Higher Education, Interpretation, and the Modular Mind

Susan E. Beers

Department of Psychology
Sweet Briar College

Until recently, psychological and educational theories have largely supported the lay intuition that our minds function as complexly integrated wholes. Now, cognitive scientists are questioning the assumption of a unitary mental structure, and proposing that the predominant architecture of the mind is modular.[1] These ideas about the nature of mental structures and processes have implications for learning, and thus for education. Although it is too early to assess the ultimate utility of either modular or unity points of view, the exploration of the implications of modularity for education may provide us with a new perspective on the complex processes involved in teaching and learning.

To date, Howard Gardner's[2] theory has been the modular approach most thoroughly examined for its educational implications, particularly with respect to the early school years. The purpose of the present essay is to explore some implications of the modular approach for higher education. Michael Gazzaniga's[3] theory will figure prominently in the present analysis. Gazzaniga's theory is particularly applicable to a redescription of the processes of higher education because of the central role it gives to the act of interpretation.

A Brief Overview of Modular Theories

Modular theories may most easily be understood when contrasted with unity theories. Unity theories of mind have dominated theorizing in psychology, philosophy, and education. Briefly described, they assume that the mind functions as an organized whole, that mental processes potentially have access to all the information in the mind.[4] For example, from this point of view one's perceptions are strongly dependent upon one's expectations, goals, and personal history. Some unity theories also assume that mental processes such as memory and problem solving function globally, in other words, that they are transferable from one domain to another. From this point of view, activities as different as playing the piano and designing a building are assumed to be served by many of the same psychological processes. Although the topic of consciousness is rarely addressed by cognitive scientists, some philosophical unity theories have assumed that one generally has access to mental processes and can report accurately about them.[5]

The assumption of a unitary mental organization can be seen throughout the literature on education. For example, the argument that the study of any particular discipline, such as Latin or mathematics, "strengthens the mind" rests upon a unity assumption.

Similarly, the teaching of critical thinking or any process as a skill separate from particular contents assumes a unitary mental organization if that skill is expected to generalize to various content areas. The assumption that self-conscious awareness is central to learning is also implicit in much educational theorizing. For example, the goal of teachers "to move the student into purposeful, conscious action"[6] assumes that conscious insight about the self and the conditions that control one's thought and behavior is broadly possible and accurate.

In contrast to the mental organization described above, modular theories propose that at least part of the mind is organized in relatively self-contained systems, called modules, which are domain specific. Modules may be innate and their activity may not be available to consciousness or penetrable by information from other cognitive sources. In other words, any given module may not have access to all the information in the mind. Clearly, modular theories cast doubt upon the utility of descriptions of the educational processes which rely heavily upon consciousness, or which assume that skills easily transfer across situations.

Modular theories vary along a number of dimensions. Although by definition modules are domain specific, theories vary in terms of what constitutes a domain. Jerry Fodor, for example, restricts domains and thus modules to highly specific functional units related to perception or language. In contrast, the modules defined by Gardner refer to broader constellations of cognitive abilities such as those required for the composition of music or scientific reasoning. Theories also vary in the degree to which they assume that modules are functionally independent, and in the extent and type of empirical support which they claim.

Gazzaniga's Conception of the Modular Mind

One of the most intriguing, if most speculative modular theories is that of Michael Gazzaniga. Like most modular theorists, Gazzaniga suggests that information may be processed simultaneously by a number of functionally isolated modular mental systems. In particular, affective reactions or behaviors may result from the processing of information by modules that are functionally separate from language-based consciousness.

