INTERNATIONAL JOURNAL OF INSTRUCTIONAL TECHNOLOGY AND DISTANCE LEARNING

February 2006
Volume 3 Number 2

ISSN 1550-6908

PUBLISHER'S DECLARATION

The International Journal of Instructional Technology and Distance Learning is refereed, global in scope, and focused on research and innovation in teaching and learning.

The Journal was established to facilitate collaboration and communication among researchers, innovators, practitioners, and administrators of education and training programs involving instructional technologies and distance learning. The editors and peer reviewers are committed to publish significant writings of high academic stature.

The initial year of publication was funded by the TEIR Center, Duquesne University. The Executive Director of the Center, Lawrence Tomei, served as Publisher. Additional support was provided by DonEl Learning Inc. and freely donated time of the editors and peer reviewers.

Donald G. Perrin
Executive Editor

International Journal of
Instructional Technology & Distance Learning

Vol. 3. No. 2.

ISSN 1550-6908

Table of Contents – February 2006

Editorial

Assessment

Donald G. Perrin

Assessment can be used to determine the performance of learners, instructors, procedures, products, and environments. It can be qualitative, quantitative, or both. Assessment can measure change in performance, separate high performers from low performers, or determine needs. Assessment can be used to measure progress or quality, justify expenditures, award prizes, accept or reject products and services, and reform institutions, curriculum, and programs of instruction.

Observable and measurable objectives are the basis of authentic assessment. Performance is ideally assessed in its real-world environment. Measuring tools must be relevant, high in quality and provide reliable and valid performance data. Where authentic assessment is not possible, simulations, gaming, or a combination of methods can provide alternative ways to gather valuable performance data. Test instruments range from pencil and paper to interactive computer graphics, 3-D animations and simulators.

In training and education, a *Needs Assessment* determines the starting point for learning. A *Gap Analysis* determines what knowledge, skills and attitudes must be acquired to meet the criterion performance. Training and education fill that gap. When combined with *Learning Management Systems*, learning is transformed into a science. Data collected from testing and monitoring can be used to improve teaching and learning as well as the assessment instruments themselves.

Assessment determines the level of learning as we progress from novice to expert. Rubrics are useful tools to measure progress through significant learning milestones. It is hardly appropriate to punish failure because failure is in itself a punishment. Assessment must be fair. Ignorance is not failure if there is no opportunity to learn. We should not unfairly categorize or pigeon-hole the unfortunate, disadvantaged, or late-bloomers. We need to recognize potential and reward performance.

Pencil and paper tests suffice for knowledge based verbal and numeric skills, but not for physical performance such as marksmanship with a rifle or cross-country skiing. Assessment tool must be relevant to the task at hand. Using the wrong assessment tool will produce erroneous data.

New skills and competencies are needed to succeed in today's workplace, especially higher level skills like reasoning, problem solving and working collaboratively. Creativity and entrepreneurial skills are of increasing importance. New curriculum goals and methods of instruction should be supported by performance-based assessment, portfolios, student-designed assessments, and alternative assessments where necessary.

Assessment should have low visibility so that curriculum is focused on its ultimate purpose and not to narrowly "teach the test". My preference is to embed testing within the learning experiences so that correction is part of the learning process with simulations, portfolios, and projects as a basis to measuring performance.

Editor's Note: Tools, timeframes, techniques, and time management for online classes differ from face-to-face clasrrom instruction. This article delves into literature and analyzes specific class records from Indiana University's Kelley School of Business to formulate six strategies to make online teaching efficient and effective.

Time Management Strategies for Online Teaching

Min Shi, Curtis J. Bonk, Richard J. Magjuka

Abstract

Instructors need to develop new time management skills when transitioning to online teaching. Based on the interviews of a dozen experienced online instructors from a successful online graduate program and analyses of their online courses, this article presents the differences of the time-related issues between face-to-face and online courses, followed by six strategies for time management in online courses.

Keywords: online teaching strategies, time management, web-based courses

Introduction

The last five years have seen vast changes in the use of the Internet in higher education and a tremendous increase of faculty involvement in online teaching. Young (2002) points out that online teaching redefines faculty members' schedules. While many instructors consider flexibility a significant advantage of online teaching (Conrad, 2004; McKenzie, Mims, Bennett, & Waugh, 2000; Parker, 2003), others may find that their workload increases due to the heavy time investment in course planning and find themselves becoming "24 hour professors" in order to be responsive to student inquiries while teaching (Hislop & Atwood, 2000; McKenzie et al., 2000; Pachnowski & Jurczyk, 2003; Visser, 2000; Young, 2002).

While it is recognized that instructors need to develop new time management skills when transitioning to online teaching (Levitch & Milheim, 2003), there is little discussion in the literature regarding what strategies instructors can take to manage the time demands for teaching online courses (Collis & Nijhuis, 2000). Collis and her colleague's article titled "The Instructor as Manager: Time and Task" published in The Internet and Higher Education five years ago is a rare piece on this topic. In that article, eight categories of instructional/management tasks are identified, and the percentage of instructor time spent on each category is suggested.

If online education is to continue to grow, faculty will have to develop effective time management strategies. This article aims to provide such strategies commonly used by some experienced online instructors today.

The Kelley Direct Online Program

The time management strategies for online teaching discussed in this article are drawn from a study with a group of instructors teaching in the Kelley Direct (KD) Online Program (http://kd.iu.edu/) at Indiana University's Kelley School of Business. KD has offered online Master's degrees in business since 1999. Over the last few years, the KD program has experienced exponential growth with enrollment growing from 14 in the first year to over 1,000 in 2004.

The courses in KD are mainly Web-based and delivered through a commercial course management system called ANGEL (http://www.angellearning.com/). Other course materials such as course packets and CD-ROMs are mailed to students at the beginning of the semester.

As part of the on-going program evaluation effort, KD faculty members were invited for interviews related to their online teaching experiences. This article is based on an analysis of the interviews with twelve faculty members, all of whom were tenured faculty and have taught online courses for several semesters in addition to many years of traditional face-to-face (FTF) classroom teaching by the time of the study. The course materials from the particular courses these faculty members taught, which were archived in the ANGEL space, were also analyzed.

Comparisons of FTF and Online Courses

Because the online teaching format is still new, it is common that instructors have taught FTF classes before they start teaching online courses. FTF courses and online courses differ greatly in the processes of course planning and delivery. Many of these differences are time-related.

At the *course planning* stage, the instructor of a FTF course may choose to only attend to the big picture of the course and develop details as the class goes on. The instructor of an online course, however, must familiarize herself with the course management system (CMS), and develop most, if not all, course materials beforehand because technology-related materials can be extremely time-consuming to produce.

In terms of *information presentation*, in a FTF course, it is verbal and sequential. Presentations have time restraints. Information is presented period by period. Students hear the same thing at the same time usually only once. In contrast, the information presented in an online course is often text-based and non-sequential. Fortunately, such information is stored online in the CMS and always available. Most course information is presented to the class from *Day-One* with instructions given as to what time to access particular modules or information. Students access information at a time convenient to them, which can be different from each other.

In terms of *class interaction*, the interactions in a FTF class are direct, synchronous, verbal, and typically one to many. Students can ask questions and receive answers instantly; instructors can evaluate or simply sense students' level of understanding instantly. The instructor controls the student turn-taking in discussions. In an online class, however, the instructor and students usually do not see each other. The interaction is many to many in both asynchronous and synchronous discussions, and thus, can be hard to follow. In asynchronous discussions, there is a delay in getting feedback from peers or the instructor. In synchronous discussions, often there is a typing delay when fingers do the talking. It can be cumbersome to impose structure to the turn-taking in online discussions. But as alluded to above, online discussions can be archived and accessed multiple times.

The *frequency of interaction* in these two kinds of classes also varies. In a FTF class, instructors and students usually interact only when class meets and during office hours. An online class instructor, on the other hand, is often available 24/7 throughout the course via web or email. Real-time interaction may also occur through instant messaging or chat rooms.

When there are confusions or changes, clarification and change announcements reach the whole class during class meetings at the same time in a FTF class. In an online class, however, there is usually a delay for the clarification or change announcements to reach all students because they do not always access the course website at the same time.

Time Management Strategies

Because an online course is quite different from a FTF class in the aspects listed above, a new online instructor needs to learn some specific strategies in order to manage the class well. Below are six proven strategies for time management in teaching an online course.

1. Write concisely and clearly.

Because writing is a major, and sometime the only, channel of communication in an online class, the importance of clear and concise writing of the course materials cannot be over-emphasized. If one student finds a sentence unclear, the instructor will need to spend valuable additional time responding to clarify. Five or ten minutes of additional time for polishing a message or task instructions before distributing or publishing may save hours in clarifying later.

