2014

BEYOND THE FIVE-MINUTE UNIVERSITY: IMPROVING LEARNING IN OUR MIS CLASSES

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Abstract:

In a classic *Saturday Night Live* skit in the seventies, Don Novello, in character as Father Guido Sarducci, skewered higher education by proposing to open the "Five Minute University." The institution would teach basic statements which students would parrot back, in effect achieving what they would have retained five years after graduation. The skit was a huge success for Novello, because it characterized the state of learning in higher education at that time.

Over thirty years later, we seek to understand what is necessary for MIS students to truly *learn* and find that the discipline's conceptualization of learning remains largely consistent with the practices mocked in the skit. Although academia's main mission is to educate students, many faculty continue to rely on pedagogies that focus on memorization, and on assessments that focus on students parroting back answers. This essay explores the components of learning as outlined in Ambrose et al. 2010, applies them to MIS, and makes recommendations to the discipline for improving student learning.

Keywords: learning, pedagogy, teaching, formative assessment, summative assessment

I. INTRODUCTION

> *I find that education, it don't matter where you go to school, Italy, America, Brazil, all are the same -- it's all this memorization and it don't matter how long you can remember anything just so you can parrot it back for the tests. I got this idea for a school I would like to start, something called the "Five Minute University." The idea is that in five minutes you learn what the average college graduate remembers five years after he or she is out of school….*
>
> *You know, like in college you have to take a foreign language….Say if you want to take Spanish, what I teach you is "¿Como está usted?" that means, "how are you", and the answer is "muy bien," means "very well." And believe me, if you took two years of college Spanish, five years after you are out of school "¿Como está usted?" and "muy bien" is about all you're gonna remember.*
>
> *So in my school that's all you learn. You see, you don't have to waste your time with conjugations and vocabulary, all that junk. You'll just forget it anyway, what's the difference?*
>
> --Don Novello (as Father Guido Sarducci)

Satire relies on humor and irony to identify problematic behaviors, but it can only be successful if the audience recognizes an element of truth in its presentation. The raucous reaction to the above skit indicated the ersatz priest was on to something. But a main goal of satire is to expedite change. Thirty-five years after the skit aired, we find that the pedagogy mocked in the skit is still widely used not only within MIS, but within academia as a whole. As university tuition increases and society scrutinizes the outcomes, we explore the question: How can MIS faculty improve student learning?

A main concern of this essay is that MIS faculty (and academia in general) continue to utilize ineffective pedagogies, which results in students who are not only disengaged in the learning process, but are also 50% more likely to fail [Freeman et al., 2014]. We present this paper as a mechanism to trigger discussion and seek solutions on how MIS as a discipline can better incorporate best practices in student learning, as well as become a model for other disciplines.

II. WHAT IS "LEARNING"?

To frame our exploration, we adopt the definition of learning from the book *How Learning Works* [Ambrose et al., 2010: p. 3]:

- *Learning is a process, not a product. However, because the process takes place in the mind, [faculty] can only infer that it has occurred from students' products.*
- *Learning involves change in [students'] knowledge, beliefs, behaviors, or attitudes. This change unfolds over time; it is not fleeting but rather has a lasting impact on how students think and act.*
- *Learning is not something done* ***to*** *students, but rather something students themselves do. It is the direct result of how students interpret and respond to their* ***experiences****—conscious and unconscious, past and present [emphasis original].*

Learning is a process. Faculty assume that if students do well on a test, they have achieved mastery of the material. Surprisingly, such an assumption is often not warranted. Novello satirizes the rote memorization of material in preparation of an upcoming exam, which he equates to "learning." Research has shown that much of what is memorized is quickly forgotten [Roediger, 2014].

