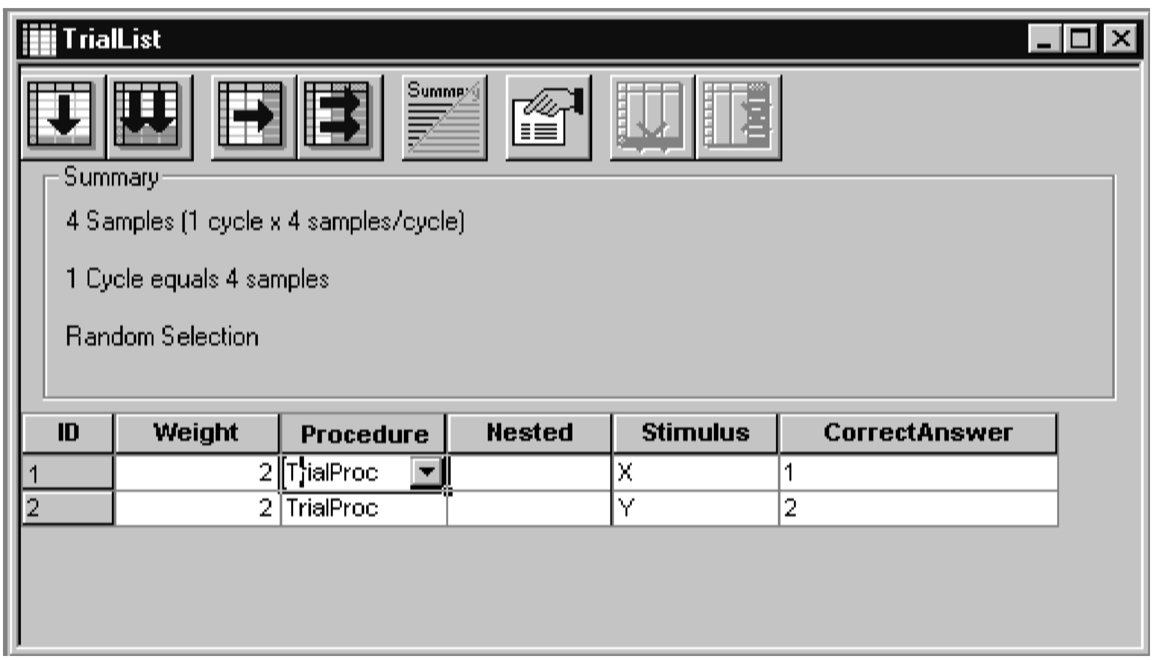


**Figure 2. The TrialList Window.**

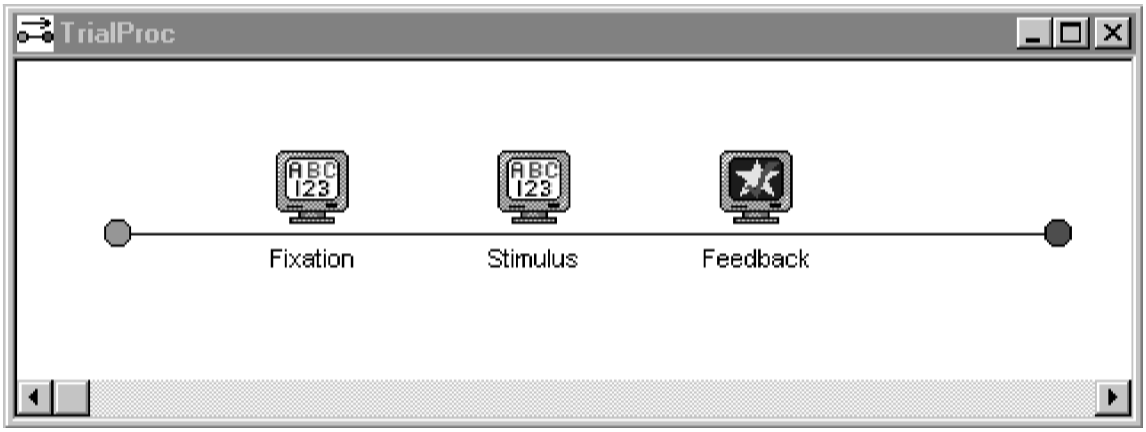


**Figure 3. The TrialProc Window.**

serting InLine coding objects. Students with no such background needed special instruction to extend E-Prime in this way. Although E-Basic conforms to the standards of other Basic languages such as Microsoft's Visual Basic, it takes more time for students to learn to use this facility than to control the more intuitive system for building experiments through the graphic user interface. However, with about two days of practice, many graduate students in psychology will be able to program in E-Basic. To learn how to do this, they can trace through the scripts for materials distributed at the Web site and look at specific examples of in-line codes provided from the Web site and from PST.

