

**Exploring the Dynamics of Organizational Learning:  
How an Instructional Reform Effort Influenced  
Teaching-related Organizational Memory Processes**

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# **Exploring the Dynamics of Organizational Learning: How an Instructional Reform Effort Influenced Teaching-related Organizational Memory Processes**

**Matthew Tadashi Hora and Anne-Barrie Hunter**

Consider an instructor sitting down to plan an upcoming course in organic chemistry for the first time. What information and related resources will she draw upon when making the syllabus, selecting course materials, deciding how best to use the course website, and choosing her pedagogical approach? Most likely she will consider features of the existing curriculum, including selected texts, prior instructors' notes and slides, course level, and student background. However, while research exists on curriculum design in postsecondary settings (Lattuca & Stark, 2009), little is known about the types of information and resources that come into play as instructors make critical decisions that will shape students' instructional experiences.

This is a critical issue in light of efforts to improve how courses are planned and taught at the undergraduate level so that they better reflect the pedagogical principles of what is known about how people learn (Bransford, Brown, & Cocking, 1999). These efforts are especially focused on encouraging faculty to adopt teaching practices based on these principles in the science, technology, engineering, and mathematics (STEM) disciplines, which many view as central to the nation's economic vitality and competitiveness (National Research Council, 2010). While evidence is beginning to suggest that some change in faculty teaching is taking place (Hurtado, Eagan, Pryor, Wang, & Tran, 2012), most researchers agree that widespread adoption of inquiry-based teaching has not yet occurred (e.g., Fairweather, 2008).

As a result, researchers are examining the reasons why the adoption of inquiry-based teaching methods appears to be slow and spotty, with initial evidence pointing to organizational factors such as constraints on time and a culture in the disciplines that inhibits faculty from adopting new teaching practices (Henderson & Dancy, 2007; Hora, 2012). This promising line of inquiry underscores the importance of understanding the nature of faculty work as it occurs "in the wild," as opposed to abstract theorizing about the nature of organizational change (Bastedo, 2012). Organizational learning theory is an approach that holds promise as an analytic lens through which we can identify the organizational factors that constrain and/or encourage faculty practice. Organizational learning theory applies concepts from human learning to that of organizations, and focuses on how organizations change and evolve (or not) in light of new information and experiences. A key aspect of organizational learning relates to the organizational memory, or how "organizations encode, store, and retrieve the lessons of history despite the turnover of personnel and the passage of time" (Levitt & March, 1988, p. 319). In organizations, information can be stored in various forms, and, over time, the retrieval of information from these repositories can become an entrenched feature of local practice (Walsh & Ungson, 1991).

Despite the promise of the organizational learning framework for elucidating critical features of faculty work, little empirical work exists that applies organizational learning theory to

teaching-related practices at the postsecondary level. Insights into these dynamics can be used to pinpoint specific organizational factors that can be altered or otherwise addressed by leaders to improve educational practice (Spillane, Reiser, & Reimer, 2002; Petrides, 2002), and even to estimate the effects of organizational reform initiatives. Indeed, some suggest that only changes involving entrenched procedures, such as those related to organizational memory, actually constitute sustainable organizational “learning,” which can lead to improved teaching practice (e.g., Argyris & Schön, 1974).

In this paper we address this gap in the literature by examining the nature of organizational memory functions related to course planning at a single public research university in the United States. Specifically, we examine the degree to which a single STEM education reform initiative, the Undergraduate Science Education (USE) project, influenced these functions. We chose to highlight a situation in which a reform was being attempted because it is through the collisions between new ideas and policies and the status quo that organizational functions and traditions are often brought into bold relief. In this study we analyze interview data from 20 STEM faculty using a structured approach to grounded theory and verbal analysis techniques to answer the following questions:

1. What is the nature of teaching-related organizational memory processes?
2. What do these memory and retrieval functions look like in practice?
3. To what degree, if any, did the USE project influence these processes?

We then consider the implications of the results for pedagogical reform efforts in postsecondary institutions.

### **Background: Organizational Learning in Higher Education**

Organizational learning has a long history in organization and administration science, but it is important to distinguish between the empirical research program of organizational learning on the one hand, and the managerial theory of the learning organization on the other hand (Kezar, 2005a). The empirical research program is generally focused on the investigation of the processes of organizational functions and change. In contrast, the learning organization approach is a more of a proscriptive approach to management that describes or advocates an idealized state of affairs. While the latter is grounded in the former, some consider the learning organization approach to be a popular yet fleeting management theory similar to Total Quality Management (TQM) (Birnbaum, 2000; Kezar, 2005a). While the concepts are certainly related, the long-standing research program of organizational learning is the main concern of this paper.

At its core, research on organizational learning focuses on the underlying processes of how organizations learn, change, and adapt (Levitt & March, 1988). Much of the research in this area was strongly influenced by advances in cognitive psychology, and concepts such as cognitive “scripts” and “schema,” which refer to mental representations related to particular

information stored as neural pathways in the brain, became widely used in the organizational learning literature (e.g., Gioia & Poole, 1984). The information processing theory of human problem solving (Simon, 1978), that likened human cognition to a computer in its use of short- and long-term memory and “if-then” rules of analysis, was particularly influential in the development of information-focused theories of organizational learning. For example, information processing theory focuses on the development of organizational systems to process information as a key function of organizational success in uncertain environments (Galbraith, 1977).<sup>1</sup> This approach emphasizes the role of information pertaining to organizational experience (e.g., established routines, effective strategies) in organizational functioning and improvement. This stored information is important for understanding organizational behavior because, once retrieved, it may act as “decisional stimuli” that elicit particular responses and actions (Walsh & Ungson, 1994, p. 61). Importantly, different types of information salient to organizational functions exist, including declarative knowledge (i.e., about something) and procedural knowledge (i.e., about how to do something).<sup>2</sup>

One appealing feature of organizational learning theory for education researchers is the prospect that an organization can in fact grow and evolve in a positive manner, and that these changes can be empirically studied to provide evidence for organizational improvement. When considering this application it is useful to understand the long-standing debate in the field regarding what constitutes evidence of learning and change. For some theorists, evidence of organizational learning is only apparent in the increased performance or observable changes in behavior, whereas others argue that changes resulting from learning may not be visible or immediately evident. For example, Huber (1991) argues that “an entity learns if, through its processing of information, the range of potential behaviors is changed” (p. 89). This focus on alterations to the mechanisms that underlay the potentialities of human behavior is similar to Argyris and Schön’s (1976) well-known distinction between single- and double-loop learning. In this view, single-loop learning occurs when an organization changes superficial behaviors or protocols but leaves internal norms and practices intact. In contrast, double-loop learning focuses on the internal mechanisms of the group or organization, and involves enacting changes to deeply held traditions, assumptions, and behaviors (Argyris & Schön, 1976). Interestingly, just as an organization may learn by altering entrenched behaviors, an “unlearning” process can be useful when organizations discard old and unproductive information or practices (Nystrom & Starbuck, 1984).