Unfortunately, academia commonly relies on approaches that encourage surface understanding. Summative assessment provides a grade, but is not effective in instilling learning. In contrast, formative assessment—in the form of constructive feedback for improving—is much more conducive to learning, but is underutilized [Black and William, 1998; Cardelle and Corno, 1981]. Exercises that encourage students to try and to fail without retribution are much more likely to result in longer term understanding and learning. Exam results can be improved by engaging students in low-stake quizzes, instead of simply asking them to recall information [Roediger, 2014]. This "retrieval practice effect" instills knowledge much better than lecture or review sessions. Interestingly, students highlighting and reviewing material creates the illusion of studying, but does not instill knowledge because the material is not practiced [Roediger, 2014]. Formative assessment also tends to be iterative, in that students continue to improve previous work and build on previous successes by correcting mistakes [McKendree, 1990]. In this manner, formative assessment becomes a longitudinal indication of performance, can instill changes in long-term memory, and can be more a more valid indicator of performance than a single graded deliverable. We discuss formative assessment more extensively later in the paper.

Learning has a lasting impact. The second part of the definition notes that for students to learn, a permanent change in the students' mental model must have occurred. This goal is in direct contrast with the "pedagogies of knowing" (e.g., lecturing on the material, teaching through PowerPoint), which can actually inhibit learning [Freeman et al., 2014]. Fundamentally, academia must adopt a more rigorous definition of what the term "understand" means. Eric Mazur, a renowned Harvard physics professor, discovered that students who "understood" Newton's third law (i.e., had passed his test) still failed to understand how to use the concept in real life—e.g., what happens when two heavy trucks collide at 50 miles per hour.[1] In other words, he found that they had memorized the concept, but still hadn't incorporated the concepts into their mental model of the world. Similarly, a common practice in MIS is to present a theoretical framework via lecture, and assume students understand that it should inform their thinking and guide their decision-making process after they graduate. In the management of technology class, for example, students may "understand" stakeholder analysis in that they can identify the correct answer on a multiple choice test (or even write a short essay about it), but still fail to understand how to later apply the framework in managing a difficult development project on their first job. Can they transfer their learning to different situations, extending and applying their knowledge [Demirer and Sahin, 2013]?

Learning is what *students* do. The last point in the definition reinforces that to improve learning, we need to focus on what the students—not the instructors—do.

> *Learning results from what the student does and thinks and only from what the student does and thinks. The teacher can advance learning only by influencing what the student does to learn.*
>
> *--Herbert Simon (Nobel Prize Winner, as quoted in Ambrose et al., 2010: p. 1).*

The differentiation of teaching and learning is important: to construct a lasting mental model, students must teach *themselves.* The faculty member's primary responsibility is to create a supportive learning environment [Ambrose et al., 2010]. Ironically, faculty who focus on teaching may actually be *undermining* student learning. A common faculty sentiment is that active learning techniques are not practical because they take too long, and instructors need to cover the content. The assumption is that if a faculty members *teach* the content, students have *learned* the content. In reality, research indicates that covering more content tends to dilute students' attention which encourages them to engage in shallow learning [Schwartz et al., 2008]. Moreover, the more time the instructor allocates for teaching (i.e., tells students what they need to know), the less time students will have to actively engage in the material, which again encourages shallow learning (e.g., memorization) [Schwartz et al., 2008].

A focus on teaching represents an acceptance of the knowledge transfer of learning—i.e., that an instructor can foster learning by telling students what they need to know. Research has indicated that the knowledge transfer model of learning is inefficient at best and ineffective if the goal is learning [Freeman et al. 2014]. In contrast, the constructionist learning model posits that for students to incorporate concepts into their long term memory (a necessary condition of deeper learning), they must interact extensively with the material. Such incorporation is unlikely to occur through lecture, textbook perusal, material highlighting, and other passive methods that focus primarily on content delivery and student memorization.

III. THE GUIDING FRAMEWORK

What factors can truly foster learning? *How Learning Works* [Ambrose et al. 2010] presents seven principles that can assist faculty in improving student learning (pp. 4-6). We explore each within an MIS context, and provide suggestions for how MIS faculty might improve student learning.

[1] Because both trucks are travelling at 50 mph, students commonly believe that the resulting force on the driver would be twice the force of hitting a standing object (say a brick wall). In fact, the force from the action (the collision) is the same, so the reacting force will be equivalent. Newton's Third Law explains this.

Principle 1: Students' Prior Knowledge Can Help or Hinder Learning

Students never enter a class with a blank slate. They draw on experiences from other classes, internships, and other life experiences. Research has demonstrated, however, that prior knowledge can both help and hinder students when taking classes.