## E-Prime Across Platforms

Currently, the three major platforms used by experimental psychologists are Windows, Macintosh, and Unix. E-Prime development has initially focused on the Windows 95/98/ME environment. However, the development of parallel tools for Windows NT/2000 and Macintosh has been progressing steadily. This development involves separate efforts for each of the components of E-Prime. For E-Studio, which is the largest programming effort, portability depends on the availability of the E-Basic interpreter. As the user works inside E-Studio, E-Basic code is continually generated and saved. The user can then exit E-Studio and use E-Run to run the experiment. This means that the E-Basic code can be transported across machines and platforms. However, to do this, one needs compatible versions of E-Basic for each platform.

For E-Run, porting requires building a separate program for each platform. The data analysis programs can port more easily, since they have relied on a version of Microsoft Foundation Classes that provides compatibility between Macintosh and Windows. When Apple releases OS X, we are hoping that it will also provide software development paths for greater compatibility with Windows.

## Building a Large Set of Classic Experiments

We are currently in the process of building a large set of classic experiments in E-Prime for downloading from http://step.psy.cmu.edu. There are now 24 experiments available at that site. In this section, we list 100 experiments that are robust enough to permit replication. We see the creation of this set of exemplary experiments as serving three purposes:

1. For teachers of introductory courses, having this large set of experiments available for downloading will increase flexibility in course planning.

2. For advanced undergraduates who are trying to build their own experiments, the availability of a rich range of experimental types is crucial. During our evaluation of PsyScope, we learned that students seldom have problems building up experiments when they are presented as classroom examples. However, when they try to convert their own ideas into experiments, students need to look at examples of fully implemented experiments in which researchers have investigated the types of phenomena that the students want to study. Without such a model, the student tends to founder about in search of a way to think about the new research project. Having 100 experiments fully implemented in E-Prime will not only help students learn E-Prime, but also help them think in structured ways about experimental design. We invite suggestions for further inclusions in this set through e-mail to macw@cmu.edu or posting to the step@mail.talkbank.org mailing list.

3. For graduate students and faculty, the inclusion of experiments in the set of exemplary materials can be a mark of honor and distinction. We believe that eventually there will be sharp competition to enter this Psychology Hall of Fame. We will establish a peer-review committee that can evaluate the assignment of this honor.

Published articles often report a series of experiments that differ from each other in minor ways. For example, Lukatela and Turvey (1994a, 1994b) reported 12 experiments based on a fairly constant design framework for rapid visual pseudohomophone priming. Rather than fully programming all 12 of these experiments, we will program one or two core examples and include instructions to the student about how to modify the scripts to work for the additional experiments. We hope to distribute an electronic copy of the original article with each experiment, if this distribution accords with copyright restrictions.

The experiments that we plan to include have all made a significant impact on psychology, as judged by mentions in the Social Science Citation Index, references in undergraduate textbooks, and judgments solicited from our advisory board. Our goal is cover a wide variety of areas in psychology. Reliance on the microcomputer is now deeply entrenched in the areas of cognitive, experimental, physiological, comparative, and perceptual psychology. For example, a count of the studies reported in *Journal of Experimental Psychology: Human Perception and Performance* and *Journal of Experimental Psychology: Learning, Memory, and Cognition* in 1990 shows that 62% were computer based. In 1997, the percentage rose to 78%. However, use of the microcomputer as a fundamental research instrument also continues to gain ground in the areas of social, personality, developmental, and clinical psychology. It is not always possible to recreate all classic experiments using the microcomputer. This will limit our coverage of classic studies in areas such as social and clinical psychology.