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<sup>1</sup> It is important to note that the information processing theorists did not advance an argument that organizations “learn” or “cognize” in precisely the same way that individual human minds do. In fact, this distinction has been vociferously debated, with some arguing that principles of decision making and cognition are fundamentally different at the individual and organizational levels (Glick, 1988; James, Joyce, & Slocum, 1988).

<sup>2</sup> Some scholars make distinctions among data, information, and knowledge (e.g., Petrides, 2002.) Exploring the differences and similarities among these concepts is beyond the scope of this paper, and we use information throughout this paper as a generic reference to the communication or reception of some type of “knowledge” (Merriam-Webster, n.d.).

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In delving more deeply into the specific processes of organizational learning, Huber (1991) argued that researchers should think in terms of information acquisition, distribution, processes of interpretation, and memory functions. In particular, organizational memory, or what Levitt and March (1988) call the recording and conservation of experience, is perhaps the most critical part of the learning process. This is due in part to the fact that most organizations experience personnel turnover and regular upheavals (e.g., course rotation procedures) that make the storage of information critical, because newcomers will draw upon these storehouses of information to guide their behavior.

Importantly, information can be stored in a variety of locations (Cyert & March, 1963). One way to conceptualize the different locations where organizational information can be stored was advanced by Walsh and Ungson (1991), who posited six different locations where organizational information is frequently stored: individual memory, cultural norms and practices, procedures, roles, artifacts, and external archives. To these we add human resources, which refers to the skills and knowledge represented by individuals that can be accessed by other organizational members (Gamoran et al., 2003). Overall, these different places where curricular information is stored can be thought of as the retention structure for organizational memory (see Table 1).

**Table 1. *The seven repositories where organizational information is stored***

<b>Individual memory</b>	Information stored in an individual's memory in the form of knowledge, beliefs, and other cognitive structures.
<b>Cultural norms and practices</b>	Ways of thinking and acting that are widely shared among group members.
<b>Procedures</b>	Specific steps for conducting activities.
<b>Roles</b>	Organizational titles and attendant responsibilities and expectations for behavior.
<b>Human resources</b>	Skills and knowledge represented by individuals that can be accessed by organizational members.
<b>Artifacts</b>	Physical objects and organizational infrastructure that represent, symbolize, or contain information.
<b>External archives</b>	Storage of information existing outside of the confines of the organization.

From these different repositories, information is retrieved during preparation for a task or during the task itself. This retrieval process can be thought of as either a deliberate, controlled process or an automatic, habituated process where decision makers are not consciously aware of how they retrieve information or from where. Once retrieved, the information enters into an active decision-making process and is thus subject to a variety of influences, including sociocultural and physical characteristics of the immediate task environment, as well as the preexisting cognitive attributes of the decision maker. That is, the prior experiences, knowledge, and beliefs of individuals will shape how the new information is interpreted and then used (Daft

& Weick, 1984; Hora, 2012). This process of interpretation highlights the fact that the organizational information, once retrieved, is not simply enacted into practice but instead undergoes a translation between the retention structure and task performance.

### **Educational Applications**

What constitutes learning is particularly salient in the field of postsecondary education, where the concept of organizational learning is widely viewed as a productive way to think about improving education. As noted, a distinction must be made between the empirical research program on organizational learning and the managerial theory of the learning organization. This distinction is particularly significant in higher education, given that many scholars use the terms interchangeably and/or refer to a collective of managerial strategies (e.g., TQM, management by objectives) (Kezar, 2005a). In a review of the literature, Kezar (2005a) found that most higher education researchers refer to the learning organization literature (120 of the papers reviewed), while fewer referenced organizational learning (58), and still fewer examples exist of empirical research on this topic. Instead, though there are empirical studies about the nature of organizational learning in postsecondary institutions, most researchers advocate for colleges and universities to become learning organizations (e.g., Boyce, 2003; Petrides, 2002; Kezar, 2005b). A promising line of inquiry that uses the organizational learning framework focuses on issues of equity and student learning. Bensimon (2005) analyzes individual faculty and their “cognitive frames,” which are seen as instrumental in shaping the ways in which they teach and think about student learning, all of which can “create the problem of unequal outcomes” (p. 101). A core idea motivating this work is that organizational learning is not about adopting new programs or best practices per se, but instead is dependent upon institutional actors changing how they think about students and learning.

Given that organizational learning is widely viewed as a productive way to study postsecondary institutions, several researchers have called for an expansion of empirical work in this area (e.g., Boyce, 2003). Yet any time that theory and/or method from one discipline is exported into another, we should try to ensure that the new application is grounded in the foundational discipline, which we strove to do in this paper. The utility and validity of the application of theories such as organizational learning to higher education settings is further enhanced by a focus on practice, which ensures that the analysis is not overly obtuse, theoretical, and removed from the realities of work in colleges and universities (Bastedo, 2012).

In this study we adopt an organizational learning framework to examine an activity that is common to all postsecondary institutions: course planning. The focus on course planning is important because of the centrality of curricular design to the instructional process (Lattuca & Stark, 2009). Course planning practices, such as creating course syllabi and selecting instructional materials and teaching activities, constitute the primary means whereby faculty design learning environments for their students. This activity is particularly amenable to analyses using the organizational learning framework in general, and the construct of organizational memory in particular. This is because, during the planning process, faculty retrieve information about the curriculum, course, and topic from various sources (i.e., the organizational memory).

## **Dynamics of Organizational Learning**

Besides documenting the nature of these processes, we investigate whether or not a particular project influenced the organizational memory functions among the faculty participants in our study. As noted, in situations where new information or policies are introduced, the processes of routinized practice (i.e., memory functions) can be brought into bold relief. Further, since the organizational learning framework can be used as a way to detect deep-seated changes to an organization, studying these processes in light of the USE project represents an opportunity to field test this framework as one approach to capturing project effects on a specific set of departmental functions. Thus, detecting whether or not instructional reforms such as the USE project altered these memory functions of storage and retrieval would indicate the degree to which the organization has “learned” or changed in response to the initiative.<sup>3</sup> Finally, insights into these issues can shed light on the processes of organizational change in general, and how faculty respond to innovations and new policy initiatives in particular.