Many MIS classes have prerequisite classes to ensure students have foundational knowledge. Faculty often complain that students don't remember the information, even if they took the class the previous semester. Even if the students remember that the material was covered, they often lack the expertise to incorporate it into their work.

Consider the situation where students are taking a senior implementation class, which assumes that students can connect a website to a database. There are many factors which can affect students' ability to recall this information. Assuming the instructor in the prerequisite class *described* how to connect, students will likely not know *how to do it*. This illustrates the difference between declarative knowledge (what I know) versus procedural knowledge (knowing how to do it as well as when I should do it) [DeJong and Ferguson-Hessler, 1996]. Conversely, students may also know how to do something, but not really understand what they know. A common example is generating a PivotTable in Excel. Students may be comfortable generating the table (the how), but may not understand what the table represents, or when the information could be useful. It is important to note that since the "what" and the "how" are self-evident to the instructor, she will likely not understand why students cannot demonstrate both. We discuss unconscious competence later in Principle 4.

Students learn faster and retain concepts longer when they can connect new material to prior concepts [Vygotsky, 1978; Bransford and Johnson, 1972; Resnick, 1983]. For these reasons, a review assignment, albeit even small, may be necessary to activate the prerequisite concepts [Bransford and Johnson, 1972; Dooling and Lachman, 1971; Gick and Holyoak 1980]. In the case of activating a skill (e.g., database connectivity), a hands-on formative assignment during class may be needed. Once completed, the class could conclude with a discussion on how teams completed the connection.

Ironically, the presence of prior knowledge can impede the acquisition of new knowledge, since students may assume their previous knowledge is valid across all contexts. For students who have previously connected a webpage to a database, this knowledge may limit them to their known approach. The student will likely not appreciate that there are multiple methods available. Students will tend to gravitate toward the known and proven, instead of researching the best approach in the new scenario.

Principle 2: How students organize knowledge influences how they learn and apply what they know.

The structure of the traditional MIS curriculum encourages the teaching of component skills first. Students exercise these skills within the relevant class context (e.g., programming classes, then database, then systems analysis). Because these concepts are taught as distinct classes, students' mental models will mimic this structure.

Within the senior project class, therefore, students will likely lack an understanding of how component skills integrate. Integration of component skills (e.g., requirements elicitation, data modeling, process modeling) is in itself a skill that must be learned. Each of the component skills plays a role within the SDLC stages. Students may be confused that although they learned programming first, coding on the project occurs last. Students may not understand that the SDLC is not just an academic theory, but a guiding framework for structuring a complex business problem.

Faculty can help students organize their knowledge by providing a contextual flowchart or template. Alternatively, students could create a concept map that documents their understanding of concept hierarchy. The syllabus can present the course in modules, with the component skills placed appropriately. The main point of this principle is that faculty structure material within its broader context to structure student learning. It is important to recall, however, that this structure can also affect student understanding—and therefore, the extent that they can recall and utilize critical MIS concepts.

Principle 3: Students' motivation determines, directs, and sustains what they do to learn.

Motivation is the personal investment a person has in reaching a desired outcome [Maehr and Meyer, 1997]. Faculty can take constructive steps to enhance student motivation, which will result in a more engaged classroom experience.

A student's level of motivation is a function of his expectancies and the perceived value of the learning goals [Ambrose et al, 2010]. An expectancy is the student's perception of the likely outcome [Bandura, 1997]. Expectancies in turn depend on the students' perception of their own efficacy to complete the task, as well as the relevant outcome expectancies. For example, if a student believes she lacks the skills to do well on a test, she is much less likely to "waste" time preparing for the test. Even if the student believes she has the skills, if the outcome expectancies are negative (e.g., the test will be graded unfairly, the tests tend to be disconnected from the material), motivation will drop. The perceived value of a goal interacts with expectancy to determine the student's motivation level.

In producing a student's level of motivation, expectancy and value are moderated by the perceived supportiveness of the learning environment. Faculty who are perceived to be supportive (attends office hours, is personally accessible) will enhance motivation. Student teams can also improve perceptions of the learning environment, since peers can provide a level of support beyond the instructor.

