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In this issue:

Encouraging Students to Learn on the Fly in CIS courses

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Encouraging Students to Learn on the Fly in CIS Courses

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Abstract

The field of Information systems (IS) is a rather dynamic field and learning-on-the fly represents an increasingly necessary skill for people working in it. Graduates need to be able to learn new tools quickly, adapt readily to adaptations in systems and efficiently use their personal resources to allow themselves and their organizations to respond competitively to their environment. Faculty teaching CIS courses need to create an environment that facilitates this sort of learning. Undergraduates acquire skills more easily if required to practice them in several of their computer information systems (CIS) courses. They need to experience learning-on-the-fly in real world ways, practice self-directed fast learning, and begin to feel comfortable doing so. Learning-on-the-fly can be added to a CIS curriculum with a few additional resources, primarily time.

Keywords: Learning, learning-on-the-fly, education, pedagogy, CIS curriculum, self-directed learning

1. INTRODUCTION

Best practices documented by ITIL (Information Technology Infrastructure Library) indicate that value is added when a business improves its "ability to adapt quickly to new requirements." (Office of Government Commerce, 2007) Similarly, value is added individually and collectively when a person improves his/her ability to adapt quickly to new requirements. One part of this ability to adapt involves learning quickly when facing a situation that requires knowledge or skills that an individual does not currently possess or has not been exposed to previously. Businesses such as Microsoft have interview questions that attempt to determine how competent a prospective employee is at learning-on-the-fly. Additionally, the New Commission on the Skills of the American Workforce stressed in a recent report the necessity for individuals who wish to be globally competitive to be able to learn new skills quickly. (National Center on Education and the Economy, 2007).

Since learning-on-the-fly is a valuable skill, perhaps especially so for those going into CIS careers, it makes sense to include practicing it in undergraduate courses. Faculty can find, and have found, ways to add projects to courses to endeavor to facilitate an environment that requires students to learn-on-the-fly. Students who become skilled at it will likely find themselves signifi-

cantly advantaged in the workplace. How do students become skilled at this particular skill? It is the position of the authors of this paper that participating in projects and exercises that require it help students develop this skill.

2. WHAT IS LEARNING-ON-THE-FLY?

Microsoft uses the term learning-on-the-fly to refer to a competency that the company seeks in employees. This competency involves learning quickly when new problems are experienced, analyzing success and failure to improve, experimenting with alternative solutions, and appreciating unfamiliar situations that challenge them. Interview worksheets provide rating scales for this competency and have interviewers ask candidates questions related to it, such as "Describe a time when you participated in an activity to learn a new skill or gain knowledge. What did you learn and how did you apply it?" (Eichinger and Lombardo, 2003)

Learning-on-the-fly is certainly part of life-long learning. It requires continuous self-directed learning as an individual looks ahead, determines the skills or knowledge he/she lacks or will soon lack to solve problems and deal with new tools. It requires a person to be curious about the world and eager to learn. It also requires a solid education as a foundation. Further, it requires an understanding of assessment. How will one know that the requisite knowledge or skills were obtained? The ability to learn on the fly is necessary to remain productive in a fast changing world:

> *…employees who…accomplish …self-directed learning in the workplace also accomplish continuous learning for continued productivity (McNamara, 2008).*

3. WHY IS LEARNING THIS SKILL IMPORTANT?

The idea of life-long learning has been around for a long time. What has changed is the life span of useful knowledge. As it grows shorter, learners must adapt more quickly. They must determine effective ways to more rapidly build necessary skills. In today's world, "Knowledge is diverse, changing, imbued with cultural values of the moment." (Weinberger, 2007) Faculty must not only provide the foundational knowledge and skills in the CIS discipline, they must also determine ways to help learners learn to learn more rapidly than before.