Writing for digital media is different from writing for print media. As pointed out in a Web writing guidebook "Hot Text: Web Writing That Works" (Price & Price, 2002), the text on screen is usually harder to read than on paper because of lower resolution and because the text appears and disappears in a moment as there can only be one page on screen at a time. Below is some of the advice from this book that relates most directly to online course material planning and creation.

- Shorten the text:
  - Cut any paper-based text by 50%;
  - Make each paragraph short;
  - Move vital but tangential or supplemental material to the sidebar;
  - However, beware of cutting so far that you make the text ambiguous.
- Make text scannable:
  - Create a meaningful title;
  - Insert meaningful headlines and subheads;
  - Highlight key works, phrases, and links;
  - Turn any series into a bulleted or numbered list.

2. Organize information in an easy-to-follow order.

In order to minimize student confusion and sense of being lost, course materials should be presented in the CMS in a way that all students can follow while generally meeting the instructor intent. As noted below, this can be achieved in several ways:

- **Chunk materials into weekly modules** and mark the start and end dates for each module. If the course materials mandate larger units, it is still important to mark the units with numbers and date them.
- **Write a "Read Me First" document for each module**. In this document, the instructor should provide guidelines on how to use the other materials in the module. Often there are multiple folders or documents in each module. A document titled "Read Me First" is hard to miss and will significantly reduce confusion among online students and class guests.
- **Label optional readings**. Instructors can overload students by providing too much information online. Making nonessential information optional can focus student attention on the more pertinent information and avoid overwhelming some students while giving other students opportunities to explore beyond course requirements.

3. Be explicit and emphatic about the time requirement in the syllabus.

Instructors usually spell out their rules regarding assignment due dates and participation in their syllabi. In an online course, because the instructor cannot read the syllabus to the class, it is even more important to direct students' attention to course guidelines and policies.

- Be extremely clear about the assignment due dates and times. Because students may be located in different time zones, the instructor must be clear about the time zone of each deadline. In addition, because distance students often have full-time jobs, it helps to set the deadline at midnight Sunday or Monday so students can have the weekend to work on their assignments. The following quote is a relevant example from a KD instructor in our study:

Unless otherwise indicated, all deliverables are due by Sunday at midnight (your time zone). That is, homework in Week 2 is due on the Sunday that begins Week 3, and so on going forward.

In the event of any necessary course scheduling change, be sure to make it as early as possible and allow students some flexibility in meeting the new requirement.

- Be clear about the turnaround time for responding and stick to it. Researchers recognize that turn-around in distance education is important because when receiving feedback or guidance on assignments late, students may sometimes feel "a lack of support which could sap their confidence" (Rickwood & Goodwin, 2000, p. 52). Thus, one should establish students' expectations of instructor feedback patterns from the beginning. It is quite common that instructors promise to reply by the next day, as indicated in the following quote from a KD instructor:

My goal is to respond to every e-mail within several hours, and always within 24 hours. However, there are times when I will be traveling, and may not able to get back to you as soon as I would like.

4. Manage asynchronous discussions.

Asynchronous discussions, which can increase the interactivity of the online learning environment when well used, are highly popular in Web-based courses. However, the time distributions for live classroom discussions and asynchronous discussions are vastly different. Below are some tips related to how to effectively manage asynchronous discussions.

- Instead of the sequential presentation of cases for discussion in the traditional classroom, an online instructor might present multiple discussion topics at the same time over a longer period of time. For instance, one KD instructor stated,

A case discussion in real time takes about 75 minutes. A case discussion here (online) takes a week. Typically a case discussion has what we call 3 pastures. A pasture is where I introduce a question and we run with (it) and the students give me feedback and we have a discussion about it. So in a 75-minute session in live classroom time, a pasture is about 20 to 30 minutes, and in online (learning) a pasture is about 48 to 72 hours.

Keeping each topic open for discussion for a week allows students to find a time during the week that is most convenient for them to participate.

- Be explicit about the participation rules. Students need to know how often they are expected to participate in online discussions. It is also quite common that certain students are always the first ones to post their answers to the discussion questions, which can be

unfair to the other students. In such a case, the instructor can assign a rotating list of students to spearhead a discussion.

- Post answers to frequently asked questions in a public area. When teaching online, the same question may come up repeatedly. Instructors may use the announcement area to post answers to individual student's questions so as to benefit the whole class while saving their own time.
- Set a rule regarding your own participation. The instructor should make it clear to the class at the beginning of the discussion activity whether he or she will actively participate in discussion. If there will be instructor participation, then it should also be made clear to the students of what nature, how often, and at what time the instructor's participation can be expected. This way, the instructor can refrain from checking and posting too often, which can be a burden to both the instructor and the students.

5. Take advantage of the technical tools available.

Often tools are available in the CMS to help instructors increase work efficiency. For example, the technology department of the Kelley Direct program has developed a group of tools, called an E-Learning Toolkit, in the CMS to meet different instructor needs.

- The toolkit includes various **customized discussion forums**, such as Q&A Forum, Round Robin Forum, and Court Forum, each of which provides a unique feature that a regular discussion forum does not offer. For example, in the Court Forum, each participant is assigned a certain role, for example, judge, plaintiff, or defendant, and posts his perspectives using that role. Such tools impose a certain structure to the discussion format, thus saving the instructor time and energy in specifying and reinforcing participation rules.
- Another tool in the E-Learning Toolkit is the **Hand-in System**, which allows the batch processing function of a large number of files. When the class size is large (e.g., over 30 students), downloading and uploading student assignments can be tedious and time consuming. The system is designed to match up the original file and the graded file automatically for students to pick up. More detailed information about this toolkit can be found in "Kelley Direct (KD) E-learning Toolkit" (Shi, Magjuka, & Li, 2005) or http://toolkit.kd.iu.edu.
- As many KD instructors have done, making your instructional needs known to your program head, peers, and technical support staff can often help to identify or develop new tools that can save time and increase work efficiency.

6. Utilize other resources.

- Share course ideas and materials with departmental colleagues. Although it takes additional time and effort for instructors teaching online courses to meet physically, instructors may find that the time they spend sharing ideas in faculty brown bags is well-spent in the long run. In programs such as KD, where the faculty members are residential, such meetings can be extremely beneficial in helping faculty share strategies and create a sense of community.
- Make use of the resources available on the Internet. Some monumental content sharing initiatives have been undertaken in North America to establish free online learning resources. MERLOT (http://www.merlot.org) and the CAREO project of Canada (http://www.careo.org/) are two good examples. By utilizing these resources, instructors can reduce the time needed for developing similar materials themselves.

Conclusion

How to manage time in teaching online courses can be an enormous challenge for online instructors. In this article, we offer many strategies that have proven effective in the courses taught by a group of experienced online instructors at Indiana University. By utilizing these strategies, both instructors and students can enjoy the convenience of online teaching and learning without getting lost, feeling overwhelmed, or sacrificing the instructional quality and overall learning outcomes.

References

ANGEL Homepage. Retrieved March 30, 2005, from http://www.angellearning.com/

The CAREO Project of Canada Homepage: Retrieved March 30, 2005, from http://www.careo.org/

Collis, B., & Nijhuis, G. G. (2000). The instructor as manager: Time and task. *Internet and Higher Education, 3*(1-2), 75-97.

Conrad, D. (2004). University instructors' reflections on their first online teaching experiences. *Journal of Asynchronous Learning Network*, 8(2). Retrieved 10/14/04 from http://www.sloan-c.org/publications/jaln/v8n2/v8n2_conrad.asp.

Hislop, G., & Atwood, M. (2000). ALN teaching as routine faculty workload. *Journal of Asynchronous Learning Network, 4*(3). Retrieved 10/14/04 from http://www.sloan-c.org/publications/jaln/v4n3/v4n3_hislop.asp

Kelley Direct Online Programs Homepage. Retrieved March 30, 2005, from http://kd.iu.edu/

Kelley Direct Online Programs Toolkit Homepage. Retrieved March 30, 2005, from http://toolkit.kd.iu.edu

Levitch, S., & Milheim, W. D. (2003, March-April). Transitioning instructor skills to the virtual classroom. *Educational Technology,* 42-46.

McKenzie, B. K., Mims, N., Bennett, E. K., & Waugh, M. (2000). Needs, concerns and practices of online instructors. *Online Journal of Distance Learning Administration, 3*(3). Retrieved 10/14/04 from http://www.westga.edu/~distance/ojdla/fall33/mckenzie33.html

MERLOT Homepage, Retrieved March 30, 2005, from http://www.merlot.org

Pachnowski, L. M., & Jurczyk, J. P. (2003). Perceptions of faculty on the effect of distance learning technology on faculty preparation time. *Online Journal of Distance Learning Administration*, *6*(3). Retrieved 10/14/04 from http://www.westga.edu/~distance/ojdla/fall63/pachnowski64.html

Parker, A. (2003). Motivation and incentives for distance faculty. *Online Journal of Distance Learning Administration, 6*(3). Retrieved 10/14/04 from http://www.westga.edu/~distance/ojdla/fall63/parker63.htm

Price, J., & Price, L. (2002). *Hot text: Web writing that works*. Indianapolis, IN: New Riders Press.