### **Methods**

Our design is that of a qualitative case study, where the case is course planning and classroom instruction in math, biology, chemistry, geology, and physics at a large, public research university. The course component of interest is the classroom lecture, instead of discussion, laboratory, or tutorial sessions. The case study method involves an intensive analysis of a single bounded unit that draws upon a variety of data and perspectives in order to provide a rich and detailed account of that unit (Yin, 2008). Within the context of a case study design we adapt theory and method from decision-making research and the learning sciences to examine in depth the underlying decision-making procedures that inform course planning. Given that many real-world tasks (e.g., course planning) are dynamic and unbounded, and interviewer intervention is often required to keep respondents on topic, researchers of naturalistic decision making developed a technique called the critical-decision method that is a retrospective think-aloud procedure (Crandall, Klein, & Hoffman, 2006; Feldon, 2010). Researchers then analyze these data to identify themes or patterns in the structure and temporal nature of respondent cognition. For this study, we drew on the critical-decision method to craft the data collection protocols, and a combination of a structured approach to grounded theory (Strauss & Corbin, 2007) and the verbal analysis method (Chi, 1997) to analyze the resulting discourse data.

### **The Undergraduate Science Education (USE) Project**

The USE project was a department-driven change effort undertaken at the study site. The 5-year project was funded by a large private donation and led by science faculty members in collaboration with several departments. The project’s goals were to improve student learning outcomes by improving faculty members’ understanding of student learning, and to encourage the use of inquiry-based teaching practices and high-quality formative and summative assessments of learning. To achieve these goals, the USE project collaborated directly with

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<sup>3</sup> However, we cannot emphasize enough that this paper does not constitute an official evaluation of the USE project, given the lack of pre- and post-intervention data and other facets of robust evaluation designs.



departments, which had committed to participate in the change effort through successful submissions as part of a competitive proposal process. The central charge to participating departments was to identify a sequence of courses to be revised, generally starting with high-enrollment, lower-division undergraduate courses and then proceeding to upper-division courses. The revision process involved identifying and agreeing upon quantifiable learning goals for each course based on what the department wishes students to be able to do at the course's end. Central to this process was the hiring of several postdoctoral researchers who were located within each participating department. The researchers worked with faculty for two or three semesters to guide and support efforts to revise the selected courses, providing both intellectual and practical assistance.

### **Sampling Procedures**

The sampling frame for this study included 170 individuals listed in the spring 2012 timetable as the instructors of record for undergraduate courses in math, physics, chemistry, biology, and geology departments at the study site. We contacted individuals up to two times via e-mail, inviting them to participate. Ultimately, 20 faculty self-selected into the study. Of these, six were considered active participants in the USE project based on their participation in course revision activities, which we first identified from USE project records and then corroborated during interviews. Given the centrality of the USE project to the study, we contacted additional instructors from a list of participants provided by USE project staff, and four agreed to participate, which resulted in a total of 24 participants. We selected a final sample of 20 from this total based on the specificity with which they described their course planning activities. That is, four respondents were not included because of the excessive ambiguity with which they described their course planning. The final sample included 10 participants who had been active in the USE project and 10 participants who had not. This split sample was desirable in order to obtain a portrayal of organizational memory functions that were both potentially directly influenced by the USE project and those that had not been directly influenced (see information about the study sample in Table 2, next page).

### **Data Collection**

All data were collected in spring 2012. The first phase involved three researchers, led by the first author. The second phase, conducted by the second author, included interviews with the four additional participants in the USE project who were identified at a later date. All researchers underwent the same training procedures, which entailed in-depth discussions about research instruments and their use in the field. For this study we followed the critical-decision method approach by asking a focused question about a recently performed task, and then asking follow-up questions to delve more deeply into the decision-making process of each respondent (see Feldon, 2010). We used a structured-interview protocol that included the following key question that generally elicited an extensive account of the respondent's most recent planning activities: "Tell me the exact steps you took in planning your next class." This question was followed by probes that examined in greater detail the role of the course syllabus, course type, prior experience, and knowledge of educational research in shaping the respondent's planning process. These probes were based on evidence from the literature on the primary factors that influence

course planning (e.g., Stark, 2000). While we did not explicitly elicit information about organizational memory functions, the question resulted in rich data about respondents' retrieval processes and the sources from which they drew while planning their classes. Then, to explore if and how teaching-related professional development (e.g., the USE project) influenced respondents' planning procedures, we asked: "How, if at all, has your participation in professional development (or the USE project) influenced how you plan and teach?" Not all respondents had participated in such projects and thus not all answered this question.

**Table 2. Description of sample**

	n	Percentage
<b>Sex</b>		
Female	8	40%
Male	12	60%
<b>Discipline</b>		
Math	4	20%
Physics	3	15%
Chemistry	2	10%
Biology	7	35%
Earth/space science	4	20%
<b>Level of course</b>		
Lower division	14	70%
Upper division	6	30%
<b>Size of Course</b>		
1–50	8	40%
51–100	5	25%
101–200	4	20%
200 or more	3	15%
<b>Participation in USE Project</b>		
Yes	10	50%
No	10	50%
<b>Position type</b>		
Lecturer/Instructor (non tenure-track)	7	35%
Assistant Professor	3	15%
Associate Professor	2	10%
Professor	8	40%

## **Data Analysis**

The research team transcribed and entered all interviews into NVivo® qualitative analysis software. Our analysis drew on a structured approach to grounded theory, which involves a combination of inductive analyses of textual data and consideration of theory that is external to the data (Strauss & Corbin, 2007). We began by segmenting the complex transcripts into more manageable units. To do this, we used an inductive, open-coding process in which new codes were created from terms, phrases, or ideas in the text. To develop the initial codes the analysts reviewed five randomly selected transcripts and independently created a list of codes

that described higher-order categories that aligned with the interview questions (e.g., steps and processes in planning, effects of professional development). The first author applied the coding scheme to all 20 transcripts, then the analysts focused on the data coded as “steps and processes in planning” and “effects of professional development.” This involved an open-coding process whereby the analysts independently developed new codes from approximately 10% of the coded text. Each analyst then compared each successive instance of the code to previous instances in order to confirm or alter the code and its definition (i.e., the constant comparative method) (Glaser & Strauss, 1967). After coding the initial selection of data the analysts met to discuss their new codes and collaboratively developed a new code list. Then the analysts coded another 10% of the data and repeated this process of code revision until they developed a final coding scheme. Examples of codes included “personal experiences of the course,” “fine-tuning lecture notes,” and “inheriting course materials.” The results of an inter-rater reliability test showed that the proportion of instances where both analysts applied the same code was 89%. The first author then applied the coding scheme to all transcripts, which resulted in an extensive NVivo® library of coded text.