Table 1 illustrates that students will be motivated to achieve a class goal ONLY if they see value in the goal, have high levels of efficacy, and perceive a supportive learning environment [Ambrose et al., 2010]. If value is lacking, students will respond in either a rejecting or evading manner. For students who have low self-efficacy, their response will be disengagement and apathy, a common rejection response. For students who have high efficacy, the response will be evasion—for example, texting in class or completing the minimum amount of work required.

For students who perceive value, those who have low efficacy will respond in either a hopeless or fragile manner, depending on the perceived level of support. Students with high levels of efficacy, however, will respond in a defiant manner. The defiance may be manifested in an overt manner (rolling the eyes, snickering, snide comments), or more passive (sleeping in class).

To foster motivation, faculty must learn to utilize the three levers. Real clients for final projects can add to perceived value. Charities and other service learning options can be a synergistic method that provide intrinsic value for the student. Faculty can also bring in guest speakers. Real value can be established by encouraging the speaker to connect the course goals with real projects at the speaker's company. This can provide significant credibility that achieving the course objectives will provide value to the job-seeking student.

For students to have positive expectancies, faculty expectations must be clear. The syllabus provides one mechanism to achieve this, but grading clarity is another. If possible, the grading standards should be distributed with the assignment so that students know what to expect. An approach for clarifying exam expectations is to provide example questions a week before the exam. This scaffolding can provide a basis for students to study, as well as remind them of

Table 1: Motivation

		Learning Environment			
		Not Supportive		Supportive	
		Students Don't See Value	Students See Value	Students Don't See Value	Students See Value
Student Efficacy Level	Low	**REJECTING**	**HOPELESS**	**REJECTING**	**FRAGILE**
	High	**EVADING**	**DEFIANT**	**EVADING**	**MOTIVATED**

Rejecting: Characterized by disengagement, apathy, alienation.
Evading: Completing minimal amount of work, texting in class
Defiant: Disrespect, "I'll show you" attitude
Fragile: Feigning understanding, hiding in class, making excuses
Hopeless: No expectation of success, disengagement from class, absenteeism
(from Ambrose et al., 2010)

important concepts. Example questions can also provide the basis for the exam review, by having student teams reach a consensus on the correct answers. This technique encourages students to debate and defend their perspective, and it also provides suggestions for questions during the exam review session.

To create a supportive learning environment, instructors must communicate to students that they care about their learning. We believe that students should be encouraged to ask any question at any time. Even basic questions can uncover a fundamental gap in students' learning—and therefore, a blind spot in the instructor's teaching. This is great formative opportunity to understand what students understand.

Instructors should also seek opportunities to provide constructive and non-judgmental feedback on students' performance. Faculty can also provide opportunities by providing challenging homework assignments, but allowing students to start work on the assignments in class in teams. The feedback and discussion throughout the class provides scaffolding for students to complete the task on their own. These sessions also allow the faculty member to engage in triage—that is, encouraging the students who need the help the most. The importance of feedback is discussed further under Principle 5.

Principle 4: To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned.

Mastery is the attainment of a high degree of competence within a particular discipline [Ambrose et al., 2010:95]. To achieve mastery, students must achieve the following:

- Competence in component skills
- In addition to *how*, an understanding of *when* and *why* the component skills are used.
- Practice integrating the component skills within appropriate contexts

Although mastery is a goal that all MIS faculty desire for their students, an instructor's mastery can be a detriment when attempting to create an effective learning environment (Table 2). New college students are in a state of unconscious incompetence--not knowing what they don't know with regard to MIS concepts and skills. As the student progresses, however, she becomes

Table 2: The Effects of Mastery

		MIS Competence/Skills	
		Incompetence	Competence
Knowledge Awareness	Unconscious	I don't know what I don't know (MIS Freshman)	I don't know what I know (MIS Faculty)
	Conscious	I know what I don't know (MIS Upperclassman)	I know what I know (New MIS Faculty)

From Ambrose et al. 2010: p. 97.

increasingly aware of what she doesn't know (conscious incompetence).