Rickwood, P., & Goodwin, V. (2000). Travellers' tales: Reflections on the way to learner autonomy. *Open Learning*, *15*(1), 47-55.

Shi, M., Magjuka, R. J., & Li, J. (2005). Kelley Direct (KD) E-learning toolkit. *TechTrends, 49*(1), 71-73.

Visser, J. A. (2000). Faculty work in developing and teaching Web-based distance courses: A case study of time and effort. *The American Journal of Distance Education*, *14*(3), 21-32.

Young, J. R. (2002, May). The 24-hour professor. *Chronicle of Higher Education*, pp. A31-A33.

About the Authors:

Min Shi is Assistant Professor of Educational Technology. She holds a Ph.D. in instructional systems technology from Indiana University.

Min Shi
Department of Education, College of Education
Zhejiang University, China, Hangzhou, Zhejiang, Zip Code: 310028

shiminzj@hotmail.com
(86) 0132-05815963

Curtis J. Bonk is Professor in the Department of Instructional Systems Technology.

Curtis J. Bonk, Professor
Instructional Systems Technology Department
School of Education, Indiana University, Bloomington, IN 47405

cjbonk@indiana.edu
(812) 856-8353

Richard J. Magjuka is Chairperson of the Kelley Direct Degree Programs and Associate Professor of Business Administration at Indiana University.

Richard J. Magjuka, Professor and Chair
Kelley Direct Online Program, Indiana University
Bloomington, IN 47405

rmagjuka@iupui.edu
(812) 855-2705

Editor's Note: Anastasios Economides explores the relationship between emotions and learning. There is a large body of research to determine reliable detection of emotions, and additional research that relates emotions and learning. This article parallels biofeedback in the way it uses affective feedback in testing to enhance learning efficiency and effectiveness.

Emotional Feedback in CAT
(Computer Adaptive Testing)

Anastasios A. Economides

Abstract:

It is well known that emotions influence learning. Also, feedback is a powerful educational tool which enhances learning. This paper aims to provide real-time adaptive feedback to emotionally support the examinee during Computer Adaptive Testing (CAT). It describes a framework for employing emotional feedback in CAT. After the CAT system recognizes the examinee's current emotional state, it supports him emotionally using emotional feedback. The paper proposes several emotional feedback types classified with respect to the emotions and their time of triggering. Finally, the CAT system provides personalized emotional feedback to the examinee according to his current emotional state.

Keywords: adaptive feedback, affective computing, computer adaptive testing, emotions, feelings, personalized feedback.

Introduction

Vygotsky (1987) observed that the study of psychology had been damaged by the separation of the intellectual from the motivational and emotional (or affective) aspects of thinking. The terms *emotions* and *affect* refer to states such as happiness, shame, fear, disgust, annoyance, sadness, anger, equanimity, anxiety, depression, surprise, and love. It is well known that emotional upsets can interfere with mental activities. Students who are anxious, angry, or depressed do not learn (Goleman, 1995).

Our feelings can profoundly influence how we approach a reasoning task. For example, sadness may support analytical problem solving (Schwartz, 2002). Affective neuroscience and psychology have reported that human affect and emotional experience play a significant, and useful, role in human learning and decision making (Bechara at al., 1997). The influence of positive affect on creativity has been well demonstrated (Isen et al., 1987; Isen, 2001). The positive affect enhances problem solving and decision making, leading to cognitive processing that is not only flexible, innovative, and creative, but also thorough and efficient. Experiments indicated that positive affect, induced by means of seeing a few minutes of a comedy film or by means of receiving a small bag of candy, improved performance on tasks that are generally regarded as requiring creative ingenuity. A slight positive mood does not just make you feel a little better but also induces a different kind of thinking, characterized by a tendency toward greater creativity and flexibility in problem solving, as well as more efficiency and thoroughness in decision making (Isen, 2000).

Poor learning can produce negative emotions; negative emotions can impair learning; and positive emotions can contribute to learning achievement and vice versa. Induced negative emotions have been shown to hamper performance on cognitive tasks, whereas positive emotions have an opposite effect (Izard, 1984). Also, inducing a sad mood in very young children increased the time it took them to learn to respond to a task, and also increased their number of errors;

inverse results were achieved by inducing happiness (Masters et al., 1979). Numerous studies have demonstrated a connection between anxiety and academic performance: the more anxious a person is the poorer his academic performance (Seipp, 1991). Preschool children in a positive mood mastered a shape discrimination task more quickly and with fewer errors than did children in an induced negative mood. Youngsters identified as at risk for school failure were found to complete mathematical problems significantly more accurately under induced positive-mood conditions (Tanis and Bryan, 1991).

However, it is not an easy task to recognize and measure emotions. There is evidence from the neuroscience about the close relationship between emotion and homeostasis (Damasio et al., 2000). Positive affect is associated with increased brain dopamine levels and influences olfaction, the consolidation of long-term (i.e. episodic) memories, working memory, and creative problem solving (Ashby at al., 1999). Fear, anger, sadness, and joy show up in the brain as different patterns of blood flow, providing one possible explanation for how affect influences brain activity. Different regions of the brain participate in happiness, sadness, and disgust (Lane at al., 1997).

Another line of research on recognizing and measuring emotions use sensors, such as body-worn accelerometers, rubber and fabric electrodes, miniature cameras and microphones, and garment or accessory-type devices, along with pattern recognition algorithms of facial expressions from video or/and vocal expressions or of stress patterns from thermal imagery of the face and other physiological measures (Picard, 1997).

Recognition (81% accuracy) of eight emotional states of a human given four physiological signals has been achieved (Picard at al., 2001). The Facial Action Coding System (FACS) is widely used in behavioral investigations of emotion, cognitive processes, and social interaction (Donato at al., 1999). Action units that include upper facial muscle movements such as inner eyebrow raise, eye widening have been used to achieve a recognition accuracy of 62.5% to 69.3% (Kapoor et al., 2003). Automated speech recognition achieved 50—60% accuracy on emotional speech (Steeneken and Hansen, 1999). Measuring the pressure on the mouse, steering wheel, etc. using force sensitive resistors shows also promising results (Mota and Picard, 2003, Dennerlein at al., 2003). Frustrated users applied higher force to the side of the mouse and the average wrist extensor muscle activity. Information from chair pressure patterns have been used (accuracy 82% to 98%) to recognize a child's interest level (Kapor et al., 2001).

Combination of the visual and audio information for emotion detection and recognition has been proposed (DeSilva at al., 1997; Chen at al., 1998; Russell at al., 2003). Recognition accuracy of 67.8% to detect interest has been reported (Kapoor at al., 2004). Electrocardiogram, electromyogram, respiration and skin conductance sensors to measure autonomic nervous system activation have been embedded in an automobile to capture episodes of driver's stress (Healey and Picard, 2000). The drivers' stress was classified in four levels with 89% accuracy.

In this paper, we propose the use of emotional feedback in Computer Adaptive Testing (CAT). Developments in psychometric theories, computer and networking technologies have enabled the widespread development of CAT. In CAT, when the examinee answers correctly a question, then the next question is harder. Otherwise, if the examinee answers wrongly, then the next question is easier (Wainer at al., 2000; Sri Krishna, 2001). The rapidly increasing number of CAT systems is due to the main advantages that it offers. The examinee answers questions tailored around the level of his knowledge and abilities. Since the questions are not too hard for him, he is not discouraged. Also, since the questions are not too easy for him, he does not get bored and no time is wasted. Furthermore, each examinee sees different question each time he takes the test and also different questions from the other examinees. So, the cheating is restricted. Finally, the results are immediate, reliable and valid.

Feedback is an important factor in learning. The feedback aims at learner-centered education. It may help the examinee in the following ways:

- Trigger and stimulate his attention and focus.
- Activate his involvement and interaction with the test.
- Activate and develop his knowledge and abilities.
- Instruct and teach him.
- Guide him.
- Inform him about his progress, strengths, weaknesses, errors.
- Correct his misconceptions.
- Prevent his failures and mistakes.

Despite the many benefits that feedback can provide in learning, it has not been widely introduced into the CAT systems. Perhaps, this is because most CAT systems are exclusively used for formative assessment rather than for self-assessment and learning. In addition, the introduction of feedback into the CAT systems is not a simple process. It needs careful requirements analysis, planning, design, development, evaluation, and redesign.