**Identifying characteristics of organizational memory and retrieval.** At this stage of the analysis, we began to consider how organizational learning theory could inform the interpretation of the data and at which point constructs such as organizational memory and retrieval entered into the analytic process. That is, the codes (and thus the organizational memory and retrieval functions as reported in this paper) were not originally derived in light of this theoretical framework, but were identified through an inductive process. We later used the theoretical framework to interpret these findings. Using this theory as a guiding framework we re-analyzed the themes identified as core components of planning in order to identify the primary components of the retention structure according to the framework set forth by Walsh and Ungson (1991). Thus, we mapped the codes onto these bins: individual, cultural, procedural, structural, artifactual, and archival. For example, we mapped the theme of “personal experiences of the course” as a key factor shaping course planning onto the memory bin of “individual memory” and so on, until the results indicating the nature of the organizational memory structure were identified. Then, to identify the nature of information retrieval functions, we examined specific references to the individual retrieving information from these sources in order to prepare for the course.

**Identifying temporal steps in routines.** Next, we sought to identify how organizational memory and retrieval functions operated in practice. To do this we used the verbal analysis technique of Chi (1997), which is a variation of protocol analysis that uses discourse-based data to identify structural features of human cognition. This is similar to causal network analysis, which is an approach for identifying relationships between concepts in a graphic and time-ordered fashion (Miles & Huberman, 1994). For this analysis we revisited the data coded as “steps and processes” and identified clearly demarcated steps in how respondents planned their courses. Not all respondents provided sufficiently detailed data, which resulted in a more limited dataset (n=18). These data represented “decision chains” for each individual, comprising specific components of his or her planning activities, and 75 unique decision components (e.g., use lecture notes) were identified across the entire set of 18 transcripts.

We then analyzed the resulting decision chains to identify patterns or overlaps, with “use lecture notes” and “revise lecture notes” the most common components reported by respondents. The decision chains that included one or both of these codes were visually depicted in order to examine the structure and temporal nature of course decision making (see Figure 1, p. 14). This approach involves graphically depicting the decision steps as a network map (see Chi & Koeske, 1983, for a seminal example of this method). It is important to note that the resulting displays represent the accounts of a relatively small number of respondents from the study, and should not be extrapolated to entire departments or institutions within the study sample, or viewed as definitive accounts of action and behavior within these administrative units.

**Identifying the effects of the USE project.** Finally, we analyzed the sections of the interviews coded as “effects of professional development” to identify whether or not the USE project or other similar initiatives had any demonstrable impact on organizational memory or retrieval functions at this institution. Using the inductive analytic techniques described earlier (e.g., open-coding, constant comparative method), the analysts first identified instances where respondents clearly attributed a change in their course planning activities to the USE project. Thus, the analysts did not infer effects but instead relied on respondent accounts. These statements of attribution were mapped onto the bins of the retention structure used in previous analyses.

### Limitations

Limitations to the study include a small, self-selected sample and the reliance on self-reported data to analyze course planning procedures and the effects of the USE project. The issue of self-selection is difficult to avoid in field-based research such as this, and we attempted to address the possibility of collecting data only from faculty engaged in teaching-related activities by creating a split sample, though we recognize the limitations of this approach. Ideally, planning procedures could be observed “live,” but practical considerations precluded this possibility for faculty participating in the study. Finally, the reliance on respondent self-reports of the effects of the USE project was unavoidable, given the lack of a pre- and post-project evaluation established at the inception of the project.

### Results

Results from the analysis are reported in four sections: first, the retention structure for teaching-related information; second, the retrieval functions that faculty use to access these repositories; third, patterns in how these memory and retrieval functions operate in practice; and, fourth, the degree to which the USE project influenced these memory and/or retrieval functions.

#### The Retention Structure for Organizational Memory

First, we report the types of repositories where curricular information was stored. The locations and the frequency with which they were referenced are depicted in Table 3. What these data demonstrate is not only the form that the retention structure takes but also the type of curriculum-related information that is stored in organizational memory. Essentially, the retention

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structure includes information about what to teach, how to teach, what works in the classroom, and what resources or materials to use.

**Table 3. Key repositories of the organizational memory**

<b>Individual memory</b>	Personal experience of course (16)	Teaching objectives (14)	Criterion for selecting teaching methods: nature of student learning (10)	Criterion for selecting teaching methods: importance of engagement (10)	Organizational constraints: role of large class sizes (10)
<b>Cultural norms and practices</b>	Peer norms and expectations (17)	Colleagues' expectation re: canon (7)			
<b>Procedures</b>	Individual autonomy (10)	Determining content (10)	Fixed curriculum (5)		
<b>Roles</b>	Position/status and time (16)				
<b>Human resources</b>	Teaching and faculty development programs (12)	Community of like-minded peers (7)	Experienced colleagues (2)		
<b>Artifacts</b>	Own materials (12)	Inherited materials (7)	PowerPoint slides (7)	Notes (4)	
<b>External archives</b>	Educational research (10)	Textbooks (5)	Online resources (3)		

**Individual memory.** Respondents reported individual-level modes of storing information that include personal experience, knowledge and beliefs, and perceptions of organizational constraints. Sixteen respondents recalled drawing upon their personal experiences with a given course when planning the next one. These experiences pertained to successful (or unsuccessful) lectures or activities, difficult topics for students, and so on. For fourteen respondents, memory of what worked in past classes helped form their teaching objectives. For example, one respondent stated that she consistently tried to engage students during class period, and that recalling her use of this technique guided much of her planning for her next courses. The respondents also reported that their knowledge and beliefs about the nature of student learning (10 respondents) and the importance of engagement during class (10 respondents) were criteria they used when selecting their teaching methods. Finally, organizational constraints to teaching represent another type of decision information based on individual memory. Ten respondents perceived that large classes inhibited their ability to use interactive teaching methods, and this perception represented a constraint to their planning.

