The Research Methods Script

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In a classroom activity for a research methods course, students identify and evaluate their own procedural knowledge of the research process. For comparative and diagnostic purposes, students generate scripts from their event-based mental representations of the research process. Students then compare their own research scripts to a script derived from expert psychologists. The activity familiarizes students with the major steps of the research process and guides their further organization and comprehension of course material. The activity also can be used to open class discussions on specific methodological topics that are script events, such as formulating hypotheses, obtaining subjects, and reporting research findings.

Scripts are mental representations of the ordered actions and events that take place in commonly experienced situations (Abelson, 1981; Bower, Black, & Turner, 1979). Studies of expertise in knowledge-rich domains have identified scripts as part of the knowledge used to solve complex problems (Hershey, Morath, & Walsh, 1991; Hershey, Walsh, Read, & Chulef, 1990). According to these authors, a problem-solving script specifies the optimal information to consider and the sequence of actions to take in a particular problem-solving context. Hershey, Wilson, and Mitchell-Copeland (in press) investigated psychologists' procedural knowledge of scientific problem solving in the context of psychological research. They discovered that, in contrast to undergraduate students of psychology, career psychologists possess reliable and readily available *psychological research scripts* that represent their knowledge of the sequential steps involved in the research process. Results indicated that development of the research script is a negatively accelerated function of experience and training in psychological research, with the greatest developmental change taking place during undergraduate education.

The class activity described in this article is based on script theory and takes advantage of students' preexisting knowledge of the scientific method. Students generate their own research methods script by following standard procedures of script generation and analysis found in the literature (e.g., Bower et al., 1979). Then, students compare and discuss their scripts, evaluating them in relation to the composite script of the class and a composite script of experienced psychology professors. Students receive a sound overview of topics typically discussed in a research methods course and a structural foundation on which to build new knowledge. The activity also allows students to participate as subjects in an informal experiment, analyze their findings, and discover their own baseline knowledge of the psychological research process.

Research Methods Scripts as Mental Representations

Scripts represent event knowledge that is readily accessible from long-term memory, making scripts a powerful way to organize and recall information. Script events are sequenced in a particular order and are organized hierarchically in memory so that basic-level events are grouped under goal categories at a higher level (Bower et al., 1979). The research methods script is no exception. According to Hershey et al. (in press), expert psychologists typically organize events in the research script into four higher order goal categories: formulate ideas, collect data, analyze data, and report findings. These authors found that experts agreed on the research activities generated and on the basic level of specificity of those activities (e.g., read literature, obtain subjects, and collect data). Experts did not mention lower level activities (e.g., turn on computer and go to work). The scripts students generate about the research process are likewise organized around a common set of events and are usually written with a specific level of abstraction. Thus, becoming aware of the research methods script can be helpful for students because it organizes their knowledge of the various research procedures they are learning.

The Class Activity

Script Generation

Sometime within the first 2 weeks of a research methods course, we ask students to participate in an activity to discover what they already know about the psychological research process. Following the procedures and instructions used by Hershey et al. (in press), we give them a response sheet with the phrases, "Get idea for project" printed near the top of the page and "Publish the research paper" printed near the bottom. Then, students are given the following instructions:

List about 20 actions, steps, or stages that characterize the process psychologists go through when working on a research problem. As you list these research activities, focus on the *typical* actions that a researcher would engage in while carrying out a *typical* psychological research project. List only activities that take place between the anchor events *Get idea for project* and *Publish the research paper*, and try to list the activities in their appropriate order.

Students usually complete this task in less than 10 min. Although students and experts usually generate only 10 to 16 events under these instructions, asking for about 20 appears sufficient to elicit an exhaustive recall and, consequently, a variety of events from all students in the group.

Next, we ask students to examine their lists while presenting a brief introduction to the script concept (Abelson, 1981) to focus them on the structural features of scripts that enhance their organization of knowledge. Explaining the central features of scripts (nothing more than we have presented in this introduction) provides students with an immediate link between the event-generation process they just completed and the notion that such event-based knowledge is organized in their own long-term memory. A treatment of script theory beyond the typical information found in an introductory psychology textbook is not necessary for instructors to follow the procedures presented herein and the evaluation portion of the activity mentioned later.

Students are instructed to draw lines between items on their ordered list to group the activities into higher order categories and to generate a name for each category. Students rarely have questions or problems in completing these tasks; they generate and divide their lists with ease. The entire procedure to this point takes about 20 min, and the evaluation stage that follows can vary in time according to the instructor's preference. We take 20 to 30 min for the following evaluation stage.

Script Evaluation

After students generate their research scripts, we assign them to small groups of two to four students to compare their event lists. As a first step in script evaluation, students can learn about several features of their research methods script by responding to the following questions:

1. Did you have any difficulty generating script events, or did they come easily to mind?
2. Scripts are organized around a common set of events at a particular level of specificity. In comparison to other students, how many events did you list? How many of the events in your script were also in the lists of other students? What kinds of events did you list?
3. Are the events in your script listed in a logical order? Are they listed in the same order as similar events in other students' scripts?
4. How many goal categories were in your script? Did the names you used for your categories correspond to the typical category names?