Previous research considers that the feedback informs the examinee about the answers and the results (Kulhavy and Stock, 1989; Ross and Morrison, 1993; Mason and Bruning, 2001). However, it is important to also support the examinee emotionally. In this paper, we propose emotional feedback to enhance learning and problem solving. This is the first paper to investigate emotional feedback in CAT. We present various types of emotional feedback in CAT. The CAT system may sense and monitor the examinee (e.g. face and eyes expressions, voice tone, blood pressure, heartbeat, breath rhythm, temperature, brain waves, muscle tension, skin conductivity, etc.) and recognize his emotional states. Then, the CAT system may present to the examinee personalized emotional feedback according to the examinee's current state. This real-time personalized emotional feedback tries to emotionally support the examinee.

Emotional Feedback types

Having documented the influence of emotions on learning, we proceed to frame the use of emotional feedback in CAT. The computer continually senses, measures and recognizes the examinee's current state. At appropriate instances, it provides to the examinee personalized emotional feedback according to his current state. First, we classify the emotional feedback with respect to the emotion type. Then, we classify it with respect to the triggering instance.

In the classification with respect to the emotion type, we consider three emotional feedback categories:

A. Positive emotions feedback,

B. Control of Negative emotions feedback, and

C. Negative emotions feedback. Let first define these emotional feedback categories.

A. Positive emotions feedback: it acts and expresses positive emotions to the examinee trying to develop, maintain and increase his positive emotions. So, it may try to increase the following examinee's emotions:

1. Enthusiasm, fascination, excitement, passion and involvement with the test.
2. Happiness, joy, delight, pleasure and amusement.

3. Satisfaction and fulfillment.
4. Calmness, tranquility, serenity, peacefulness, comfort and relaxation.
5. Hope and optimism.
6. Expectancy, anticipation, certainty, assurance and acceptance.
7. Sympathy and love.
8. Pride and honor.

B. Control of negative emotions feedback: it tries to control the examinee's negative emotions. So, it may try to control the following examinee's emotions:

1. Boredom and apathy.
2. Sadness, melancholy, sorrow and depression.
3. Anger, irritation, indignation and upset.
4. Anxiety, stress and nervousness.
5. Fear, concern, worry and doubt.
6. Confusion.
7. Pessimism, defeatism and self-pity.
8. Frustration, despair, hopelessness and panic.
9. Astonishment, amazement and negative surprise.
10. Shame, guilt, humiliation, embarrassment and dishonor.
11. Disgust and aversion.
12. Hate.

We further classify the Control of negative emotions feedback into 4 sub-categories:

a) ***Avoidance and prevention of negative emotions feedback***: it tries to avoid and prevent the development of negative emotions;

b) ***Control and management of negative emotions feedback***: it tries to control and manage the examinee's negative emotions not allowing them to grow;

c) ***Relief and alleviation of negative emotions feedback***: it tries to relief and alleviate the examinee's negative emotions lowering them;

d) ***Transformation of negative emotions feedback***: it tries to transform the examinee's negative emotions to positive ones.

C. Negative emotions feedback: it expresses negative emotions to the examinee trying to increase his effort and commitment.

Next, we provide specific emotional feedback types:

1. *Humor and Jokes*. It amuses the examinee making him happy. It calms and cools down him. It relieves his sadness.
2. *Entertainment and Games*. It amuses and pleases the examinee.
3. *Reward*. It develops the examinee's passion, expectancy, and optimism. It increases his satisfaction and honor. It alleviates his anger.

4. *Sympathy and Goodwill*. It increases the examinee's delight, fulfillment, peacefulness, acceptance and sympathy. It decreases his anger and hate.
5. *Positive Surprise*. It increases the examinee's excitement. It prevents his boredom and apathy.
6. *Encouragement*. It increases the examinee's involvement, enthusiasm and hope. It decreases his doubt, pessimism and anxiety. It alleviates his frustration and disgust.
7. *Acceptance*. It increases the examinee's assurance, calmness and fulfillment. It decreases his irritation and anxiety. It reduces his shame and guilt.
8. *Praise and Congratulations*. It increases the examinee's assurance, fulfillment and pride. It decreases his worry, defeatism and shame.
9. *Criticism*. It challenges the examinee and increases his effort and commitment.
10. *Punishment*. It energizes the examinee and increases his effort and work.

Next, we present the classification with respect to the feedback activation instance.

Activation Instance of the Emotional Feedback

Depending on the appearance time of the emotional feedback, we classify the emotional feedback into the following categories:

A. ***In advance emotional feedback***: it supports emotionally the examinee beforehand of an action. For example, it may enhance his enthusiasm, hope and optimism before the test start. It may reduce his stress; relax his anxiety and fear before presenting a question.

B. ***Immediate emotional feedback***: it supports emotionally the examinee immediately after of an action. For example, it may comfort the examinee after the test start. It may reduce his panic after a wrong answer. It may encourage, praise and congratulate him on his effort, on his results, etc. However, it may also criticize and blame him for not studying enough after a wrong answer to an easy question.

C. ***Delayed emotional feedback*:** it supports emotionally the examinee after some time of an action. For example, it may try to cool down him after the test. Or, it may try to tranquilize an agitated examinee. It may congratulate or criticize him about his effort or results.

More specifically, for the emotional feedback in CAT, we distinguish: 1. Pre-Test emotional feedback, 2. Pre-Answer emotional feedback, 3. After-the-Answer emotional feedback, and 4. After-the-Test emotional feedback.

1. **Pre-Test emotional feedback:** it is presented to the examinee on his request, or on teacher's request, or automatically based on the examinee's current state before the test starts.

   For example, it may excite the examinee about the test subject by presenting real life cases and future perspectives. It may inspire his curiosity asking introductory questions that trigger his imagination. It may challenge him by presenting to him the maximum score achieved by other students previously. It may create a pleased, friendly, comfort, joyful and cheerful environment. It may enhance his optimism about his success in the test by comparing the difficulty level of the test to other tests he succeeded in. It may make him aware of what to expect from the test, the questions, and the result interpretations. It may help his prediction, forecasting and foresight about the test questions (e.g. with respect to the question types, difficulty levels, subjects, format and media). It may prepare him to be ready for the questions by presenting sample questions. It may increase his certainty and surety

that the questions will be on the subjects that he had been taught and studied. It may increase his belief on the test usefulness and meaningfulness by showing real life applications. It may increase his trust and confidence on the test credibility by showing reliability and validity analysis of the questions. It may relax his concerns about the test fairness by showing statistical results from previous test with respect to discrimination factors (e.g. gender, ethnicity). It may reduce his disgust about the test subject by showing to him its practicality and usefulness.

2. **Pre-Answer emotional feedback**: it is presented to the examinee on his request, or on teacher's request, or automatically based on the examinee's current state after a question is presented to him and before he answers it.

   For example, it may energize and stimulate the examinee by asking to make preliminary selections. It may enjoy and amuse him by providing jokes, cartoons, music, etc. It may encourage him by confirming that he can answer correctly. It may assure him that the question difficulty and subject are appropriate for him. It may clarify what the question is asking for. It may assure him that there are not tricks and hidden traps in the question. It may motivate him about the importance and meaningfulness of the question. It may increase his confidence and belief that he will answer correctly. It may show understanding, empathy and compassion to him about the question difficulty. It may lessen his shame for not understanding the question by showing that other examinees could not also understand the question. It may prepare him for the difficulty and the subject of the next question. It may assure him on the appropriateness and suitability of the next question.

3. **After-the-Answer emotional feedback:** it is presented to the examinee on his request, or on teacher's request, or automatically based on the examinee's current state after he answers the question.

   For example, it may excite it may reward the examinee with entertainment for his correct answer. It may congratulate and praise him for answering correctly. It may feel for and show compassion to him for answering wrongly. It may excuse him for his wrong answer. It may criticize and chide him for his wrong answer. It may allay and appease his irritation and upset in case he does not agree with the question result. It may justify the correct answer in case he strongly disagrees. It may cool down him with music after his strenuous effort to answer the question. It may confirm and assure him that he is doing well. It may assure him that one wrong answer is not a disaster. It may explain to him the importance of his answer in the final score. It may assure him on the right contribution of his answer to his overall score.

4. **After-the-Test emotional feedback**: it is presented to the examinee on his request, or on teacher's request, or automatically based on the examinee's current state after the test end.

   It may agree with his satisfaction with respect to his effort and his performance. It may support his happiness and joy for succeeding the test. It may honor and flatter him by admiring his performance. It may show understanding and excuse him for failing the test. It may show to him understanding about the test difficulty. It may show to him mercy for failing the test by letting him to take it again. It may alleviate his anger towards himself for failing questions that he knew the correct answer. It may assure that everything is done properly and the result interpretation will be fair. It may assure that this test is not everything in life and that there are also other chances to take it again. It may remove his concerns and doubts about the accurate interpretation of the test results. It may relax his worry about the fair and confidential use of the test results. It may prepare him for what to expect with respect to the test results interpretation and use. It may assure him of the reliability and validity of the test results interpretation. It may positively surprise him by giving to him

extra points for “good” behavior (e.g. short answer times, minimum resource usage). It may recognize his effort. It may decrease his hate about tests by showing to him the benefits from the test.