The unique feature of Gazzaniga's theory, which makes it of particular interest to the educational theorist, is the role he assigns to a specific module that he terms "the interpreter." The interpreter is assumed to be a linguistic system, but it is not viewed as isomorphic with the centers of the brain which, to date, have been identified as responsible for the production and understanding of language. It is roughly akin to the "internal speech" that we may experience when we reason problems out, and that becomes externalized when we speak with others. Other modules, functionally isolated from the interpreter, may initiate feelings and behaviors. The interpreter module may have access to the results of the analyses of these other mental modules without being aware of the processes involved in the analyses, or the stimuli that initiated the analyses. The interpreter's role in these circumstances is to give an interpretation or explanation of the results—the feelings and behaviors—that the person experiences. According to Gazzaniga, the interpreter does this as a matter of course, offering plausible if sometimes incorrect interpretations. In sum, the interpreter's role is to offer a coherent account of oneself, and it presents such accounts even when it lacks adequate information

on which to base them.

Gazzaniga's theory was inspired by data from his research with split-brain patients who have had their *corpus callosa* (the bundle of fibers connecting the right and left hemispheres of the brain) severed as a surgical procedure to control specific forms of epilepsy. Although in everyday life such patients function normally, in the laboratory their special status can be observed when stimuli are directed to one side of the brain or the other. For example, most split brain patients cannot verbally identify objects visually projected to the right side of the brain, because speech centers are generally located in the left hemisphere. From research with split brain patients, a good deal has been learned about the capacities of the right and left hemispheres of the brain. Some have concluded that this research presents strong evidence that the mind is organized modularly.[7] Gazzaniga's own theory is, in part, based on studies in which different information is presented to the two hemispheres of the brain. For example, a split brain patient was asked to point to the one of several pictures which best "went with" the one he was shown on a projection screen. A slide of a snow scene was presented to the nonverbal right hemisphere, and the left hand, controlled by that hemisphere, pointed to a picture of a shovel. Simultaneously, a slide of a chicken claw was presented to the verbal left hemisphere, and the right hand, controlled by that hemisphere, pointed to a picture of a chicken. When asked to explain why his left hand pointed to a shovel, the subject reported, "The chicken claw goes with the chicken and you need a shovel to clean out the chicken shed."[8] While such evidence is consistent with the postulation of an interpreter module, Gazzaniga's speculation goes far beyond currently available data. At the same time, his theorizing is compatible with that from a number of other sources.

Gazzaniga's theory is reminiscent of Freud's view that feelings and behaviors may arise from the unconscious, while the conscious portion of the ego offers a rationalization for those behaviors. It is also compatible with dissonance theory in social psychology, and with a growing body of data from that discipline which suggests that people are inclined to "tell more than they can know" in interpreting their own behaviors. This social psychological research suggests that people willingly and confidently describe what in their view causes their behaviors, but that these causal accounts are often erroneous.[9]

Perhaps most important, Gazzaniga's theory is compatible with recent theorizing about the nature of emotion.[10] While for some time it has been assumed that feeling arises subsequent to cognitive operations, and may be dependent upon them, recent theorizing argues that feeling is the result of a modular process separate from, and prior to, cognition. In Robert Zajonc's words, feeling arises "early in the process of registration and retrieval, albeit weakly and vaguely, ... it derives from a parallel, separate and partly independent system in the organism."[11] To the extent that feelings are modular in origin, it may make sense to posit, with Gazzaniga, a separate module that connects feelings to linguistically-based consciousness.

Educational Implications

While Gazzaniga himself has not written about the implications of his theorizing for education, his work would seem to suggest a perspective on education with a decidedly hermeneutic and contextualist flavor.[12] From this perspective, the process of education may be described as one of influencing the interpreter to give

particular types of accounts of the world, accounts that gain their value from the academic cultures from which they grow. They may be the rational accounts for feelings or intuitions initiated by mental modules that do not have direct access to the language-based interpretive processes of the brain. The process of socializing the interpreter may occur throughout the school years, but it is particularly salient in higher education, where skills in analysis, synthesis and evaluation are in the foreground of the educational process.