**Cultural norms and practices.** Decision information can also be “stored” in cultural forms, particularly the shared expectations and beliefs among members of a group that constitute high-status knowledge (Weick, 1979). Seventeen respondents reported that their colleagues held general expectations regarding teaching and learning, such that these norms represented a clearly identified body of information within their departments. More specifically, seven of these

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respondents reported that these norms pertained to colleagues' expectations regarding the canon of their discipline and the topics that should be taught to undergraduate students. These expectations were perceived as so strong as to be beyond debate, such that determining the curriculum for certain courses was as simple as selecting a canonical text.

**Procedures.** Procedures in an organizational memory context refer to the information inherent within the steps that individuals and groups follow when performing tasks. In regards to course planning, 10 respondents reported that one of the most salient procedures was the autonomy afforded to them by their departments. That is, instructors were largely left to their own devices when planning and then teaching their courses, with few, if any external requirements to be met. Conversely, another 10 respondents observed that procedures existed in their departments for determining the content included in a course syllabus. These procedures included curriculum committees that made decisions about courses on a regular basis, or department-wide policies regarding the undergraduate program and desired aptitudes and skill sets. For some courses a fixed curriculum was in place, such that procedures for course materials (e.g., textbook), assessments, and even classroom activities were predetermined (five respondents).

**Roles.** Decision information can be stored in organizational roles through the responsibilities and tasks assigned to a particular position or title. For 16 respondents in this study, their position and its attendant obligations was salient to course planning largely due to constraints on the time they could spend on teaching. Of these respondents, seven were tenure-track faculty and nine were contract lecturers. Each had different duties and demands on his or her time, but all felt that their roles by definition enacted constraints on their time available for designing their courses and preparing for specific classes.

**Human resources.** The human resources repository of decision information refers to the expertise and knowledge of colleagues and co-workers that are available to faculty. For 12 respondents, information about teaching and learning was available through teaching-related programs at their institutions. Seven respondents reported that a community of like-minded peers within their departments or institutions served as a resource for curricular information. Additionally, these communities provided a support system for faculty engaged in instructional improvement. Finally, two respondents noted that departmental colleagues who previously taught the course were an important source of information.

**Artifacts.** Decision information about the curriculum is also stored in physical artifacts. For 12 respondents, their own materials (broadly described as collections of notes, slides, and other materials) for a particular course were an important repository of information. Another seven respondents noted that they inherited these materials from other instructors. In regards to specific types of curricular artifacts, respondents reported PowerPoint slides (seven) and lecture notes (four) as important sources of information.

**External archives.** Curricular information could also be stored outside of a given department or institution. Ten respondents reported that the educational research literature helped

them glean insights into effective teaching strategies. Another five respondents reported that textbooks helped shape the sequence and content of their courses. Finally, three respondents reported that they regularly drew upon online resources (e.g., other faculty's course websites, online libraries related to teaching) when planning courses.

### Processes of Information Retrieval

Next, we report the different processes whereby faculty retrieve curricular information from the different storage bins of organizational memory. These processes include creating or developing new plans, refining or “fine-tuning” existing plans, and enacting the plans in the classroom.

**Plan development.** One way respondents retrieved curricular information was during the development of new course syllabi and/or individual lesson plans. Twelve respondents described retrieving information from a variety of sources when developing new plans: creating new PowerPoint slides (seven respondents), formulating new questions (seven), making new lecture notes (six), establishing new learning goals (six), and selecting new examples or problems (four). For example, when formulating new questions, both for use with clickers as well as verbal questions, some respondents drew upon experienced colleagues for advice (human resources), inherited materials (artifacts), and new knowledge about student learning (individual memory). The important point is that the retrieval process centered on the development of a new plan.

**Adapting existing plans.** The most widely reported retrieval process did not involve developing or creating new class plans. For 13 respondents, planning largely involved fine-tuning or “tweaking” materials that already existed in some form, such that planning took relatively little time or effort. These materials were retrieved either from respondents' existing stockpile of slides, notes, and other media, or from colleagues, often those who taught the course the previous semester.

In this course, when I first agreed to teach it, I went to who had taught the course before and talked to them about what should be in the course and what text was used. What they did was give me the word files with their course notes and I went through them and fine-tuned them.

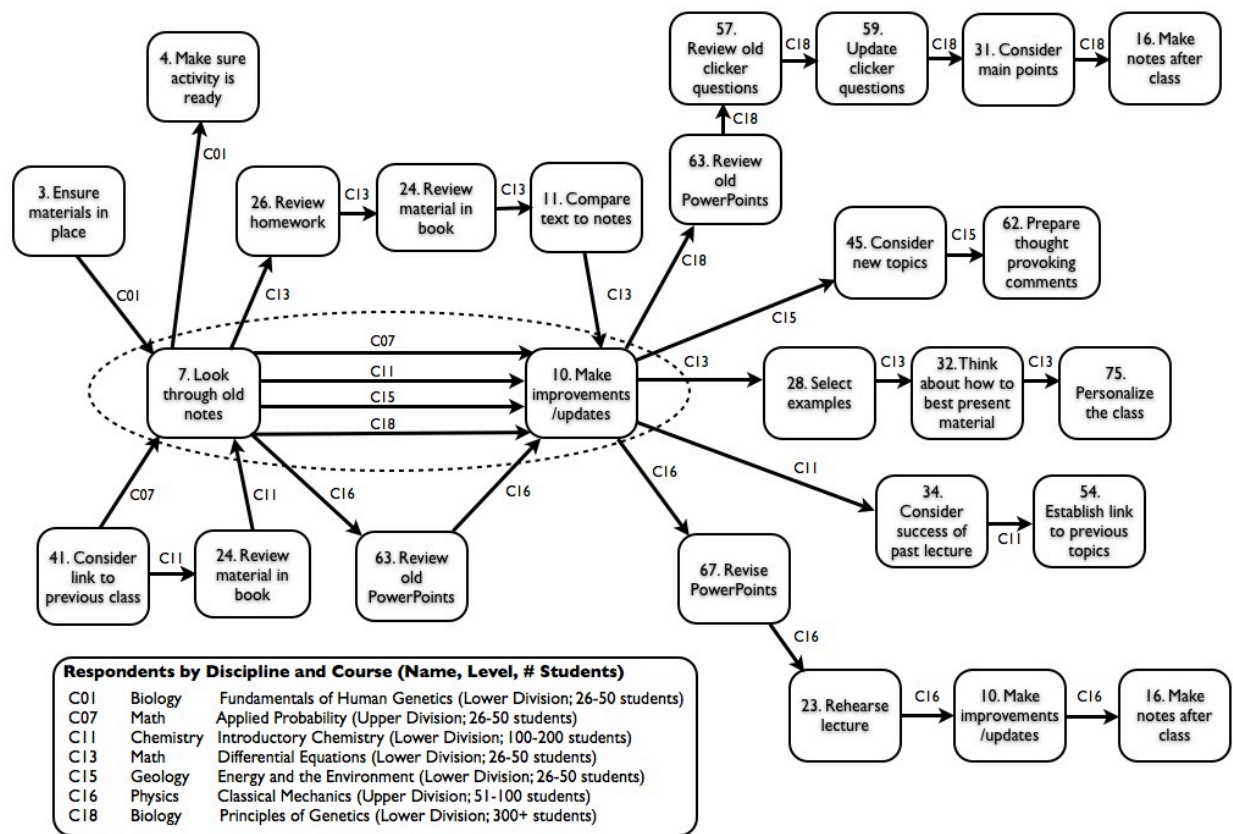
Where respondents made alterations to their own materials, this was sparked by external events, including student reactions to prior classes (eight respondents), new developments in the discipline (eight), poor student performance (six), and post-class reflections about what worked (or did not work) in a particular class (three).