Conclusions

Feedback is an important mechanism in learning. Previous research in computer testing considers only feedback that informs the examinee about the answer to every question. This paper proposes personalized emotional feedback in CAT to emotionally support each individual examinee. It also presents classifications of the emotional feedback according to the emotions induced, as well as according to the triggering instances. The CAT system may present emotional feedback to the examinee before the test start, after the question presentation and before his answer, after his answer, and after the test end. Based on the examinee’s current state, the most appropriate emotional feedback type should be invoked. For example, if the examinee answers wrongly, a hint or an alternative question version with encouragement comments may help him. It may show understanding to the examinee by agreeing on the question difficulty. It may assure the examinee that he is on the right track and he is doing well in the exam. It may attract his attention and inspire his curiosity about the test. It may challenge him. It may motivate him about the test educational objectives, and the obtained benefits.

This is the first attempt to introduce emotional feedback in CAT. As such, it provides the framework on which further practical cases will investigate the actual improvement on examinee’s performance and satisfaction that is achieved using personalized emotional feedback. It may stimulate future research on specific feedback constructs to generate specific examinee’s emotions. The presented ideas may trigger further investigation towards emotions supported learning. Designers and developers of CAT systems may include such personalized emotional feedback into their CAT systems. Then, evaluation of real systems will investigate the emotional feedback effect on the examinee’s satisfaction and performance in real exams.

References

Ashby F.G, Isen, A.M. and Turken, U. (1999), "A neuropsychological theory of positive affect and its influence on cognition", Psychological Review, 106, No 3, pp. 529—550.

Bechara, A., Damasio, H., Tranel, D. and Damasio, A. (1997), "Deciding Advantageously Before Knowing the Advantageous Strategy", Science, 275, pp. 1293-1295.

Chen, L.S., Huang, T.S., Miyasato, T. and Nakatsu, R. (1998), "Multimodal human emotion/expression recognition", In: Proceedings of International Conference on Automatic Face and Gesture Recognition, Nara, Japan, IEEE Computer Society.

Damasio, A.R., Grabowski, T.J., Bechara, A., Damasio, H., Ponto, L.L.B., Parvizi, J. and Hichwa, R.D. (2000), "Subcortical and cortical brain activity during the feeling of self-generated emotions", Nature Neuroscience, Vol. 3, No 10, pp 1049—1056.

Dennerlein, J., Becker, T., Johnson, P., Reynolds, C. and Picard, R.W. (2003), "Frustrating Computer Users Increases Exposure to Physical Factors", in Proceedings of the International Ergonomics Association, Seoul, Korea.

DeSilva, L.C., Miyasato, T. and Nakatsu, R. (1997), "Facial Emotion Recognition using Multi-modal Information", in Proceedings of IEEE International Conference on Information, Communications, and Signal Processing, Singapore.

Donato, G., Bartlett, S., Hager, M., Ekman, J.C.P. and Seinowski, T. (1999), "Classifying facial actions", IEEE Transactions on Pattern Analysis and Machine Intelligence, 21, No 10, pp. 974—989.

Goleman, D. (1995), "Emotional Intelligence", Bantam Books, New York.

Healey, J. and Picard, R.W. (2000), "SmartCar: detecting driver stress", in Proceedings of International Conference on Pattern Recognition (ICPR'00), pp. 4218-4221, September 3-8, 2000, Barcelona, Spain, IEEE Computer Society.

Isen, A. M., Daubman, K. and Nowicki, G. P. (1987), "Positive affect facilitates creative problem solving", Journal of Personality and Social Psychology, Vol. 52, pp. 1122-1131.

Isen, A.M. (2000), "Positive affect and decision making", in Lewis, M. and Haviland, J. (Eds): "Handbook of emotions", Guilford, New York.

Isen, A.M. (2001), "An Influence of Positive Affect on Decision Making in Complex Situations: Theoretical Issues With Practical Implications", Journal of Consumer Psychology, 11(2), 75-85.

Izard, C.E. (1984), "Emotion-cognition relationships and human development", in C.E. Izard, J. Kagan, & R.B. Zajonc (eds.), Emotions, cognition, and behavior, Cambridge University Press, New York.

Kapoor, A., Qi, Y. and Picard, R.W. (2003), "Fully Automatic Upper Facial Action Recognition", in Proceedings of the IEEE International Workshop on Analysis and Modeling of Faces and Gestures (AMFG 2003) held in conjunction with ICCV 2003, pp. 195-202, Nice, France.

Kapoor, A, Picard, R.W. and Ivanov, Y. (2004), "Probabilistic combination of multiple modalities to detect interest", in Proceedings of the International Conference on Pattern Recognition, Vol. III, pp. 969- 975, Cambridge, England.

Kulhavy, R. W. and Stock, W. A. (1989). "Feedback in written instruction: The place of response certitude", Educational Psychology Review, Vol. 1, No 4, pp. 279 – 308.

Lane, R., Reiman, E.M., Ahern, G.L., Schwartz, G.E. and Davidson, R.J. (1997), "Neuroanatomical correlates of happiness, sadness and disgust", American Journal of Psychiatry, 154, pp. 926—933.

Mason, B.J. and Bruning, R. (2001), "Providing feedback in computer-based instruction: What the research tells us", http://dwb.unl.edu/Edit/MB/MasonBruning.html

Masters, J.C., Barden, R.C., & Ford, M.E. (1979). "Affective states, expressive behavior, and learning in children", Journal of Personality and Social Psychology, 37, pp. 380-390.

Mota, S. and Picard, R.W. (2003), "Automated Posture Analysis for Detecting Learner's Interest Level", Workshop on Computer Vision and Pattern Recognition for Human-Computer Interaction, CVPR HCI.

Picard, R.W. (1997), "Affective Computing", The MIT Press, Cambridge, MA.

Picard, R.W., Vyzas, E. and Healey, J. (2001), "Toward Machine Emotional Intelligence: Analysis of Affective Physiological State", IEEE Transactions Pattern Analysis and Machine Intelligence, Vol. 23, No. 10, pp. 1175- 1191.

Russell, J.A., Bachorowski, J.A. and Fernández-Dols, J.M. (2003), "Facial and vocal expressions of emotion", Annual Review of Psychology, Vol. 54, pp. 329-349.

Schwarz, N. (2002), "Situated Cognition and the Wisdom of Feelings: Cognitive Tuning", in Feldman Barrett, L. and Salovey, P. (Eds.) The Wisdom in Feeling, Guilford Press, New York, pp. 144-166.

Seipp, B. (1991), "Anxiety and academic performance: A meta-analysis of findings", Anxiety Research, 4, pp. 27-41.

Sri Krishna, T.M. (2001), "Web-based adaptive testing", Learning Technology newsletter, Vol. 3, No 3, pp. 44-47.

Steeneken, H.J.M. and Hansen, J.H.L., (1999), "Speech under stress conditions: Overview of the effect on speech production and of system performance", in Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing, Vol. IV, pp. 2079-2082, Phoenix, Arizona.

Tanis, B., & Bryan, J. (1991), "Positive mood and math performance", Journal of Learning Disabilities, 24, pp. 490-494.

Vygotsky, L.S. (1987), The collected works of L.S. Vygotsky, Plenum, New York.

Wainer, H. et al. (2000), Computer Adaptive Testing: A Primer, Second Edition, Lawrence Erlbaum Associates, Inc., London.

About the Author

Anastasios A. Economides is Professor in the Information Systems Department, University of Macedonia, Thessaloniki, Greece.

Email: economid@uom.gr.

Editor's Note: In this article, Muhammad Betz relates classical learning theories and practices and information processing theories to online learning. He documents the importance of social aspects of learning and how social interaction and discourse differs between classroom and online environments.

Solo and Social Learning in Online Courses: Implications for Information Processing Theory

Muhammad K. Betz

The "online" revolution in higher education, which had grown to include over two million students in 2004 (Allen & Seaman, 2004), has led to debate among educators about the nature of learning in this new medium (Hiltz & Turoff, 2005; Pincas, 2000; Richardson, 2002). Invariably, this debate forms a demarcation between solo (individual) and social aspects of learning. It seems that the social aspects of learning have gained prominence in online courses, as stated here, "Online learning is a new social process that is beginning to act as a complete substitute for both distance learning and the traditional face-to-face class" (Hitlz & Turoff, p. 60). However, no one has said that social learning has eliminated solo learning, either. The purpose of this paper will be to examine solo and social learning and to offer a reconciliation of them in an overarching theory of learning that is useful but not pedantic.