Microsoft is not the only organization that recognizes a need for self-directed learners who are adept at learning on the fly. Other businesses like Google have as well, "Google shifts burden of learning … the focus is on hiring individuals who demonstrate love for self-directed learning." (Sullivan, 2007). CIS graduates will need to understand concepts, formulas and skills that constitute the knowledge base of their profession. But they also need to recognize the specific need to be able, in this field, to learn new skills and knowledge as needed on an ongoing basis. To do so they will need to understand their own learning styles and needs. Faculty must find ways to:

> *…develop a self-directed learning program that empowers the students to find relevance and new meaning for training issues they face. Self-directed learning is not a new measure, but it has begun to emerge as a better method for meeting continuing education needs and skills retention. (DeMauro 2008)*

Faculty need to bring students to the realization that learning material as you need it to solve problems is becoming more useful than ever before as "…students must learn to be conscious of what information they know about the problem, what information they need to know to solve the problem, and the strategies to use to solve the problem. (CTL, 2001)

4. HOW DO STUDENTS LEARN THIS SKILL?

Once it is clearly understood that learning-on-the-fly is an important skill for students to acquire, the question of how they learn the skill is naturally raised. Since learning-on-fly requires students to engage in self-directed learning, approaches used for enhancing self-directed learning can be considered. A recent article for educators in higher education stressed, "the importance of regarding becoming a self-directed learner as a …process, and the need for teachers to take part in the learning. Unifying idea is to emphasize the essence of providing opportunities for, as well as stimulating, the stu-

dents inquiring approach and responsibility." (Silen and Lars, 2005).

Apparently one part of self-directed learning is problem-based learning (PBL). (Massa, 2008) Providing students with problems that they haven't seen and pointers to tools that can assist them in solving the problems and testing their solutions becomes the agent that helps students learn how to learn-on-the-fly.

In terms of an education competency, Microsoft provides descriptions of four levels of proficiencies. At the expert level, the employee is "an avid, adept, disciplined and versatile learner in the context of an activity; quickly and effectively integrates new information and skills to enhance personal performance or the performance of the organization." (Eichenger and Lombardo, 2003). Obviously these are the sort of qualities we would hope to see in our graduates in computer information systems. How is it, then, that faculty do not directly address these proficiencies in curricular guidelines?

5. TEACHING LEARNING-ON-THE-FLY IN CIS

Faculty can easily recognize students who are not yet skilled at learning-on-the-fly. Those students readily complain when faced with challenging situations, "But we haven't learned that yet; you haven't taught that to us. How can we be expected to use that tool? We don't have that at home." On the other hand, some self-directed learners may merely need some opportunities practice to hone this skill:

Perhaps it can be said that self-directedness is that internal force which compels individuals to assimilate, synthesize, and internalize new information, given the circumstances in which they find or expect to find themselves. (Fisher, 1995)

How are learners taught to be self-directed in their learning? One approach is to provide problems that faculty suspect students have never encountered, and for which reasonable solutions require skills or knowledge that the students are unlikely to currently possess. Examples of situations used in courses found in a CIS program follow.

CIS 210- Fundamentals of Information Systems

The introductory class in CIS contains an introduction to learning-on-the-fly component. Students are introduced to the concept that this skill is critical to success in the CIS field due to software, hardware and processes continuously evolving to keep pace with business needs. This skill is then practiced in the class via the use of Microsoft Project in an out-of-class experience with the software using a tutorial approach. The students are required to use the software to produce a Gantt chart relevant to another assigned project. Microsoft Project is not taught or directly addressed in the classroom environment. Students must access the software on the campus network (in the student labs), make use of the tutorials if desired, and quickly accomplish a self-learning experience.

Since this is a sophomore-level course, students are also provided with directions for finding other tools, on the Web and in the school library, which might aid in their knowledge acquisition. Obviously the instructor is also available to answer questions. However, the instructor repeats that students are developing a specific skill – that of learning-on-the-fly. Also, students benefit as those project management tools learned through this exercise are used in higher-level courses to organize team members on projects, set deadlines, and communicate team progress and needs effectively.

CISB 460- Electronic Commerce

One of the key components in an e-commerce class is that of constructing an e-commerce site incorporating web elements discussed in the classroom environment. In the e-commerce class, students may be encouraged to explore available hosting options, software options, shopping cart options, and to present their findings to the class. In this way, students are involved in determining what they need to know to accomplish a task. This knowledge seeking helps students prepare for learning-on-the-fly as well as incorporating traditional knowledge to begin the project. (Mykytyn, Perason, Paul & Mykytyn, 2008) Students are asked to make software selection based on factors such as:

- Cost

- Ease of learning
- Availability of documentation
- Compatibility with other software
- Potential for future support.