**Plan enactment.** Finally, curricular information is also retrieved in the classroom itself, where lesson plans and materials are enacted in front of students. This is another layer of retrieval beyond the earlier stages of plan creation or fine-tuning. For 10 respondents, the retrieval process involved a direct transmission from their notes and/or materials to their

instructional behaviors. Two of these respondents directly copied their notes onto the blackboard, whereas another three simply used their plans as a loose guideline for their teaching.

### Patterns of How Curricular Information Is Retrieved in Practice

While it is important to document the nature of the memory retention structure and related retrieval processes, it is by tracing the actual flow of decision making and information retrieval that we can arrive at an accurate portrayal of organizational memory-in-action. In this section we present results from a thematic network analysis of the steps that respondents went through while planning, and if/how aspects of organizational memory were engaged. Eighteen respondents provided clear indications of the temporal process of their planning, and the most common “chain” of planning steps involved two themes: looking through old lecture notes and updating these notes. These themes were reported by a total of seven respondents, either as a direct link between the two themes (four respondents), an indirect link between the two themes (two), or only as a reference to a single theme (one). Taking these seven respondents’ planning procedures, it is possible to see in the aggregate patterns in planning, and the degree to which the retention structure and/or retrieval processes were involved (see Figure 1).



**Figure 1. Decision steps for course planning: How curricular information is retrieved from the retention structure in practice.**



## **Dynamics of Organizational Learning**

The figure depicts the processes whereby individuals retrieved curricular information from the retention structure while planning their classes. Each decision chain (i.e., sequence of boxes) represents this process for an individual instructor, as depicted by his or her code in the study sample. Within each box is one of the 75 decision steps identified in the analysis of the entire sample. For example, respondent C01 (a biologist teaching a genetics course) reported the following steps in her planning: ensuring materials were in place, looking through old notes, and then making sure class activities were ready. Respondent C11 (a chemist teaching an introductory course) reported a more complex sequence of steps, but shared the common theme of looking through old notes. Indeed, each of the seven respondents depicted retrieved curricular information that was stored in the artifacts bin—lecture notes. These artifacts were either the result of prior experience teaching the course, or were inherited from prior instructors. As a result, this process implicates two other aspects of the retention structure: individual memory (personal experience of the course) and human resources (experienced colleagues). These results highlight the importance of preexisting curricular artifacts in shaping how some faculty in the study sample plan their courses. As one biology faculty describes this process:

Since this is my first semester teaching I took many colleagues' advice, which is to start with somebody else's notes. So I start with those, and then I take a look at the homework assignment, look at the book and see what the students will be asked to do, and compare that to my notes. At that point I revise, maybe introduce new examples or replace examples. And then it becomes a question of how am I going to present that content? And to personalize the teaching for myself, hoping that the way I understand it offers an alternative way for them to see it as well.

This quote illustrates how a single instructor fine-tunes existing notes. Besides retrieving information from existing notes to update them, the respondent also draws upon other resources, such as the textbook and beliefs about student learning. Importantly, as discussed above, all seven respondents depicted in Figure 1 referenced the core process of looking through notes to fine-tune them as a sort of habituated or automatic practice. This behavior was described by many, especially those who had taught for several years, as part of their routine for preparing a course or individual classes. Interestingly, two respondents (C16 and C18) described altering these notes immediately after the class, and adding new notes to the lecture notes about what worked or did not work in the class, which reflects an effort to update these artifacts based on reflection about the efficacy of their own teaching practices.

### **Effects of the USE Project on the Retention Structure and Retrieval Practices**

Finally, we consider the influences of the USE project on the elements of the retention structure and subsequent information retrieval processes. By examining organizational memory functions in places where reforms are being attempted, we can illuminate local practices and procedures that influence the success of these initiatives, and track changes in the organizational memory as a way to assess the depth and sustainability of reform efforts.

**Changes to the retention structure for organizational memory.** In this section we review self-reported changes to the seven different elements of the retention structure (see Table 4).

**Table 4. Effects of USE project on the repositories of organizational memory**

<b>Individual memory</b>	Helped establish learning goals (7)	Changed personal teaching objectives (6)	Changed criterion for selecting teaching methods; nature of student learning (2)	
<b>Cultural norms and practices</b>	Changed peer norms and expectations (12)	Changed colleagues expectations re: canon (1)		
<b>Procedures</b>	N/A			
<b>Roles</b>	N/A			
<b>Human resources</b>	Increased knowledge base within department (11)	Facilitated growth of community of education-minded faculty (7)		
<b>Artifacts</b>	Created new course syllabi (5)	Created new “packets” of materials (4)	Created new assessment materials (4)	Created new clicker questions (3)
<b>External archives</b>	Increased exposure to educational research (5)			

**Individual memory.** Seven respondents reported that they developed new learning goals for their courses through their participation in the USE project. Once learned, these goals are stored in the memories of the instructors as they plan and teach their courses. Similarly, six respondents reported that they altered their personal objectives and rationale for teaching in general, not for a specific course, as a result of their involvement in the USE project. This change came about through increased knowledge and appreciation of the learning theory and the educational literature. Finally, two respondents stated that the criterion by which they selected teaching methods changed. In contrast to previous criterion that hinged on efficiency and tradition, these faculty instead considered whether or not a particular method had been demonstrably linked to student learning.