Review of Important Literature

Piaget's View

It is appropriate to begin any discussion about learning with a review of Piaget's theories. Researcher Rheta DeVries explores both the role of solo and individual learning in Piaget's views of development (DrVries, 1998). The author points out that there is an assumption that Piaget focused solely on the solo considerations of learning; however, Piaget cited the importance of peer relations in learning from his earliest writings. In fact, Piaget addressed individual development in terms of social interactions in relation to sociomoral development, affective and personality development, and intellectual development. As stated, "Piaget's description of sociomoral development was expressed as movement from anomy (non-regulation by others or the self) to heteronomy (regulation by others) to autonomy (self-regulation)" (p. 4). With respect to affective and personality development, Piaget attributed a power to the affective side of students to motivate the intellectual side. In social learning, individuals form schemes for affective "knowledge," simultaneously, as cognitive schemes are formed, through the aegis of social reciprocity.

Piaget is quoted thus, "In his early work, Piaget (1929/1995) insisted that 'there area social elements in logical knowledge,' that 'social life is necessary condition for the development of logic,' and that 'social life transforms the very nature of the individual'" (p. 7). From the exclusively cognitive point of view, it is clear that Piaget identically valued individual and social operations.

Social Learning Online

One telling research study explored the social dimensions of online learning by varying instructional arrangements for a module in a graduate level course to weigh the importance of solo and social learning aspects. As stated, "The basic assumptions were that learners construct their own knowledge through active engagement with texts and through interaction and dialogue with others" (p. 271). Specifically, this study examined socialization, learner interaction, and text-based versus face-to-face communication, in dispensations of the instructional module. Some

versions of the online course included face-to-face sessions while others did not. Students and instructors reported value-added perceptions for face-to-face sessions. However, they also cite the research of Salmon, who found that students were confused by switching from face-to-face to online formats in courses, based on the different ways that students socialize in the two environments. In face-to-face learning, students socialize in relation to personalities, but in online learning, students socialize in text-based interactions. The authors conclude, "The distinguishing features of the new online environment – lack of auditory and visual cues, asynchronicity and dependence on written text – have shown to result in the emergence of new types of interaction and discourse" (p. 278).

A Seminal View

Two prestigious authors, Gavriel Salomon and David Perkins, examine both individual and social learning in a comprehensive article that has important implications (Salomon & Perkins, 1998). The authors begin by admitting that until recent years, social learning has been underemphasized in relation to individual or solo learning and then acknowledge that the concept of individuals learning in isolation, apart from social and cultural influences, is decrepit. In an effort to examine solo and social aspects of learning they offer a paradigmatic view of learning from the viewpoint of information processing. As stated, "The information processes in question might occur within the mind of an individual or within complex webs of social interaction" (p. 2). In a familiar vein of discourse, the authors cite critical conditions which information processing must systematically elicit, in order for solo or social learning to occur.

Six distinct meanings of social learning are identified as:

1. active social mediation of individual learning, in which a person or group of persons help an individual to learn;
2. social mediation as participatory knowledge construction, which is learning that results from the act of participating in group effort towards learning;
3. social mediation by cultural scaffolding, which is learning that derives from social artifacts or media;
4. the social entity as a learning system, which is learning that derives from large group or organizational participation;
5. learning to be a social learner, learning to learn from social participation; and
6. learning social content, which is comparable to service learning or apprentice type learning in a social context (p. 3).

In reviewing these six points, conclusions are offered related to the superiority of social versus solo learning for each distinction.

Finally, three relations between solo and social learning considerations are articulated. The first relation is captured so: "While almost all individual learning is social in some sense, the degree of active social mediation may vary considerably form situation to situation" (p. 11). The second relation identifies three points on the continuum including individual learning on one end and social learning on the other. These three points would be: individuals learning solo, to individuals learning in groups, to individuals learning though social participation. The third relation posits a "reciprocal spiral relationship" (p. 12), in which the two polar forms of learning complement each other. The authors comment in closing that the implications for instructional design are clear, in that structures that encourage the reciprocity of solo and social learning must be built in to learning environments.

Information Processing Theory of Learning*

The Information Processing Model of Learning, like all models of learning, offers a metaphor that explains the process of human learning, and in this particular case, learning is compared to the way that a computer processes and stores information (Gagne, 1985). The process of learning is compared to the sequence of information processing, i.e., inputting data, processing data, and storing data for later retrieval. The steps of information processing are also related to concepts of human memory, implying that humans process data for learning in a manner similar to the way that computers process data (see Figure 1). Of course there are complicating factors, not the least of which is the human mind (Betz, 2001).

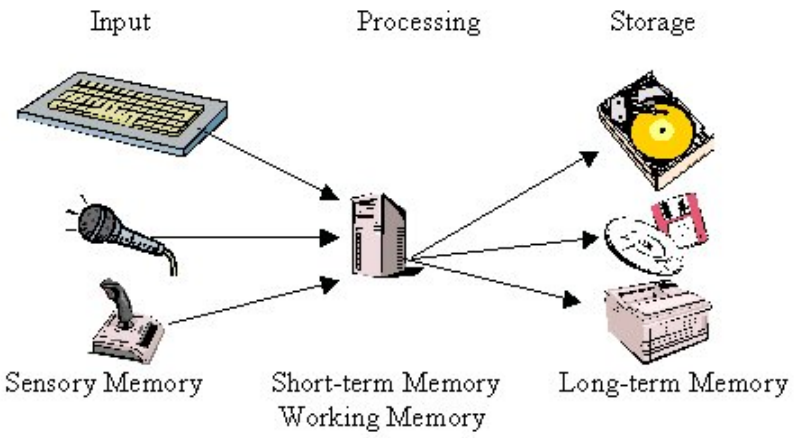

Figure 1. **Computers and Humans: Information Processing**

Human Memory and the Information Processing Model

The mind continually receives data from the five senses into the *sensory memory*. When motivated or activated, the mind can selectively focus on target data for input into the short-term memory. After selecting data for input into the *short-term memory*, the data is held for a few seconds of time. If during those few seconds, the learner begins to manipulate the data, with the *working memory*, at least some of the data can be retained. The *short-term memory* holds data long enough so that the *working memory* can attempt to assimilate and accommodate, in Piaget's terms (Woolfolk, 1998), the new learning into the *long-term memory* for permanent or long-term storage. Although data in the *long-term memory* is not altogether permanent and is thought to evolve and "fade" (Garry, 1999), data in the *long-term memory* can be retrieved for use long after initial learning.

Human Memory			
Sensory Memory	**Short-Term Memory**	**Working Memory**	**Long-Term Memory**
Receives data	Holds data	Processes data	Stores data
Computer Operations			
Basic input of data	Input of data into applications	Manipulation of data	Storage of altered data

Figure 2. **Human Memory and the Information Processing Model**

Information Processing Theory and Online Learning

How does the information processing theory of apply to online learning? There are several dimensions to consider in answering this question. A paramount consideration is that offered by Salomon and Perkins above (1998), that learning in an educational environment is characterized by solo and social aspects. It is clear that the application of information processing theory in online learning must address both of these aspects. The other dimension warranting attention relates to the essential constructs of information processing, i.e., sensory memory requiring input, working memory requiring processing, and long-term memory requiring storage for later retrieval (Woolfolk, 2004).

Sensory Memory

At the level of sensory memory requiring input, online learning offers distinctive forms for both solo and social learning. Solo learning involves individuals reading course materials and completing course assignments. In addition, solo learning also occurs in a recessive way when students participate in small group (team) activities and in large group (whole class) activities. A consideration of the various platforms for online courses such as Blackboard, WebCT, e-College and Outlook Express (used exclusively by the University of Phoenix, the world's largest online university) gives a clear indication of the dominant milieus for sensory input in online courses. All of these platforms have Discussion Boards for whole class participation, Team Areas for small group interaction, Course Documents and Materials for vital information; and Announcements for course navigation. The input of information takes place in these platform structures for both solo and social learning.

Working Memory

The course constructs related to working memory for processing information are the same as those listed above for sensory memory, but at this level, student activities are required. For example, students complete assignments at the individual level thereby creating solo learning in a direct sense. Students participating in whole class discussions engage in solo and social learning by answer discussion prompts and responding to classmates' postings on whole class forums. In those classes with small group or team activities, students participate in informal discussions related to completion of team assignments, act together to create strategies that divide the tasks necessary to complete the assignments, and combine and edit individual contributions into a final product. In the small group work, social learning is emphasized, but solo learning outcomes can also result.