Language is central to the concept of the interpreter, and central to education. In the words of Joseph LeDoux, language "is at the core of human subjective reality. It provides a universal code through which divergent subjective experiences can be commonly registered and thus woven into a coherent life study."[13] Of course, teachers use language constantly. They attempt to influence students by the written and spoken word, and look to students' speech and writing as evidence of educational attainments. But there are implications for education that go beyond this simple analysis. Development of the interpretive processes may be seen as the primary function of higher education; knowledge itself may be viewed as consisting of acts of interpretation. At its heart, learning may be conceived as involving the "mastery of a range of 'languages' or 'symbol systems' for the sake of ordering experiences."[14]

This claim leaves open the further epistemological status of the interpretations that bring order to experience. The renderings of experience advocated by the various academic disciplines may be viewed as bringing us ever closer to a single most accurate interpretation of reality. However, it is more common for those in academia to adopt a position of contextual relativism. From this pragmatic perspective, various ways of structuring experience gain validity from their usefulness or coherence with other views of the world, not from their correspondence with an unchanging reality. From this position, judgments about the utility of a particular rendering of experience are made in the context of a particular social community at a particular time and place. In the words of Gergen:

> The major criterion by which the validity of a given interpretation may be judged is the extent to which it accords with the prevailing rules of communication within the culture. In effect, interpretations may be rendered acceptable or unacceptable to the extent that they meet currently adopted standards of intelligibility.[15]

From either the realist or the pragmatic perspective, the academic disciplines may be viewed as social communities that have developed specific vocabularies for describing experience, and characteristic modes of justification, such as ways of using symbols to make arguments.[16] This vocabulary and style of reasoning is what teachers hope to transmit to their students. The process is similar to that described by LeDoux, Donald Wilson and Gazzaniga with respect to the development of the interpreter: "The process of psychological maturation in our culture is largely the process through which the verbal system learns to regulate, in accord with social standards, the behavioral impulses of the many selves that dwell inside us."[17]

When teachers eschew the rote learning of facts, and express the hope that students will come to think like members of their disciplines, they are, from this point of view, expressing a desire that

students take part in a particular linguistic community with particular standards of communication.

In summary, when extended to describe the educational process, Gazzaniga's theory suggests that education may be a process of influencing the interpreter to offer a particular mode of interpretation of experience. The type of thinking that we call rational, and its various manifestations in the styles of justification in our disciplines, is the academically appropriate account of one's feelings, beliefs and behaviors. Socialization into the academic community allows the interpreter to give such accounts, just as socialization into other communities develops the accounts it gives for other experiences. The student thus becomes initiated in the appropriate academic language of justification. From the perspective of Gazzaniga's theory, the interpreter develops a new vocabulary for describing the person's observations, actions, and feelings.

The above analysis casts the "cognitive development" of college students in a new light. Jean Piaget viewed mental architecture as unitary rather than modular[18] and William Perry, extending the Piagetian perspective, viewed cognitive development in the college years as involving global restructuring of students' conceptions of knowledge.[19] The process is described as one of cognitive transformation in which a student moves from viewing truth as absolute and as transmitted by authorities, to viewing truth as relative and contextual, dependent upon evidence and arguments. The transition from dualistic attitudes to those of contextual relativism may indeed be common as a student progresses through his college years, but it need not be the product of global mental restructuring. Rather, students may simply respond appropriately to the rewards and punishments meted out by their teachers in response to students' linguistic productions. If teachers reward expressions of contextual relativism students are likely to express them; however, other, nonverbal modules may not be affected.

Indeed, the rational justifications produced by a well-educated interpreter may be, in a sense, confabulations produced in response to the need to account for feelings or action tendencies caused by modules functionally separate from linguistic mental processes. As LeDoux argues:

> If the initiating circumstances of an emotional reaction were consciously encoded, the conscious self has a chance of understanding later emotional responses in similar situations. Even then the possibility for interpretive error arises. [Otherwise] the conscious self is left to its own devices to figure out the affective significance of an event. In doing so, finding a socially or personally acceptable interpretation often takes precedence over a correct interpretation.[20]

Feelings and preferences may arise quickly in response to relatively gross discriminations of stimuli.[21] In the educational process, students may have such quick emotional reactions to their teachers, to the material presented in class, or to their reading. Rational justifications or arguments take longer to arise than do emotional reactions. Such interpretive rational justifications may be grossly based on the initial preferences or emotions, but one's access to the stimuli or processes that produced them may be very limited. It is not surprising, then, that when asked to respond to academic material students' initial

reactions may be "I liked (or didn't like) it," and little more. The appropriate strategies for presenting arguments, that is, the skills of the interpreter, need to be explicitly trained.