**Cultural norms and practices.** Respondents claimed that the USE project influenced two features of cultural life related to curricular decision making. First, 12 respondents reported that the expectations and norms related to teaching and learning evolved from an almost exclusive focus on research to one that also acknowledged the value of teaching. These respondents attributed this shift in cultural norms in part to the USE project, as well as other campus-wide initiatives focused on teaching and learning. Second, one respondent noted that the USE project’s efforts led directly to a change in how some of her colleagues viewed the canon of their discipline regarding introductory courses. These colleagues altered their previous focus on covering a broad range of topics to accommodate an emphasis on what could be taught well during a semester-long course. Importantly, this change was not uniformly observed across the

department, as some in the department pushed back and argued that covering the entirety of the canon was of primary importance.

***Human resources.*** One of the most notable effects of the USE project on organizational memory was the increase in teaching and learning resources available to the respondents. These included human resources (11 respondents) in the form of postdoctoral researchers who were widely viewed as representing a substantial increase in the knowledge base of teaching and learning within departments. Thus, through hiring and “planting” these individuals within departments, the USE project immediately enhanced the local human resources for curricular information. Another impact of the project included the facilitation of a community of like-minded instructors focused on education within STEM departments (seven). This community was viewed as an important resource that provided a local support system and knowledge base.

***Artifacts.*** The USE project impacted the artifactual forms in which plans were made and stored, including new course syllabi (five respondents), packets of materials (four), assessment materials (four), and clicker questions (three). Two departments participating in the project are making a concerted effort to archive these materials for future use.

That’s why I’m trying very hard to create materials that are easy for another faculty member to make sense of.... It should be obvious to them why this helps. And it should be easy for them to find and use, so we’re trying not to write 10-page instructor guides. We’re making it freely available, and we’re trying not to go overboard.

For this instructor, the storage of the new curricular materials in physical form was a critical part of the pedagogical reform process, as she recognized that instructors coming to a new course often seek out materials from previous instructors, yet in this department no formal mechanism existed for archiving curricular artifacts. However, the instructor also observed that by simply storing these materials, one could not assume that a new instructor would adopt them. Instead, the person would need to be motivated to adopt these admittedly complex and demanding materials. This underscores the importance of the retrieval process and how the presence of high-quality curricular information in the retention structure may be a necessary antecedent to adoption, but not a guarantee.

***External archives.*** The USE project influenced how five faculty drew upon an external source of curricular information—that of educational research. Prior to their involvement with the project, these individuals had little exposure to either formal learning theory or educational research in their disciplines, both of which provided a new source of knowledge upon which they drew when planning their courses.

***Changes to the retrieval of curricular information.*** Of the seven respondents whose information retrieval practices are depicted in Figure 1, three had been engaged with the USE project (respondents C01, C16, and C18). Each drew upon preexisting materials, including lecture notes, PowerPoint slides, and clicker questions when planning their classes, and each reported that the USE project influenced the development of these materials. This included the

articulation of student learning goals that became the groundwork for course syllabi and all subsequent materials such that lecture notes, slides, and clicker questions were explicitly linked to these goals. Thus, through leading faculty to articulate learning goals and embed them within their course materials, the USE project directly shaped the artifactual repositories of curricular information. When respondents began to plan future classes they drew upon these resources. That is, the USE project did not directly influence the nature of the retrieval process itself, but instead it led to alterations in the information sources that were habitually tapped as part of these processes. It is important to note that two instructors observed that the traditional ways in which curricular information are retrieved (i.e., in an unstructured fashion by instructors who rotate in and out of courses) were significant barriers to the realization of the USE project's goals. This was due to the lack of guarantees that the new instructors would adopt the newly created materials, or have the pedagogical training to use them proficiently in the classroom.

### **Discussion**

In this paper we presented a new approach to studying organizational change and learning at the postsecondary level that emphasizes the importance of how curricular decision information is stored and retrieved. This approach results in an account of faculty practice that offers analytic possibilities and applications for researchers and policymakers.

#### **A New Model for Understanding Organizational Learning in Postsecondary Settings**

The concepts of organizational learning and the learning organization are commonplace in the educational literature, yet the lack of conceptual clarity and grounding in the foundational literatures of organization and administrative science inhibits the utility of the theory for research and application in higher education. The approach described in this paper moves beyond a singular focus on individual cognition or notions of individual learning applied to postsecondary institutions (e.g., Bensimon, 2005; Kezar, 2005b) to a more comprehensive accounting of organizational functions and the role of information storage and retrieval. A particular contribution of this study is the integration of multiple levels of organizational functions (i.e., micro, meso, and macro) without privileging any single level in describing how organizations “learn” and change. That is, by focusing on individual level decision making as it occurs within the sociocultural and organizational contexts of postsecondary institutions, a multilevel account of social practice is possible. Given that faculty operate within a complex intersection of influences, including disciplinary, professional, and organizational (Austin, 1996; Umbach, 2007), it is critical to account for the multiplicity of factors that shape curricular decision making.

#### **The Multiple Repositories of Curricular Information: “Soft” and “Hard” Memory Functions**

The flow of information between the stored memory and its use in planning a course or class is an important feature of teaching that dictates what is taught in the classroom and how. One the most important findings from this study is that curricular information is not stored in a single location or format. Instead, information about what and how to teach is stored in formalized systems and artifactual or physical forms (i.e., the “hard” memory) as well as in informal systems and individual and/or sociocultural forms (i.e., the “soft” memory). While

planning for a course or a class, individuals will likely draw upon both sources of information. For example, a chemist in our study (respondent C11) drew upon both soft (i.e., memories of previous class topics and successes) and hard (i.e., old notes and topics in the syllabus) repositories of information when planning a class.

To understand the nature of organizational change, it is important to distinguish between the two types of memory functions, and the ways in which faculty retrieve information from them. An exclusive focus on hard memory sources, such as student evaluations or course syllabi, which is possible given the ease with which hard memory sources can be identified, will lead faculty to overlook a significant portion of the information available to them as they plan their courses. That is, less tangible soft memory sources, such as cultural norms and the obligations linked to organizational roles, can also play a considerable role in faculty decision making. However, even entrenched beliefs and cultural norms must interact with the technical and structural features of departments and institutions, such that the hard and the soft features of organizational life and information co-exist in an interactive and even recursive dynamic.