Long-Term Memory

The completion of solo and social assignments in online courses in conjunction with instructor feedback characterizes the nature of long term memory acquisitions. As the course evolves, the instructor, or facilitator, adds formative and summative feedback to solo and group efforts. In many cases, the feedback reflects monitoring of group work and participation in group activities that is intended to guide student learning. The provision of feedback for solo and group assignments and efforts is another important element of finality to learning. It is important at this stage of online courses that instructors hold learners equally accountable for both solo and social aspects of the course. Tacit monitoring cannot be assumed to have any effect, particularly in the online medium. For this reason, both extent and quality of student participation in large and small group activities should be assessed and related feedback provided or important learning outcomes could be lost.

Summary

That there is a continuum between solo and social aspects of learning is congruent with John Dewey's call for an establishing two major principles for learning, in a general sense, and they are the principle of continuity of learning experiences and the principle of the continuity of growth (Dewey, 1938). Salomon and Perkins (1998) have identified the relationship between solo and social learning as a reciprocal spiral, which too is in accord with Dewey's two principles of continuity and growth. It fully seems that the question as to how online learning can evidence the reciprocity of solo and social learning is best answered by considering the information processing of learning. As stated by McAlpine (2004), "The instructional implications of this theory emphasize: well-organized instruction, extensive and variable practice, and learner control of the information being processed. This theory links particularly well to routines as well as problem-solving and knowledge building of words" (p.124). This description points to the most common, extant form of online courses. These courses work best for knowledge building and problem-solving. They work best when they are highly organized. They work best when they provide for both solo and social learning experiences that work in reciprocity to create quality learning.

References

Allen, E., & Seaman, J. (2004). Entering the mainstream: The quality and extent of online education in the United States 2003 and 2004. Needham, MA: Sloan Consortium, 2004.

Betz, M. (2001). The instructional plan for learning and curriculum alignment: The iplca. Learning Technology Newsletter, 3(4), retrieved from http://lttf.ieee.org/learn_tech/issues/april2001/index.html#4

DeVries, R. (1997). Piaget's social theory. Educational Researcher, 26(2), 4-17.

Dewey, J. (1938). Experience and education. New York: Macmillan. 91.

Hartley, J., & Davies, I. (1976). Pre-Instructional strategies: The role of pretests, overviews, behavioral objectives, and advanced organizers. Review of Educational Research, 46(2), 239-265.

Hiltz, S., & Turoff, M. (2005). The evolution of online learning and the revolution in higher education. Communications of the ACM, 48(10), 59-64.

Gagne, R. M. (1985). The conditions of learning and theory of instruction, fourth edition. New York: Holt, Rinehart, & Winston. xv+359.

Garry, M. (1999, November). Reinventing yourself. Psychology Today. (Retrieved on-line at: http://www.findarticles.com/cf_0/m1175/6_32/56883560/print.jhtml.)

Nicol, D.J., Minty, I., & Sinclair, C. (2003). The social dimensions of online learning. Innovations in Education and Teaching International, 40(3), 270-280.

Northrup, P., Lee, R., & Burgess, V. (2002). Learner perceptions of online interaction. (ERIC Document Reproduction Service No. ED477075)

Pincas, A. (2000). New literacies and future educational culture. Association for Learning Technology Journal, 8(2), 69-79.

Richardson, A. (2002). An ecology of learning and the role of elearning in the learning environment. Global Summit of Onlien Knowledge Networks 2002. (papers)

Salomon, G., & Perkins, D. (1998). Individual and social aspects of learning. Review of Research in Education, 23, 1-24.

Woolfolk, A.E. (1998). Educational psychology, seventh edition. Boston: Allyn & Bacon. xxiv+593.

Woolfolk, A.E. (2004). Educational psychology, ninth edition. Boston: Allyn & Bacon. xxxiii+669.

* Contents from these two sections of the paper have been used with permission by the Editor of the Learning Technology Newsletter.

About the Author

Muhammad Betz

Muhammad Betz Ph.D. has taught almost 150 courses online in many different platforms. He has been a high school English teacher and football coach, a corporate trainer, and is now a Professor and departmental Chair in Teacher Education.

His degrees in field are: B.S., Ball State University; M. Ed. and Ph.D., University of Texas-Austin.

His specialty areas include Instructional Technology, Curriculum and Instruction, and Teacher Education.
Email: mbetz@sosu.edu

Editor's Note: Cell phones, pocket computers and PDAs (Personal Digital Assistants) offer web access, text messaging and voice options for Mobile learning (M-Learning). These technologies offer new opportunities for interactive communications and learning at a distance.

M-Learning – A New Paradigm in Education

Nitin Upadhyay

Abstract

Teaching and learning will continue in a world of words. Mobile educational systems have started to emerge as potential educational environments supporting life-long learning. The role that communication and interaction plays in the learning process is a critical factor. The modern day mobile phone users are experiencing dramatic change in the way they can use their mobile phones. This paper intends to identify and discuss the strategic assumptions behind the current thinking on the m-learning paradigm and to explore the relationships with e-learning development. Mobility and communication are essential for satisfying several needs associated with learning, working, socializing, political participation, entertainment and other activities. M-learning has now emerged as a new wave of development, based on the use of mobile devices combined with wireless infrastructure. Much of the current literature on m-learning reveals all the strengths and weaknesses associated with the more mature e-learning communities.

Keyword: m-learning, e-learning, mobile education, mobile learning paradigm.

Introduction

M-learning has now emerged as a new wave of development, based on the use of mobile devices combined with wireless infrastructure. Mobile Learning has a strong foundational base when it comes to how the student will learn when there is an interaction of the learning material, technological platform, and the wireless network. Just like wireless technology which was built on numerous technological advances, M-Learning also is a combination or a hybrid of more than one system. In this case, M-Learning relies on pedagogical theories and strategies of the Behaviorist, the Cognitivist, and the Constructivist Learning groups. The acceptance of e-Learning or web-based learning is due to growing availability of commercially available Learning Management Systems (LMSs) such as WebCT, BlackBoard, Learning Space, IntraLearn , Top Class, eCollege, Click2learn, Authorware, LearnLinc ,Virtual-U, Web Course in a Box, UniLearn and WebBoard [1].

Using mobile devices such as Palm handheld computers connected to web servers on campus, students can truly experience the freedom and productivity of mobile handheld computing [2].

> *"Behaviorist, cognitivist, and constructivist theories have contributed in different ways to the design of online materials, and they will continue to be used to develop learning materials for online learning. Behaviorist strategies can be used to teach the facts (what); cognitivist strategies to teach the principles and processes (how); and constructivist strategies to teach the real-life and personal applications and contextual learning. There is a shift toward constructive learning, in which learners are given the opportunity to construct their own meaning from the information presented during the online sessions. The use of learning objects to promote flexibility and reuse of online materials to meet the needs of individual learners will become more common in the future. Online learning materials will be designed in small coherent segments, so that they can be redesigned for different learners and different contexts. Finally, online learning will be increasingly diverse to respond to different learning cultures, styles, and motivations" [3].*

Emerging technologies are leading to the development of many new opportunities to guide and enhance learning that were unimaginable even a few years ago. There are already about one million courses on the internet, 30,000 of them compiling with a scientific definition of online, 22,000 of these are listed on the telecampus portal, with many of them making didactic use of the World Wide Web [4].

M-Learning – A paradigm shift

As our society is entering a knowledge-based, Internet/Web-driven economy, college education becomes a necessity for any individual who wants to be competitive and successful, regardless of his or her age, gender, and race (Fisher, 1997; Holstein, 1997). The wireless technologies of the mobile revolution have seen the worldwide proliferation of wireless communication devices [5].

As part of a growth trend in the e-learning market, mobile learning is evolving into a dynamic, interactive and personalized experience for employees. Framingham, Mass.-based research firm IDC predicts the e-learning market will grow from $6.6 billion in 2002 to nearly $25 billion by 2006. The Economist Intelligence Unit, the UK-based business information arm of the company that publishes "The Economist," expects e-learning and traditional learning to become indistinguishable in the near future. More than 150 million Americans carry a mobile phone. According to IDC, that number will grow to more than 180 million by 2007 [6].

It has been pointed out that access to technology makes technology an integral part of daily learning [7]. It has often been suggested that access on its own will not fulfill the promise which many have meant lies in the use of ICT in school [8], but where several criteria for the successful integration of ICT play a role[9].

It has been pointed out that school learning is characterized by memorization and reproduction of school texts, and where teacher talk dominates and students' activity is largely limited to answering questions formulated by the teacher [10]. In such a learning culture, drawing on examples of mobile telephony in classrooms, one can say that their role can be regarded as that of an "intruder" in the learning culture, a disturbance [11], and as such a *disruptive technology*. Mobile technology actually offers the appropriate educational environment to assist learning activities both inside and outside the classroom [12].

As Paul Harris in Goin' mobile states mobile learning is the ability to enjoy an educational moment from a cell phone or a personal digital assistant [13].