The functional separation of emotion and interpretation modules offers an explanation for some of the difficulties in this tutelage. Zajonc suggests that preferences have an "inescapable character" that makes them "feel valid." Preferences also implicate the self concept because "they identify the state of the judge in relation to the object of judgment."[22] These factors make educating the interpreter a challenge. Students may not see the need for rational justification because of the belief that their feelings attest to their own validity. Challenges from the teacher to encourage the student to provide rational justification may be taken as attacks on the self. The hostility and frustration that students may experience can thus possibly be understood as a function of their unfamiliarity with the academic language, coupled with the effects of modular mental processes.

From the perspective of Gazzaniga's theory, we can also better appreciate the feeling that students may have, that academic work involves "game playing." Teachers require students to adopt styles of expression that they and their peers may not characteristically use. To survive in an academic community they may adopt this language, but it is not the only one available to them. Thus we may find that the linguistic productions of students have an "as if" character. Their rational, academically appropriate accounts exist alongside their previous languages of expression, adopted from their participation in other communities. Each may be called upon, depending upon the context in which communication is taking place.

Conclusion

In sum, if we conceive of the mind modularly, and in particular if we posit an interpreter module, the educational process is cast in a new light. In effect, education is seen as an indoctrination of the student into a particular style of expression that may be used to justify pre-existing preferences, and not solely as refining of the intellect to develop those preferences. The goal of educating the "whole mind" seems inflated if we construe the mind modularly, because the tools of education are largely the tools of language. Education may thus be best suited to influencing only a portion of the mind. To the extent that the present analysis speaks to the limits of education, one may find it discomforting. Education may expand the role of rational thought, but it is unlikely to make the mind rational.

But conceiving the mind modularly also opens possibilities toward clarifying the task of education. An educated interpreter is liberating. It gives one some sophistication in the wider culture of middle class life and work; it provides access into the linguistic communities of educated women and men. Higher education thus expands the worlds in which the individual may successfully function. In a perhaps more significant sense, new vocabularies for describing experiences increase one's options for self-description and self-expression. One or more academic languages may provide students with personally relevant meanings that enhance their lives.

Modular theory also has implications for goal-directed behavior. While modular theories do not assume that the interpreter always directs behavior, under some cases it certainly does so.[23] People consciously and verbally articulate goals and plans, and proceed to act upon them. An enriched vocabulary thus ultimately may provide behavioral

options that otherwise would not be available.[24]

Perhaps most important, education can make the interpretive process itself transparent. It can encourage students to reflect upon the ways in which meaning is ascribed to experience. Understanding the power of the languages of interpretation opens the doors to the creative reconstruction of experience, to new concepts and theories that create our culture. As Richard Rorty[25] has suggested, intellectuals are people who, dissatisfied with the languages in which they have been socialized, invent others. While the process of higher education will not ensure that all students become intellectuals, it can encourage the exercise of skills and the types of reflection that help them to become so.

SUSAN E. BEERS is Associate Professor in the Department of Psychology at Sweet Briar College, P.O. Box 14, Sweet Briar, VA 24505. Her primary areas of scholarship are philosophy and psychology of education and the teaching of critical thinking and writing.

1. See Noam Chomsky, "Rules and Representations," *The Behavioral and Brain Sciences* 3, no. 1 (1980): 1-15; Jerry A. Fodor, *The Modularity of Mind* (Cambridge, Mass.: MIT Press, 1983); Howard Gardner, *Frames of Mind* (New York: Basic Books, 1983); Michael S. Gazzaniga, *The Social Brain* (New York: Basic Books, 1985); Marvin L. Minsky, *The Society of Mind* (New York: Simon & Schuster, 1986).