### **Retrieval Functions and Enactment: Plan Creation and the Role of Artifacts**

Another important finding is the centrality of curricular artifacts in the information retrieval process. That is, the regular pattern of retrieving old lecture notes and subjecting them to fine-tuning or “tweaking” is a dominant mode of planning practice. This highlights two critical features of organizational learning: the importance of artifacts and the habituated nature of many organizational routines.

First, curricular artifacts play a considerable role in dictating how faculty approach course planning. This suggests that once an instructor creates lecture notes, PowerPoint slides, and clicker questions, he or she is highly likely to return to them time and again. Retrieval of preexisting artifacts is understandable given the limited time faculty members have to prepare courses. While it is beneficial for well-designed materials to have an enduring impact on an individual’s teaching and subsequent experiences for students, poorly created materials will have a similarly long-lasting, though this time negative, impact. As we have seen, artifacts exert a strong influence on teaching and learning, as instructors new to a course often inquire about preexisting notes, slides, and other artifacts and adopt them to a greater or lesser degree.

Second, the tacit and habituated nature in which curricular information is retrieved is an important factor to consider in relation to organizational learning. While the data do not provide evidence that the retrieval of information from lecture notes was automatic, the respondents did describe it as recurring and habitual. One respondent characterized the retrieval and refinement of lecture notes as “just something that I’ve always done,” which shows that this common practice is a deeply ingrained and non-problematic behavior for some individuals. This finding highlights the role of habit, which can supersede or override controlled or conscious decision-making processes (Bargh & Williams, 2006). Over time these can become internalized as unconscious decision rules or heuristics, such that, when particular situations are encountered (e.g., being unexpectedly assigned a new course), habit may dictate individual behavior (Greeno,

1998). This may be particularly true in academic settings, where time constraints on faculty press individuals to constantly seek ways to make their work more efficient. In research universities, this is particularly the case with teaching, which generally takes a backseat to research. As one respondent stated, having course materials “in the can” that could be easily retrieved each semester made her teaching much easier.

### **Implications for Educational Improvement at the Undergraduate Level**

Besides contributing to the theory of organizational learning in higher education, the approach described in this paper has implications for efforts to improve education. Specifically, we suggest that this approach can be used to complement existing metrics for program evaluation and to diagnose leverage points for new change efforts.

**New metrics for studying change.** Educational reform efforts traditionally gauge project efficacy by measuring particular formative and summative indicators. For an initiative such as the USE project, these could include the number of faculty involved in course transformation activities or project effects on faculty teaching practices and/or student learning outcomes. While we do not suggest that these measures are insufficient for evaluating the ultimate effects of an initiative, metrics for capturing if and how an intervention influenced the underlying mechanisms that support organizational behavior are rarely integrated into educational evaluations. That is, measures that could demonstrate that an organization has “learned” or has demonstrated some degree of double-loop learning (Argyris & Schön, 1976) are rarely seen. Given the centrality of organizational memory functions in supporting faculty practice, measuring changes to how curricular information is stored and retrieved would provide insights into these matters. Thus, we consider that one of the hallmarks of the effectiveness of initiatives such as the USE project in influencing teaching and learning is its influence on the core organizational functions of memory storage and retrieval as they pertained to course planning (e.g., new course syllabi).

However, in considering the effects of specific projects on these memory functions, it is important to remember that these functions are the result of a complex array of factors, including departmental history and tradition, institutional policy, disciplinary expectations, and so on. While a single initiative such as the USE project could be viewed as influencing or affecting these memory functions, it will be extremely difficult to attribute changes in these processes to any single factor. For example, the USE project was not the only pedagogy-related initiative underway at this particular institution. Other factors that may have contributed to changes in memory functions included supportive departmental leadership that predated the initiative. Taking these contextual factors into account, measuring changes in how curricular information is stored and retrieved can show project impact.

**Diagnostics for identifying leverage points.** An organizational learning framework sheds light on specific organizational processes and elements that strongly shape how and why faculty do what they do. Such descriptions can act as a diagnostic account of curricular decision making that organizational leaders can use to support or alter particular leverage points (e.g., policies governing course rotations) that can lead to educational improvement (Spillane,

## **Dynamics of Organizational Learning**

Halverson, & Diamond, 2001). This perspective is based on the notion that successful interventions are those that are well aligned with and responsive to features of existing practice, rather than top-down changes that ignore the daily realities of faculty work (e.g., Fishman, 2005). Recent evidence shows that some STEM faculty are resistant to the efforts of teaching-related reforms because of a top-down approach to change, which highlights the importance of paying close attention to the existing features of faculty work (Henderson & Dancy, 2008). We suggest that because organizational memory plays a critical role in instructional practice, efforts to improve teaching and learning will need to engage or otherwise alter these organizational processes in order to meet their goals. For example, if preliminary scans of a department targeted for change indicate that faculty within that department habitually use catalogued PowerPoint slides when preparing their courses, then efforts to improve teaching would be well served by focusing on improving these materials. Efforts that ignore these habituated practices by introducing innovations that are at odds with these practices are likely to be met with outright resistance or poor fidelity to the goals of the initiative (Rogers, 1995).

Initiatives should not take a scattershot approach to influencing teaching and learning with no clear strategy or rationale about the targeted specific practices and the organizational factors that support them. However, we do not suggest that altering a single component of organizational memory (e.g., lecture notes) will result in wholesale transformations to faculty practice. Thus, specific features of organizational memory should not be viewed as determinants of faculty behavior but as factors that individuals negotiate while planning. That is, memory functions do not “cause” teaching behaviors in the sense of a unidirectional notion of causality, but they are instead an integral feature of behavior that includes individuals’ navigation of their sociocultural and organizational milieu (Greeno, 1998; Martin, 2011). This distinction is important because educators and policymakers would be well served by appreciating the complexity of organizational functioning while also being attentive to those factors that seem to play an outsized role in how faculty go about planning and teaching courses.

## **Conclusions and Next Steps**

Organizational learning is a valuable lens through which to analyze and understand faculty practice. The foundational literatures of the theory clearly indicate that organizational learning is much more than the application of principles of individual learning from cognitive science to organizations, or a singular focus on whether or not individuals learn and grow. Instead, organizational learning refers to changes in the complex interplay between individual cognition and the specific sociocultural and organizational contexts in which they work. Research on this topic in postsecondary institutions is in its infancy, and insights into how distinct organizational features such as finance, governance, and student affairs interact with individual practice hold great promise for improving the field of higher education’s understanding of processes of organizational change and improvement.

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