After selections have been made, the construction process for the e-commerce site becomes a thread that runs throughout the course. The culmination of the process is the presentation of the sites to the class, along with a discussion of the successes, obstacles, hurdles, failures, and other observations/revelations that the students learned while attacking this component of the class.

This approach to project based learning (Mykytyn, et.al., 2008) incorporated with learning-on-the-fly, prepares students for a fast-paced technology career where the only constant is change. Students are rewarded with a positive vision of the self-learning and self-confidence attained by achieving their goals. Being able to learn-on-the-fly facilitates their abilities to acquire, deploy, and evaluate new technologies in the corporate workplace.

CISB 442 Systems Analysis and Design and CISB 451 Database Administration

This two course sequence forms a critical path in information systems (IS) curriculum. Since most IS jobs involve application of systems analysis and design concepts and practices and since most modern systems involve database of one form or another, most students will use what they learn in these two classes on the job after graduation. What better classes are there to employ learning on the fly to prepare students for employers' expectations? What better classes are there to build upon the leaning on the fly concepts introduced in the Fundamentals of Information Systems class (CISB 210).

In Systems Analysis and Design (CISB 442), students continue to use MS Project to implement and manage team Gantt Charts and network diagrams. They expand their personal tool set by learning traditional SA&D methods (e.g., data flow diagrams, entity-relationship diagrams, hierarchy charts) and object-oriented methods (e.g., activity diagrams, sequence diagrams, class diagrams). After an overview in class of the role of each method and demonstration of a few examples of each, students must learn the mechanics of constructing the specific diagrams on the fly in order to complete the assignments for each unit. Moreover, the requirement for each assignment is to submit the finished work electronically to a network drive in the output format of a formal drawing tool (e.g., MS Visio, Visual Analyst, Omondo (a.k.a. Eclipse UML)). So, each student must learn both the method and the tool on the fly.

In Database Administration (CISB 451), students revisit some of the methods and tools used in the prerequisite Systems Analysis and Design class. If they failed to learn those on the fly in the previous semester, they must do so to be successful in this class. Additionally, there is an expectation to use Structured Query Language (SQL) to which they were exposed in other prerequisite classes. In this class, however, the exposure to SQL is at a much deeper and more thorough level. Students are encouraged to test the SQL they write for several gradually more complex assignments using MS Access, although Access is not taught in this class. After they have built their knowledge of SQL and Access on the fly, they are then expected to complete their last few assignments using first Oracle on a closed Windows 2003 local area network, then MySQL on a closed Linux local area network. They are given a one class period demonstration of those tools. Then, students must learn how to access both networks and how to use both packages on the fly.

CISB 331 Advanced Business Programming

Once students have learned to program in an introductory programming class, they should be expected to be able to program. Consequently, an advanced programming class should not have to teach them that. If they haven't learned how to program, there is an opportunity to learn on the fly. A better solution, though, would be for the student to take another or repeat the same introductory class.

As students apply the techniques they have discussed in class, there is ample opportunity for learning on the fly. If the advanced programming class uses a different programming language than the beginning class

(which is the case for CISB 331, which uses Java rather than Visual Basic in the prerequisite class), then there is more opportunity for students to learn the new programming environment and syntax on the fly.

CISB 471 Advanced Business Systems

This is the capstone class for the BS in CIS. All other courses are either a direct or nested prerequisite to this one. Consequently, all knowledge and skills sets from previous classes should be employed in this one. If a student has shirked learning in or forgotten material from other classes, they have a great opportunity to learn on the fly to be ready for this class.

In this class, students are assigned realistic, live or simulated, team projects. That adds the element of the unexpected. Most of those projects involve implementing a web-based database system. The expectations for the completed systems are set at a higher level than in other classes, i.e., the systems will be implemented for the client and must withstand changing requirements, user errors, security attacks, and the like. Moreover, the client has the right to specify the hardware and software platform for which the students build the system.

Therefore, as students progress through the project, they must first discover what they do not yet know and learn that material on the fly. Often that has included learning PHP, XML, Apache, JavaScript, specific tools used on client's chosen commercial web space server, etc. While the class does formally cover some of that material in the lecture portion, the students must build their knowledge on the fly just in time for use.

