Generative Learning Theory, Paradigm Shifts, and Constructivism in Educational Psychology: A Tribute to Merl Wittrock

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This appreciation of Wittrock’s contributions to educational psychology suggests that his 1974 article describing generative learning theory was remarkably prescient. In that article Wittrock set the stage for the subsequent paradigm shift from cognitive to constructivist approaches to instruction. Furthermore, his suggestion that schools were the most appropriate contexts for testing learning principles is widely shared among contemporary educational psychologists; it is noteworthy that Wittrock also urged testing these principles in training sites. Finally, Wittrock also emphasized the importance of transfer, prior learning, and the interaction of student characteristics and instructional methods in his generative learning approach, themes that are as important 35 years later as they were when the article was first published. These considerations and Wittrock’s dedication to the profession confirm that he was the complete educational psychologist.

In rereading Wittrock’s (1974) statement of his generative theory, it is amazing how prescient that brief article was. Wittrock anticipated both the directions in which the field of educational psychology has moved in the last 35 years and the importance of many contemporary concerns. This article briefly examines some topics discussed in Wittrock’s article to get a clearer picture of how he anticipated contemporary concerns.

PARADIGM SHIFTS

Wittrock (1974) carefully differentiated his generative theory from the previously entrenched stimulus-response paradigm. He conceptualized generative theory as being part of the cognitive movement and listed the major figures stimulating the paradigm shift from stimulus-response approaches to the cognitive paradigm. It is interesting to note in hindsight that Wittrock was actually laying the groundwork for another paradigm shift from cognitive theory to constructivism.

Constructivism was stimulated by a number of scholars including Dewey (1929), Piaget (1952), Bruner (1966), Von Glasersfeld (1989) and perhaps principally by Vygotsky’s (1978) work during the 1930s which did not come to the attention of American psychologists until it was translated from the Russian more than 30 years later. Constructivism, perhaps the dominant contemporary paradigm among scholars and developers concerned with instruction, came into vogue more than a decade after the publication of Wittrock’s 1974 article, advanced by the writings of Brown, Collins, and Duguid (1989); Lave and Wenger (1991); and Duffy and Jonassen (1992), among others. A case can be made that Wittrock (1974) anticipated even the naming of the paradigm: He distinguished the generative approach from stimulus-response theory “by introducing into the paradigms for studying learning the perception and interpretation of the learner processing the information and actively constructing [italics added] meaning from it” (p. 88).

It is not surprising that Wittrock was unaware that a paradigm shift was about to occur. In a chapter, written 10 years before Wittrock’s article, Hilgard (1964) assumed that he was writing the obituary of Gestalt psychology (Bower & Hilgard, 1981). Amusingly, Gestalt psychology was a forerunner of cognitive psychology, and at the time Hilgard was writing (1964) the paradigm shift to a cognitive orientation was beginning. The Gestalt school’s insistence on studying the organizational structure of relatively molar content, its internal representation, and its reorganization was a departure.
from stimulus-response psychology’s concerns with linking molecular segments of behavior. Although Gestalt psychology has waned in popularity, cognitive psychology, its intellectual descendent, became the major approach in the field for many years, and still has many adherents despite the predominance of the constructivist paradigm in contemporary thinking (Tobias & Duffy, 2009).

Constructivism as a theory of learning is widely accepted in the field (Kintsch, 2009), even by researchers critical of some of its applications to instructional practices (Mayer, 2004, 2009). Kirschner, Sweller, and Clark (2006) initiated a round of sharp criticism of constructivist approaches to instruction, as did a number of others who advocated more explicit instructional methods (see Tobias & Duffy, 2009, for detailed position papers by both critics and supporters of constructivist approaches to instruction and for discussions of the controversy among supporters of both positions that are beyond the scope of this article). It is difficult to predict whether the contemporary controversy about the value of constructivist instructional approaches marks the beginning of a shift away from that paradigm. Of course, it was just as difficult for Hilgard (1964) to know that the Gestalt school he was eulogizing was laying the foundation for cognitive psychology as it was for Wittrock to anticipate that he was preparing the groundwork for a shift to constructivism.

According to Hilgard (1964), the major reason for the demise of the Gestalt paradigm was its failure to generate as much research as the stimulus-response approaches that supplanted it. Duffy (2009), an enthusiastic constructivist, and Tobias (2009), a confirmed eclectic, both cited a dearth of research on many major topics in the controversy about constructivism initiated by Kirschner et al. (2006). An especially important gap is the failure to study the cognitive processes engaged by constructivist instructional methods. Whether learning is predominantly social or not, the internalization of learning is mediated by the types of cognitive processes engaged and by the intensity with which instructional input is processed (Tobias, 1982). If Hilgard (1964) was correct, constructivists would be well advised to engage in an active research program to investigate these processes. Constructivism has provided useful insights about the importance of social and situative approaches to learning; however, rhetoric extolling the values of a theory, demonstrations of instructional methods, or design experiments studying different variations of a method may not be substitutes for research that either compares different methods and/or identifies the cognitive processes engaged by them.