In contrast, new MIS faculty members recall not only what they know, but why they know it (conscious competence). At some point, however, the faculty member loses that context, and concepts become increasingly self-evident (unconscious competence). They subsume their understanding of "how" with the more contextual (and experiential) understanding of "why" and "when". Faculty in effect operate at a higher and more complex conceptual level than the student, and this results in a lack of understanding of why students don't understand the obvious.

MIS faculty forget that students may have studied the concepts once, six to twelve months in the past, and that the context may differ. For example, if activity diagrams were taught within the context of the systems analysis and design class, students may understand *what* they are and *how* to do them. But within the context of the senior project class with a real client, they may not understand the *why* and *when*—that is, when they should be used and why they can clarify inefficiencies in the client's business processes. Students may also not understand the larger context—that is, the role activity diagrams play within the larger MIS project. In short, students at this point do not exhibit mastery, because they lack a full appreciation of *when* and *why*—in addition to the more basic *what* and *how*.

As discussed in Principle 2, the MIS curriculum is structured to provide component skills in the foundation courses. The resulting hierarchical mental models in students can, however, endanger the achievement of MIS mastery. As mentioned earlier, because foundational concepts are presented within disparate courses, students must be given an opportunity to practice integrating their disparate skills, therefore achieving the transfer of knowledge. Even a small amount of practice can have a considerable effect on the students' performance.

One method to encourage movement toward mastery is for faculty to present information in different ways so that students can build on those limited mental models. One example might be for students to contrast inheritance within object-oriented with supertype-subtype models within relational databases. Are they the same? Different? Similarly, a management of technology class could utilize process modeling to better understand the steps necessary to encourage organizational change. Such practices will improve the interconnections in the concepts, as well as allow students to apply the concepts across different contexts.

Principle 5: Goal-directed practice coupled with targeted feedback are critical to learning.

When MIS faculty approach a problem, they implicitly set a goal: I want to learn to play the guitar, or I need to cook dinner for twenty people. In college classes, however, the clarity of the goal from the students' perspective is often less concrete. In a Java programming class, for example, a goal for a particular course segment might be to understand for-loops. To the instructor, this might make perfect sense, but there are levels of understanding:

- Understand the format of a for-loop
- Create a for-loop that prints out the numbers 1 through 10.
- Search the elements of an array and determine whether or not a specific value exists in the array.
- Create an algorithm that finds the square root of any real number.

The above go from concrete to more conceptual, as well as from knowing (memorization) to doing (analysis and synthesis of concepts). The last two goals actually do not mention for-loops, requiring the student to identify that iteration is needed. Without clarification from the instructor, students will tend to gravitate toward learning the first two, given that they are the easiest. They are also the most likely to result in shallow learning, since the students can memorize the answer. Instructors will tend to gravitate toward the latter two, which are more conceptual and involve higher order thinking. Such a contrast in focus results from a lack of goal clarity. Stating goals in terms of what students must be able to do—not in terms of what they need to know—may help direct students' efforts.

Once the goal has been clearly specified, the student will need assistance in achieving that goal. Practice toward that goal (the amount of practice is often underestimated by both students and faculty) is essential. Feedback—either from an instructor or the relevant environment—is one of the most effective mechanisms for fostering learning. Whether it be from hitting the ground when learning to ride a bike, a friend who tells us our shirt doesn't match our pants, or a college professor who encourages her students to dig deeper on a class project, timely and corrective feedback can be immensely valuable in guiding students' future efforts.

Principle 6: Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning.

In the introduction, we discuss our guiding definition of learning and state that the instructor's main responsibility is to create an environment conducive to learning. In creating that environment, instructors must be aware that students may be at different levels of ethical and intellectual development [Perry, 1968]. These different levels of cognitive development are important for the learning environment because faculty often expect a high level of understanding complex concepts which may be beyond the students' maturity [Battaglini and Randolph 1987].