2. Howard Gardner, *Frames of Mind*.

3. Gazzaniga, *The Social Brain,* Joseph E. LeDoux and Michael S. Gazzaniga, "The Brain and the Split Brain: A Duel With Duality as a Model of Mind," *Behavioral and Brain Sciences* 4, no. 1 (1981): 109-10.

4. Fodor, *The Modularity of Mind.*

5. A fuller description of these assumptions can be found in Owen J. Flanagan, *The Science of the Mind* (Cambridge: The MIT Press, 1984).

6. Donna H. Kerr and Jonas G. Soltis, "Locating Teacher Competency: An Action Description of Teaching," *Educational Theory* 24, no. 1 (1974): 6.

7. See Flanagan, *The Science of the Mind*; Thomas D. Nagel, *Mortal Questions* (London: Cambridge University Press, 1979); Roland Pucetti, "Brain Bisection and Personal Identity," *British Journal for the Philosophy of Science* 24 (1973): 335-55.

8. Gazzaniga, *The Social Brain*, 72.

9. Richard E. Nisbett and Timothy D. Wilson, "Telling More Than We Can Know: Verbal Reports on Mental Processes," *Psychological Review* 84, no. 3 (1977): 231-59; Lee Ross and Richard E. Nisbett, *Human Inference: Strategies and Shortcomings of Social Judgment* (Englewood Cliffs, N.J.: Prentice Hall, 1980).

10. See Nico H. Frijda and Jaap Swagerman, "Can Computers Feel?" *Cognition and Emotion* 1 (1987): 235-58; Nico H. Frijda, "The Laws of Emotion," *American Psychologist* 43, no. 5 (1988): 266-75; William B. Swann, Jr., "Identity Negotiation: Where Two Roads Meet," *Journal of Personality and Social Psychology* 53, no. 6 (1987): 1038-51; Robert B. Zajonc, "Feeling and Thinking:
Preferences Need No Inferences," *American Psychologist* 35, no. 2 (1980): 152-75; Robert B. Zajonc, "On the Primacy of Affect," *American Psychologist* 39, no. 2 (1984): 117-23.

11. Zajonc, "Feeling and Thinking,"154.

12. See Kenneth J. Gergen, *Toward Transformation in Social Knowledge* (New York: Springer-Verlag, 1982); "The Social Constructionist Movement in Modern Psychology," *American Psychologist* 40, no. 3 (1985): 266-75.

13. Joseph E. LeDoux, "Brain, Mind and Language," in *Brain and Mind*, ed. David A. Oakley (New York: Metheun, 1985): 210.

14. Maxine Greene, "Philosophy and Teaching," in *Handbook of Research in Teaching*, 3rd ed., ed. Merlin C. Wittrock (New York: Macmillan, 1986): 480.

15. Gergen, *Toward Transformation,* 193.

16. Paul H. Hirst, "Liberal Education and the Nature of Knowledge," in *Philosophical Analysis and Education*, ed. Reginald D. Archambault (London: Routledge and Kegan Paul, 1965).

17. Joseph E. LeDoux, Donald H. Wilson, and Michael S. Gazzaniga, "Beyond Commisurotomy: Clues to Consciousness," in *Handbook of Neurobiology* Vol. 2, ed. Michael S. Gazzaniga (New York: Plenum, 1979): 550.

18. Flanagan, Jr., S*cience of the Mind*.

19. William G. Perry, Jr., *Forms of Intellectual and Ethical Development in the College Years* (New York: Holt, Rinehart & Winston, 1986).

20. LeDoux, "Brain, Mind and Language," 213.

21. Swann, Jr., "Identity Negotiation"; Zajonc, "Feeling and Thinking."

22. Zajonc, "Feeling and Thinking."154.

23. Daniel M. Wegner and Robin R. Vallacher, "The Trouble With Action," *Social Cognition* 5, no. 3 (1987): 179-90.

24. Gergen, *Toward Transformation.*

25. Richard Rorty, *Contingency, Irony and Solidarity* (New York: Cambridge University Press, 1989).

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