We will now list our initial set of 100 choices for inclusion in the STEP program database. We hope that readers will provide us (macw@cmu.edu) with feedback regarding the appropriateness of this selection set. In this list, some experiments are listed with asterisks. These are already available from sources on the Web that we will discuss below. In the areas of sensation and perception, our choices include:

1. Fechner (1856): absolute threshold measurement using Landolt rings, and measurement of the difference threshold and the point of subjective equality by varying the frequency of a tone.
2. Stevens (1972): changes in psychophysical scaling by adjusting a rectangle to match the area of a standard stimulus of a different shape; equal loudness contours.
3. Ramachandran (1992): the filling-in of blindspots in vision.
4. Körte (1915): apparent motion.
5. Helson (1964): adaptation-level theory in a relative-size illusion.
6. Gulick (1971): the minimal duration of stimulus to produce tonal characters.
7. Schiffman (1982): color aftereffects.
8. Schiffman (1982): Mach bands and the neural enhancement of edge detection.
9. Schiffman (1982): Weber's law.
10. Schiffman (1982): apparent brightness as a function of the surrounding intensity.
11. Schiffman (1982): the Müller-Lyer illusion.
12. Schiffman (1982): the Ponzo illusion.
13. Schiffman (1982): size–distance illusions.
14. Schiffman (1982): the horizontal–vertical illusion.
15. McCollough (1965): the McCollough effect.
16. Massaro (1987): the McGurk effect.
17. Warren and Warren (1970): phonemic restoration effect.
18. Jung and Spillman (1970): measurements of visual receptive field size.
19. Garner (1970): the aesthetics of "figure goodness."

In the area of attention, we have selected

20. Cherry (1953): loss of material in the unattended ear.
21. Moray (1959): loss of material in the unattended ear.
22. Broadbent (1954): attending to only one ear at a time.
23. Gray and Wedderburn (1960): division of attention between the ears.
24. Treisman (1960): semantic processing of information in the unattended ear.
25. Neisser (1964): visual search.
26. Neisser and Becklen (1975): selective attention to superimposed images.
27. Schneider and Shiffrin (1977): automaticity.
28. Eriksen and St. James (1986): time course of selective visual attention.
29. Kramer and Hahn (1995): splitting of the beam of attention.
30. Shapiro, Raymond, and Arnell (1994): attentional blink.
31. Posner, Snyder, and Davidson (1980): spatial cuing.
32. Yantis (1993): stimulus-driven involuntary capture of attention.
33. Treisman and Gelade (1980): feature integration theory.
34. Johnston and Schwarting (1996): pop-out features.
35. Green and Swets (1966): signal detection theory.
36. Stroop (1935): the Stroop effect.

In the area of memory, our selections are

37. Waugh and Norman (1965): decay versus interference.
38. Wickens (1972): release from proactive inhibition.
39. Paivio (1965): dual-code theory.
40. Baddeley (1966): acoustic confusability in working memory.
41. Conrad (1964): letter confusion matrix.
42. Sperling (1960): iconic visual memory.
43. Brown (1958): duration of primary memory.
44. Craik and Watkins (1973): retention does not guarantee storage.
45. Craik and Tulving (1975): the levels-of-processing effect.
46. Tulving and Pearlstone (1966): availability versus accessibility in memory.
47. Posner and Keele (1968): the creation of category prototypes.
48. Brewer (1977): memory for the pragmatic implications of sentences.
49. Bransford and Franks (1971): schema-based memory.
50. Loftus and Palmer (1974): eyewitness testimony.
51. Barclay and Wellman (1986): accuracy of autobiographical memory.
52. Johnson, Hashtroudi, and Lindsay (1993): source memory.

53. Jacoby (1983): implicit memory.
54. Weldon and Roediger (1987): picture superiority effect.
55. Roediger and McDermott (1995): false memories.
56. Daneman and Carpenter (1980): verbal memory span.
57. Conway and Engle (1996): general capacity theory.
58. Kirkpatrick (1894): serial position effects.
59. Sternberg (1966): search in short-term memory.

In the area of imagery, we will include:

60. Metzler and Shepard (1974): mental rotation.
61. Ertel and Bloemer (1975): imagery for sentences.
62. Huttenlocher and Presson (1973): imagery and motion.

In the area of psychophysiology, E-Prime can be linked to the student version of the BioPak physiological monitoring system. Psychophysiological measures possible in this framework include GSR, heart rate, pulse, basic ERP, and temperature. These indicators can also be used in personality and health psychology. Experiments that demonstrate the use of these measures include

63. Sutton, Braren, and Zubin (1965): the P300 response to surprising stimuli.
64. Kutas and Hillyard (1980): the N400 response to incongruity.
65. Coles and Rugg (1995): the N400 response to semantic priming.
66. Walter, Cooper, Aldridge, McCallum, and Winter (1964): contingent negative variation.
67. Kornhuber and Deeke (1965): readiness potential, reflecting motor preparation.
68. Ekman and Friesen (1978): coding facial expressions.