In Principle 4, we noted that faculty's unconscious competence can blind them to students' lack of understanding. In addition to this dichotomy in intellectual maturity, a gap is also likely present for social and emotional maturity. Early in the course, students will have a natural reticence to ask questions, since they lack conceptual understanding and the instructor's response is an unknown. Students will fear being mocked or dismissed by peers or the instructor, and it will take only one such incident to shut down future inquiries. To create a supportive learning environment, faculty must strive to make uncertainty safe [Ambrose et al., 2010] by not only encouraging questions, but providing students a basis for doing so. Instead of simply asking for questions, faculty might provide scaffolding options that create a foundation for insightful questions. In an alternative to a traditional quiz, for example, the instructor might follow up the individual quiz with the option to take the quiz as a group. Groups must then reach a consensus answer. The reporting back after the quiz will allow the instructor to compare and contrast answers across teams.

Another source of frustration for students is the perception that grading is subjective. As mentioned in Principle 3, students' motivation is directly affected by their outcome expectancies. If they perceive that grading is arbitrary, motivation will diminish. Instructors might provide examples of previous assignments, which can provide a comparison for the students. Providing a clear grading rubric may also suffice.

Student teams can improve the class' overall climate. To avoid performance equity issues, we encourage faculty to consider moving team exercises *into* class, instead of assigning them outside of class. After assigning a problem at the start of class, the faculty member might select one team to present their proposed solution. Other teams can then critique the approach. If some concepts are still unclear, the instructor can give a mini-lecture for 10-15 minutes to clarify the outstanding concepts. This approach can dramatically improve the effectiveness of lecture, since the knowledge transfer occurs after the students have worked within the domain, and therefore within the learning context. Students will also feel more confident in and capable of asking questions, since they will have a stronger basis for their inquiry.

Instructors often complain about student inattention during class, especially involving the use of laptops and mobile phones. We have seen some draconian policies implemented to punish students' texting, for example. The emotional maturity levels of students do support instituting limits on the use of technology during class, and such practices can interfere with other students' learning. But we would also argue that repeated violations of the policy are a warning flag about the effectiveness of instructor's learning environment. Students are communicating that class is boring, lacks relevance, and is too faculty-centric. Instead of punitive measures, we suggest first exploring options for involving students more in the learning process.

Principle 7: To become self-directed learners, students must learn to monitor and adjust their approaches to learning.

Catalina: Dr. Smith? Can I talk with you about my grade on the first programming exam? The one on Chapters 1 through 5?

Dr. Smith: Sure. What can I help you with?

Catalina: Well, I got a 42%. I did terrible on the programming section. I've never gotten such a low grade in my life. I read the chapters five times and highlighted the important sections that you said would be covered. I even created flash cards and studied with my teammates. I'm thinking I need to drop the course….

All college faculty have had a similar conversation with students. The first concern is a disconnection between student and instructor expectations on what was covered on the exam. As discussed in Principle 5, instructors must be very clear when conducting summative assessments so that students understand the instructor's expectations regarding learning. Catalina focused on strategies that encouraged memorization—not problem-solving and analytical thinking. If Dr. Smith's exam focused on *knowing* the content within the assigned chapters, Catalina might have been fine. If Dr. Smith expected Catalina to *solve a problem* using the chapters as a reference, then the result should not be surprising. Catalina is convinced that she "studied." Her misguided approach is not uncommon among students, since memorizing is easier to accomplish than analysis and synthesis.

To alleviate these misconceptions, faculty should consider providing in-class formative exercises that reflect upcoming exam questions. Early in the process, instructors may provide scaffolding through team collaboration, which will enable students to judge their understanding versus their peers. This result can be shared, adding scaffolding to the problem. When preparing for a test, faculty should allocate the same amount of time that will be available on the exam, which will encourage self-assessment.

Dr. Smith's clarity of the scope of coverage may also be problematic. Simply stating, for example, that exam coverage is Chapters 1 through 5 is usually ineffective, since this content may span over one hundred pages. Recall that mastery involves the contexts of not just *what* and *how*, but also *when* and *why*. If Dr. Smith is truly striving for deep learning and mastery, it may be beyond students' abilities to master that amount of material, across the desired contexts, and within the allotted time.

To anticipate a rejoinder to this perspective, what if an instructor doesn't expect mastery? That is, aren't there some concepts that students just need to know? Our response would be that anything that is known is likely to be soon forgotten. Everyone can find any fact with their smartphones. In a provocative TED talk video ("Building a School in the Cloud"), Sugata Mitra posits that the pedagogies of knowing have become obsolete. Teachers should not teach, but should instead provide encouragement and interesting questions for students to solve. The instructors' other responsibility is to avoid inhibiting learning by getting out of the students' way.