In the next part of the activity, students are asked to share their event lists with the class. A master list of all unique events along with their frequency of mention can be compiled on the chalkboard or an overhead projector. Help students sequence events in a logical order to create a composite script for the class. (In our classes, we draw a line through those events mentioned by fewer than 20% of the students to highlight research activities of greatest significance to them.) After a brief class discussion of the composite script, the instructor can present a composite script from experts in psychology (see Table 1) alongside the class script for direct comparison. An evaluation of students' scripted knowledge of the research process continues with the following questions:

5. How closely does the class script compare to the expert script? How many high-consensus and low-consensus activities are in each script?
6. Does the class as a whole already possess a good deal of knowledge about the research process?
7. Look at your own script. How does it compare to the expert script? How does it compare to the class script? Given that scripts provide a structure that helps us comprehend new information, how might you use the script concept to increase and monitor your own understanding of the research methods you will learn about this semester?

Table 1. Composite Psychological Research Script From 49 Psychology Professors

(anchor) Get idea for project
READ LITERATURE ON TOPIC
Discuss idea with colleagues
Conceptualize project
Determine appropriate subject population
Formulate Hypotheses
DESIGN EXPERIMENTAL METHODS
Obtain available materials and measures
Construct experimental materials and measures
Obtain research assistants
Pilot Test Procedures and Measures
Refine experiment based on pilot results
Obtain Subjects
DATA COLLECTION
Code and organize data
DATA ANALYSIS
Determine if hypotheses were supported
Make a conference or brown-bag presentation
Conduct final literature review
WRITE DRAFT OF PAPER
Get feedback on paper
Revise draft of paper
Submit Paper for Publication
Make post-review revisions
(anchor) Publish the research paper

Note. Following Hershey et al. (in press), high-consensus events (mentioned by ≥ 60% of professors) are shown in capital letters, moderate-consensus events (mentioned by 40% to 59% of professors) are shown in upper and lower case, and low-consensus events (mentioned by 20% to 39% of professors) are shown in italics.

Class Discussion

Upon identification of the class composite script, students are pleased to recognize that their collective knowledge is, in many respects, similar to that of experts. They are usually surprised by both the similarity among their individual

scripts, the class composite script, the expert script, and the subtle differences in the way we each conceptualize psychological research. By answering the questions in the activity, students are challenged to think critically about the research process. The classroom situation gives the instructor an opportunity to help students improve their understanding of the research process before misconceptions can hinder their further learning of methodological details. Students should be reminded that they are in the course to begin to assimilate the more detailed knowledge that experts possess. In this regard, an individual's script represents a good foundation for building new knowledge from the course. Hershey et al. (in press) found that undergraduates already have a working knowledge of the higher order goal categories within the research process. These authors referred to this higher level of knowledge as the *research metascript* and suggested that it is a mental framework on which students develop more detailed knowledge of the research process.

Students find the expert script interesting in its simplicity and coherence. Learning opportunities from discussion of the expert script seem limited only by one's imagination. For example, students may ask the meaning of such activities as a brown-bag presentation or pilot research (events often left out of students' scripts; see Table 1). The instructor could then discuss what it is like to go to graduate school by noting that experts present brown-bag talks, conduct pilot studies, obtain research assistants, and so on. Or the instructor may elect to focus students on specific course concepts. For example, students can be encouraged to take note of any event in the expert script that they did not have in their own script, so that they can gain more understanding of those particular research activities.

Finally, the research script activity may be useful in other ways. For example, it can illustrate the structure of mental representations and, for those with an interest in metacognitive awareness, it can demonstrate how to monitor one's own understanding in a problem-solving domain. We have used the activity to assess changes in students' knowledge of the research process from the beginning to the end of our methods courses. The activity is also suitable for introductory courses as a review of concepts in scientific psychology and basic research methodology.

Evaluation and Conclusion

In one undergraduate research methods course, the activity was administered during the second week and then referred to regularly throughout the course. On the last day of class, 31 students completed a survey that included eight questions about the script activity. The mean ratings given by students on a scale ranging from 1 (*not at all*) to 5 (*very often*) were as follows: (a) I thought about the research methods script on occasions other than the day of the activity ($M = 3.94$), (b) I specifically studied class material related to research events that I left out of my original script ($M = 3.35$), (c) I created study questions from the expert script to assess my understanding of course material ($M = 2.03$), (d) I felt like the research methods script was helping me organize my understanding of the research process ($M = 4.19$), and (e) I took time to memorize the expert script to organize my thinking for class exams and projects ($M = 3.10$). Mean ratings on a scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) were as follows: (a) Knowing about my own research methods script was useful in this class ($M = 4.35$), (b) The research script activity was interesting ($M = 4.13$), and (c) I believe my research methods script is more like the expert script now that the class is over ($M = 4.55$).

From these data, we conclude that students perceive the research script activity as interesting and useful. Students who generated and evaluated scripts used the activity more for the general organizational information it provided than as an active study strategy; thus, students may not use their scripts in novel ways without some direction by the instructor. Nevertheless, students tended to reflect on their scripts throughout the course, and they could gauge their learning by comparing their scripts to the expert script. To obtain comparative data on the development of students' scripts, 17 students from a different methods class generated scripts and constructed a composite script at the beginning and end of the term. Results demonstrated that agreement on events between the class composite script and the expert script increased by 37% during the term. It appears that the utility of the script activity for increased learning is promising.

Student comments during one term included: "I did not know there was so much to doing research before you actually collect the data"; "Now that I have done my own study" (a course requirement), "I will never leave 'code data' out of my script again!"; and the inevitable, "I memorized the expert script because I thought you would test us on it." One student wrote in the margin of her survey, "Showed me what I needed to learn from the start." The survey results, comparative data, and comments indicate that the research methods script activity is a worthwhile experience. The activity reinforces and enhances students' organization and understanding of the procedures involved in psychological research. It also allows students to identify areas in which they need further study.

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Note

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