In the area of social psychology, representative experiments include

69. Higgins, Rholes, and Jones (1977): priming of impression formation.
70. Hamilton, Katz, and Leirer (1980): goals in impression formation.
71. Bodenhausen and Lichtenstein (1987): social stereotypes and social judgments.
72. Judd and Park (1988): group perception.
73. Leavitt (1951): communications networks.
74. Myers and Lamm (1976): group polarization.
75. Nisbett and Ross (1980): current attitudes bias memory for older attitudes.
76. Koriat, Lichtenstein, and Fischhoff (1980): overestimation of knowledge.
77. Baranski and Petrusic (1996): overconfidence in motor performance.
78. Bilodeau, Bilodeau, and Schumsky (1959): decline in performance following withdrawal of knowledge of results.

Representative experiments in the area of developmental psychology include

79. Saffran, Newport, Aslin, Tunick, and Barrueco (1997): implicit memory for auditory sequences.
80. Siegler (1988): counting strategies.
81. Piaget, Inhelder, and Szeminska (1960): formal operations.
82. Adolph (1995): infant locomotion strategies.
83. Kuhl (1991): the perceptual magnet effect.
84. Sheppard and Lane (1968): distinguishing infant cries.
85. Vurpillot (1968): the development of visual scanning.

Some representative experiments in psycholinguistics include

86. Swinney (1979): crossmodal priming of homophonous readings.
87. Meyer and Schvaneveldt (1971): spreading lexical activation.
88. MacDonald (1993): noun–adjective ambiguities.
89. Marslen-Wilson and Teuber (1975): shadowing and error detection.
90. Rayner, Carlson, and Frazier (1983): minimal attachment processes.
91. Boland, Tanenhaus, and Garnsey (1990): verb control information.
92. Clark and Chase (1972): sentence–picture verification.
93. Glushko (1979): gang effects in reading.
94. Perfetti, Bell, and Delaney (1988): automatic phonological processing during reading.
95. Kempe and MacWhinney (1999): on-line measures of sentence interpretation.
96. Lukatela and Turvey (1994a, 1994b): phonological processes in reading.

Finally, our choices for the area of human factors include

97. Welford (1968): Fitts law.
98. Newell and Rosenbloom (1981): power law of practice.
99. Klahr and Carver (1988): LOGO debugging.
100. Klapp (1988): human factors workload.

Together, this collection of 100 sample classic experiments will provide a solid resource base both for instructors seeking to broaden their curriculum and for students who are trying to articulate their own independent research projects.

**Two Approaches to Demonstration Experiments**

The STEP project emphasizes the importance of linking learning about experimental psychology to an EG system. It is helpful to distinguish this approach from another, perfectly viable, approach that is being taken by several other projects. In this second approach, a programming language such as Java or AuthorWare is used to build single versions of classic experiments which can be run directly over the Web interactively, without the need to use an EG system. This second approach has three advantages:

1. Students do not have to purchase the ClassMate CD.
2. Students or cluster supervisors do not have to install E-Prime.

3. The person who programs the experiment is not limited by the current capabilities of E-Basic, but can use a more powerful programming language like Java.

The first two advantages involve relatively minor inconveniences. However, the third advantage is a major issue. In practice, we have found that most experiments in psychology are easy to program in E-Prime. The exceptions lie mostly in the area of problem-solving, where code for routines such as Missionaries and Cannibals will take time to develop.

Experiments based on this first model are now available from three major sites. These include http://psychexp.olemiss.edu/, http://coglab.psych.purdue.edu/coglab/Labs, and http://kahuna.psych.uiuc.edu/ipl/. The site at the University of Mississippi uses Authorware and Shockwave to distribute demonstration experiments. To modify these experiments, students and instructors need to learn to use AuthorWare. The sites at Purdue and Illinois use Java applets to distribute programs. Although reaction time accuracy is not guaranteed when one is connected to the Internet, all of these sites distribute excellent material that will be truly valuable for use in beginning classes in psychology. STEP targets the next level up the educational ladder. After students have viewed these basic demonstrations, they will want to build experiments of their own. STEP and E-Prime address this need.

## Developing Support Materials

Learning to use E-Prime involves more than just building a demonstration experiment. For the beginner, virtually all of the components of experimental design are challenging, new concepts. It is not an easy matter for the student to understand what we mean by factors, levels, confounds, randomization, nesting, balance, dependent variables, and independent variables (Keppel, 1982; Shaughnessy & Zechmeister, 1994). Students often need to understand the shape of the questions that experiments can resolve. Only certain variables can be controlled in a laboratory setting. Students have to slowly come to realize that we cannot get directly at the true content of thought and emotion. Instead, our ideas have to be packaged into a shape that is amenable to experimental testing.