Another facet is that students need to become self-learners in order to become life-long learners. As students progress, graduate, and work, they will increasingly be required to teach themselves. To truly learn how to learn, students must first accept that they are responsible for their own learning [Pascarella and Ternzini 2005]. Consistent with this view, we have come full circle in this paper: we reiterate that our primary responsibility as educators is to create an environment that encourages students to learn. We need to point them in the right direction, but then get out of their way. Instead of focusing on content coverage, we need to shift to mastery of key concepts. Instead of teaching, MIS instructors must foster student engagement, deep learning, and concept mastery of the critical concepts that provide anchor points for their future learning.

IV. CONCLUSION

This paper embraces the criticism that Don Novello successfully targeted at academia over thirty years ago. The purpose is to use a rigorous definition for learning and to examine what the MIS discipline needs to do to embrace student learning.

We acknowledge that if faculty were to adopt our suggestions for improving learning, they would not have sufficient time to cover the material in a traditional MIS course. Indeed, Father Sarducci mocks the breadth of coverage common in college courses: why cover a lot of material when students will only remember only a few concepts anyway? We again believe that he is on to something. Faculty do tend to focus on content delivery over content mastery, and we argue that this focus on content coverage comes at the expense of learning. We therefore propose that MIS coverage should *shrink* and that faculty should focus only on the most important concepts that provide future anchor points for students to explore on their own. Of course, depth of coverage should increase, so that students can achieve true mastery. Consistent with our definition, such an approach should increase—not decrease—learning.

Consistent with this idea, we note that faculty historically have focused on content objectives, which translate into what we want students to know. Process objectives—skills that transcend discipline—are consistently listed as the true value of higher education. Students need to solve problems, think critically and analytically, and communicate effectively. These skills are more attainable using student-centered pedagogies, and arguably cannot be achieved through lecturing.

We believe that learning should be fun, but that educational practices in higher education have removed much of the wonder. We often hear faculty complain that students want to be spoon fed: they don't want to do anything. We disagree. We believe that MIS students are motivated, but that they expect faculty to propose interesting questions to answer. Toward the end of Sugata Mitra's wondrous video, he states:

> *…I think we need a curriculum of big questions….There was a time when Stone Age men and women used to sit and look up at the sky and say, "What are those twinkling lights?" They built the first curriculum, but we've lost sight of those wondrous questions. We've brought [education] down to [knowing] the tangent of an angle. But that's not sexy enough. The way you would put it to a nine-year-old is to say, "If a meteorite was coming to hit the Earth, how would you figure out if it was going to or not?" And if he says, "Well, what? how?" you say, "There's a magic word. It's called the tangent of an angle," and leave him alone. He'll figure it out.*
>
> *--"Build a School in the Cloud," Sugata Mitra.*

Interestingly enough, nine-year-olds still have that joy that comes from intellectual exploration, but somehow as a society we drum it out of them. By the time that nine-year-old reaches high school, learning has become something to tolerate, not to savor.

Hence, the "Five Minute University" still has validity. But we see encouraging trends that could render it a historical anachronism. Faculty are moving content delivery outside of class and adopting more engaging pedagogies. Resources such as MOOCS (Massive Open Online Courses) and Khan Academy are providing new resources that relate to students and provide any-time learning. This exodus of classroom content frees up time for more hands-on opportunities. In turn, faculty are embracing innovative approaches such as problem-based learning, team-based learning, project-based learning, and flipping the classroom. All these techniques engage students and encourage learning by posing interesting questions for students to explore.

Perhaps MIS (and academia) has reached a junction point. We encourage MIS faculty to rethink their educational expectations: what impact are they *really* having on their students? What do they *really* expect that their students can do six months after class ends? Is that good enough? In the spirit of our three part definition of learning, we encourage faculty to expect and strive for deeper learning. We encourage faculty to engage students' interest—not punish them for providing cues that class is not living up to their expectations. And finally, we encourage faculty to expect and enable student mastery by creating a learning environment that is fun and rewarding…and then get out of their way.

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