Note: these same comments about realistic, live or simulated team projects apply in other classes such as Systems Analysis and Design or Database Administration.

All of the projects used to facilitate learning-on-the-fly involve project based learning (PBL) and "right now learning"… as proposed by Knowles in 1990. Adults need to know what is useful to them and learn when it is important to them to learn. The learning experience benefits them immediately in their coursework.

Given the demands of the new global innovation economy for creative, team-work oriented problem-solvers capable of adapting to the ever-changing needs of business and industry, PBL may… be the antidote. (Massa, 2008).

Research shows PBL provides students with skills that are critical to lifelong learning. (Massa, 2008)

With consistency between courses in the CIS program, students can learn systematic approaches to learning-on-the-fly. They learn self-directed training techniques:

Self-directed training includes the learner initiating the learning, making the decisions about what training and development experiences will occur, and how. The learner selects and carries out their own learning goals, objectives, methods and means to verifying that the goals were met. (McNamara, 2008)

6. WHAT RESOURCES ARE REQUIRED?

The primary resources required are time and access to tools. Time is perhaps the most difficult resource to provide. Faculty must allow some time in their courses for students to practice learning-on-the-fly. Some faculty may protest that the amount of material that needs to be covered in a course does not allow for practicing this skill. The authors of this paper suggest that this skill is too important to leave out. It needs to be included in several of the CIS courses. Learning-on-the-fly is an integral skill for a well-prepared CIS graduate.

Although students determine what they need to solve the problem, what they need to learn, how they will learn it in time, and how they will know when they've learned it, it is necessary for faculty to assist students in assessing these elements, especially at first.

7. SUMMARY/CONCLUSION

Learning-on-the-fly is a skill that CIS graduates need to have acquired. Students need to practice this skill in their undergraduate courses. Faculty need to find ways to bring in projects that allow students to become adept at self-directed learning. They need to stress the need for such skill, and help students evaluate themselves on this competency. Curriculum models need to add this skill as a part of the mix of other

fundamental skills and knowledge requirements. There is no doubt that the CIS workers of the future will need this skill more than ever before.

8. REFERENCES

Center for Teaching and Learning (CTL), ed. Valerie Ross. (Winter 2001). Problem-Based Learning. Speaking of Teaching (Stanford Univ. Newsletter on Teaching), 11(1).

DeMauro, K. (Feb. 2008) "Self-Directed Learning". Fire Engineering,161(2), p.20-22.

Eichinger, R. and Lombardo, M. (2003) Interview Worksheet for Learning on the Fly Competency, derived from the Leadership Architect Competency Library, found on www.microsoft.com/education/competencies/comp-learningonthefly.mspx, Accessed 5/19/2008

Fisher, T. (Fall 1995). Self-Directedness in Adult Vocational Education Students: Its Role in Learning and Implications for Instruction. Journal of Vocational and Technical Education, 12(1).

Knowles, M. (1990). The Adult Learner: A Neglected Species (rev. ed.). Houston: Gulf Publishing.

Massa, Nicholas. (Spring, 2008). Problem-Based Learning (PBL). New England Journal of Higher Education, 22(5), p19-20.

McNamara, C. (2008). Strong Value of Self-Directed Learning in the Workplace: How Supervisors and Learners Gain Leaps in Learning. Accessed at www.managementhelp.org/tran_dev/methods/slf_drct.htm on 5/19/2008.

Mykytyn, K., Pearson, A., Paul, S., and Mykytyn, P. (2008). The Use of Problem-based Learning to Enhance MIS Education. Decision Sciences. 6(3) p. 89-113.

Office of Govenrment Commerce (OGC). (2007). *ITIL: Introduction to the ITIL Service Lifecycle*, The Stationary Office, UK.

Siemens, G. (2004). Connectivism: A Learning Theory for the Digital Age. Available at www.connectivism.ca.

Silen, C. and Uhlin, L. (Aug. 2008). "Self Directed Learning", Teachin in Higher Education, Vol. 13, Issue 4, P. 461-475.

Sullivan, John. (Nov. 2007). Google. Workforce Management, 86 (20), p.42

Weinberger, D. (2007). Everything is Miscellaneous: The Power of the New Digital Disorder, Times Books, NY,NY.