The most difficult moment in learning a new system like E-Prime occurs when you try to build your own first experiment. At this point, learners who find the instructions unclear or the interface opaque may quit in frustration. To avoid this, we have designed three E-Prime components that cushion the early learning process. First, there is a clear, step-by-step user manual for building the first experiment. Second, there is an animated QuickTime movie that shows exactly what key and mouse strokes are needed to build the experiment. Third, there is an experiment wizard that guides the learner through the process. Our goal here has been to build a system in which a novice user can build the first experiment in less than 2 h.

We have tested these components with 10 subjects, 9 of whom had no previous exposure to the system. These subjects were tested individually in 3-h sessions. The results were outstanding. Subjectively, these new users were very pleased with the system. The average time required to cover the tutorial materials was 80 min. The average time to create a new experiment was 19.6 min. Three of the subjects chose to do the experiment without the wizard, and 7 chose to do it with the wizard. All who chose not to use the wizard had significant programming experience. We estimate that learning time for E-Studio was 5% of that required for MEL, and 20% of that required for PsyScope to reach a similar level of ability. The general response to the interface was very positive. Asked whether they would use E-Prime to create experiments, 8 of the 10 subjects said "yes," but 2 said that they needed more information to decide whether E-Prime could handle the designs they used in their own research. One user sighed that, "I only wish I was beginning graduate school with something that simple. This would have dramatically improved my productivity in graduate school."

In order to facilitate the tutorial process for PsyScope, Jon Vaughan and Penny Yee at Hamilton College have developed a series of PsyScope tutorials (http://cogito.hamilton.edu/). These comprehensive exercises, whose development was supported by NSF, are designed specifically to work with PsyScope. Chris Schunn has now constructed a parallel set of materials for use with E-Prime. These support materials include PowerPoint shows that demonstrate how to build experiments in the E-Prime interface. There are also class assignments, questions, and discussions of issues in experimental design and statistics. All of these materials have been tested twice in classes with undergraduates at George Mason University.

## Future Developments

Apart from the projects that are currently underway, we also hope to use STEP to articulate ways in which E-Prime can be extended in future versions:

1. We are interested in using E-Prime for the delivery of multimedia stimuli and instructional segments. E-Prime can play QuickTime movies, but it needs to provide simple methods for paging through instructional sequences. This is particularly important for instructional purposes on the beginning undergraduate level.

2. We will further adapt E-Prime to provide animation control for games and graphical manipulations of visual workspaces by subjects. Currently, E-Prime can control sprites through DirectX, and we plan to build on this basic facility. In many situations, one wants the subject to deal with dynamic operations on the screen. For example, in a version of the Wisconsin Card Sort task, subjects place cards by hand in piles. In the computer-animated version of this task, one would like either a drag and drop animation or a clicking procedure to move the card and provide the location for it to move to, followed by having the card move. Similarly, in the Tower of Hanoi problem, one moves disks from one peg to another. With animation control, it will be possible to construct E-Prime experi-

ments for problems such as Tower of Hanoi, and Missionaries and Cannibals (also known as Hobbits and Orcs, Cryptarithmetic, and Water Jugs (Einstellung). In each of these problems, subjects need to watch the way in which the computer screen updates the problem state after each move.

3. E-Prime also needs to permit message transfer. Many experiments involve bargaining and social interaction (Axelrod, 1984). In a computer context, these require that people and computers communicate asynchronously through an interactive transfer of messages. Although E-Prime cannot currently handle this type of interaction, the use of DirectPlay and Game Sprockets will make this possible eventually.

4. To make questionnaire and survey administration through E-Prime attractive, we will construct a survey wizard that guides a user through the construction of a new survey instrument. This wizard will first help the researcher construct a set of demographic questions that will be placed at the beginning of the survey or questionnaire. Next, the wizard will guide the researcher through the construction of specific survey items in different forms, including Likert scales, numerical responses, true–false questions, and open-ended questions. Tools will be provided for the graphic construction of the display of items. A variety of standard templates will be available that can be implemented without any additional graphic selections. Once the format is established, the researcher will begin to enter the specific text for each survey item. The researcher will be able to organize items into blocks for randomization, while still controlling the consistency of item appearance and instructions within blocks.

Researchers who are interested in providing input to the development of STEP and the selection of materials for the experiment database should contact macw@cmu.edu. Currently, about 25% of the experiments listed above can be downloaded from http://step.psy.cmu.edu. The collection of experiments and documentation will grow over time.

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