PRIOR KNOWLEDGE AND ATI RESEARCH

Wittrock (1974) emphasized the critical importance of prior knowledge repeatedly, and it is a major variable in most contemporary approaches to instruction. Dochy (1992) and his associates (Dochy, Segers, & Buehl, 1999) provided strong empirical support for the significance of prior knowledge. Those reviews found that prior knowledge accounts for two thirds of the variance in most studies when it was assessed.

Wittrock (1974) also advocated research examining student aptitudes, instructional treatments, and their interaction (ATI research) to determine whether instructional methods were differentially effective for students varying in cognitive and affective characteristics. Wittrock suggested that ATI research could help clarify many problems dealing with learning. ATI research was stimulated by Cronbach’s (1957, 1967) call for an integration of the correlational and experimental paradigms in psychology. Cronbach and Snow’s (1977) book provided an additional stimulus to that work. ATI research lost some of its popularity when results indicated that interactions between student characteristics, other than prior knowledge, and instructional treatments were difficult to replicate (Cronbach, 2002; Gustafsson & Undheim, 1996).

Over the last decade cognitive load theory (Kalyuga, 2007; Kalyuga, Ayres, & Chandler, 2003; Sweller, 1994) consistently found many ATIs, and these results may stimulate renewed interest in ATI research. A forthcoming issue of Instructional Science (Kalyuga & Renkl, in press) is very much in the spirit of the kind of research Wittrock advocated. That journal issue describes five studies of the expert...
reversal effect between instructional methods differing in the amount of working memory absorbed and participants’ prior knowledge of the content domain. Clearly, these effects are examples of replicated ATIs (Tobias, in press). The findings described in that journal issue are similar to those found in multimedia research by Mayer (2001) and his associates in a research program closely related to cognitive load theory.

ATI findings from cognitive load theory and multimedia research confirm Wittrock’s (1974) emphasis on prior knowledge. They also support the hypothesis of ATIs between instructional methods and prior knowledge (Tobias, 1973, 1982) in instructional contexts in general, in addition to those examined in cognitive load theory. A research program (Tobias, 1989) demonstrated that students with limited prior domain knowledge profited from instructional methods providing substantial instructional support, whereas knowledgeable students could succeed without such assistance. Reviews of ATI research consistently support interactions in which prior knowledge (Gustafsson & Undheim, 1996; Tobias, 2005) was the student characteristic studied.

THE GENERATIVE DISCIPLINE AND TRANSFER

Wittrock (1974) frequently mentions the importance of educational psychology as a discipline. This was a recurring theme of a book he coedited (Wittrock & Farley, 1989), and a staple of frequent discussions over the many years in which we jointly served on the Executive Committee of the American Psychological Association’s Division of Educational Psychology. As in the 1974 article and the book he coedited with Farley, Wittrock talked at length about the advances in understanding learning and its assessment that had been originated in the discipline.

In the 1974 article, Wittrock also discussed the importance of transfer and its significance to educational psychology. Transfer remains a major topic in the field (Mestre, 2005; Royer, Mestre, & Dufresne, 2005). It is impossible to teach everything that students might need in their future lives, thus what is usually taught in education tends to be a beginning, or foundation for their future and students at all levels are expected to adapt and apply that in their future learning or in the world of work. Despite its importance, transfer continues to be a puzzle; anecdotal evidence suggests that it is ubiquitous, yet transfer continues to be difficult to demonstrate in the laboratory. Schwartz, Bransford, and Sears’s (2005) conceptualization of transfer as preparation for future learning is very much in keeping with the generative learning theory Wittrock proposed. Also in support of generative theory are the findings by Schwartz, Lindgren, and Lewis (2009) that instruction aimed at preparation for future learning may require more time during acquisition than other approaches, but it tends to be more effective in the long run. Perhaps Schwartz et al.’s conceptualization and the more recent findings will help to clarify the puzzle that transfer continues to pose for the field.

CONCLUSION

It is clear that Wittrock’s short article both predicted and stimulated many of the developments in educational psychology over the next 35 years. He was the complete educational psychologist. This is evident in his professional and scientific publications, his dedication to the field, his interactions with both colleagues and students, and his unstinting generosity in spending long hours assuming many time-consuming roles to serve the discipline he loved. Educational psychology is a better field as a result of his efforts.

REFERENCES