Today's ICT has significantly extended the scope for learning anywhere, anytime and the term m-learning has gained serious strength and influence in describing the future of education [14]. From a pedagogical perspective, mobile learning supports a new dimension in the educational process. Features of mobile learning include [15]:

- Urgency of learning need;
- Initiative of knowledge acquisition;
- Mobility of learning setting;
- Interactivity of the learning process;
- 'Situatedness' of instructional activities; and
- Integration of instructional content.

Mobile learning technology

The new paradigm is more proactive and pushes information to people; the components that mobile learning system includes [16]:

- authoring tools for content capture and conversion for mobile delivery
- mobile game and simulation templates
- mobile learning management, which registers and track mobile learning use
- mobile learning content management systems that download and manage a repository of mobile content
- enterprise application integration tools, such as CRM and HRIS.

From courseware to performance-ware: The stand-alone learning content model needs to transform to a context-driven, task-sensitive, performance-support model. Examples include guided tasks, instructions, job-aids, and reference-ware. In addition, standards need to be defined to interchange performance-objects, which are delivered within the context of a job-task, with leaning-objects, which focus on modular course content.

From course management to business workflow: Business workflow and processes become the delivery platform for mobile learning and performance support.

From instructional design to performance-based design: Compiling content and courses transforms into job, task, activity, and business application context analysis. This links workflow to granular content.

From mouse-and-click to pen-and-voice interface: New forms of interactivity include small or non-existent keyboard interfaces. In the future, pen-based handwriting-recognition and voice-recognition tools to capture and access information will become the norm.

From centralized server to peer-to-peer networks: Peer-to-Peer networks facilitate communication, collaboration, and resource sharing at the edge of the Internet--compared to the traditional client/server networking model.

According to Empowering Technologies learning technology is moving towards mobile learning era. The evidence is overwhelming that mobile learning is beginning to take hold [17]:

- Over 50 percent of all employees spend up to half of their time outside the office.
- The average employee had less than three days of training in 2004.
- The number of Mobile phone users has doubled since 2000.
- Mobile phone subscribers around the globe will total nearly 1.5 billion by the middle of 2005, that's about one quarter of the world's population.
- Worldwide mobile commerce market will reach $600 billion by 2005.
- There will be more than 2 billion wireless internet subscribers worldwide by 2006.
- Multi-purpose handheld devices (PDA and telephones) will out sell laptop/desktop computers combined by 2005.
- Most major US companies will either switch to or adopt wireless networks by 2008.

Devices to be used

"The hypothetically perfect device would be small and fit easily into one's pocket. The screen should fold out to A4 paper size and have paper readability. Wireless connectivity should be of high speed, the user should be always online with the possibility to switch seamlessly between wireless zones and phone networks. The device should have an integrated phone and support all the major office formats for reading and writing as well as "pdf" format. Security should be high, and if the device is lost the data should be made useless with no risk to the owner. The perfect device should render standard web pages perfectly and offer the ability to strip out advertisements etc. and display useful content only. The web pages should be readable offline as well as online. This should facilitate an understandable on-the-fly text-to-voice and voice-to-text feature. The following list describes a close-to-perfect handheld device [18]:

- Always online connectivity
- Bluetooth for connection with other devices
- Built-in video cannon for displaying presentations etc.
- Camera for documentation in the field
- Flash support
- Full size keyboard available
- Full WI-FI connectivity
- Large storage capacity (Large is a relative term changing with time)
- Screen of acceptable size and readability
- Large battery capacity
- Messaging client for peer-to-peer communication
- Non-volatile memory for backup
- Phone ability
- Read Adobe Acrobat documents
- Read/write common office formats
- Scanner and printer built in
- Small compact device
- Support multimedia content as well as flash, java and java script etc.
- Synchronize and check e-mail with common mail clients.
- Text-to-voice screen reader and Dictaphone

Many obstacles exist in terms of implementing any significant m-learning applications, based on current mobile technology capacity. These obstacles can be summarized in the following form [19]:

- Limited memory and storage are major inhibitors.
- Screens are generally too small for the use of any sophisticated applications.
- Intermittent connectivity is a major barrier.

- Cross-platform solutions are not yet possible.
- Links to learning management systems or enterprise systems are in an embryonic stage of development.
- The industry is plagued by proprietary solutions.
- Transmitting across different browsers and platforms is almost impossible.
- Existing applications are not easily integrated to the mobile technology environment.
- Start-up costs are invariably high.
- Tracking outcomes is difficult.
- Security is a major issue.
- Cost of accessing major third-party networks is punitive.
- Multiple permissions are necessary in terms of negotiated access.
- Continuous technology development militates against stability and sustainability in terms of mounting viable m-learning applications.

Designing Course Structure

The application developer needs to consider the user when designing the mlearning course content and structure. The following simple principles are recommended [20]:

- Keep it Simple
- Avoid large amounts of data
- Avoid underlined text as this will be mistaken for Links
- Use Selection Lists for data entry
- Consistency - place links in same place throughout application
- Always provide link to Start page or Index
- Use Titles on Cards to ease navigation
- Use Tabloid format - headlines and summaries
- Use short words

Advantages of Mobile Learning

No other learning approach matches the integrated, continuous flow of m-learning [21]:

***Seamless access to learning resources*:** With mobile learning, you can learn and study anywhere - from the classroom to your desktop or laptop to your pocket. A true mobile learning system allows users to take a course on any device.

Freedom, power, and choice: M-learning students can choose where, when, and how they will study. The new range of options includes online synchronized, online self-paced, downloaded courseware, and computer-based training. M-learning offers new levels of freedom with the ability to exercise control over learning patterns.

***Organized productivity*:** With only a cell phone, handheld device, PDA, or hybrid unit, users can access administrative functions, download courses, and review their learning history through a learning management system. M-learning offers an efficient way for learners to access key information and maximize their time.

***Flexible, portable convenience*:** The ability to customize learning schedules is a key advantage to m-learning. Learners are not restricted to a specific physical environment, a particular delivery channel, or a fixed set of times for undertaking training and education. Using the latest technology, students can update their knowledge base on a just-in-time basis to prepare for meetings or presentations.

The technologies involved in e-learning and m-learning (computers, laptop computers, PDAs (Personal Digital Assistants)/handhelds/ palmtops, smartphones and mobile phones can be arranged on a continuum(Figure 1):

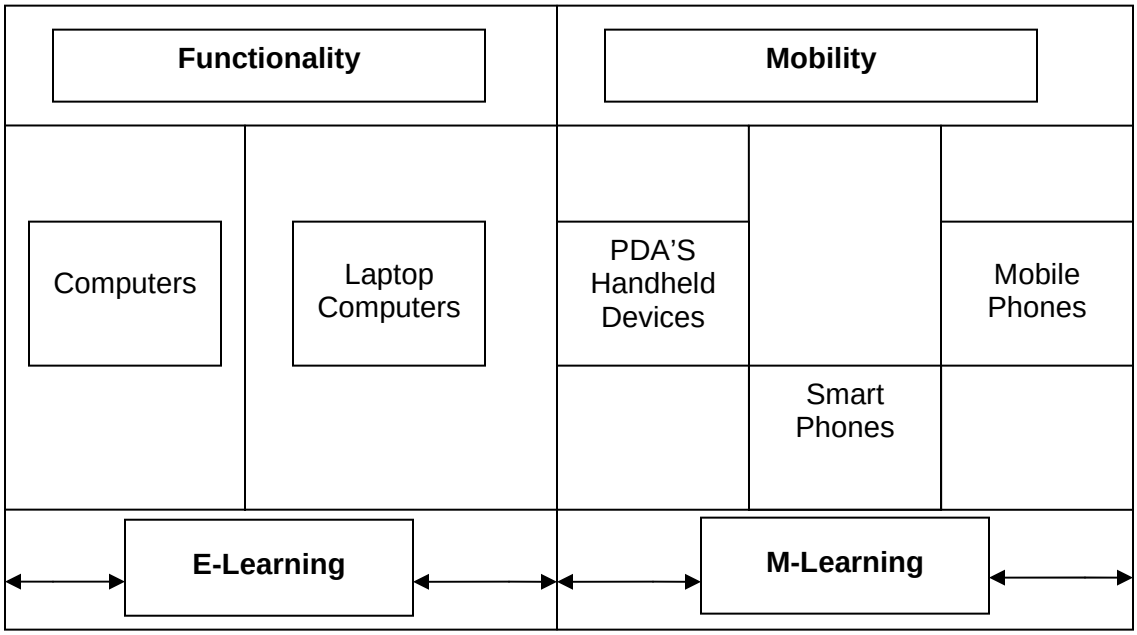

Figure 1: Relationship of m-learning to e-learning

Conclusion:

> *"In the longer term, as we realize that learning should move from an organizational function to an individual necessity, m-Learning will likely move from a hosted service to device-resident applications we can carry with us wherever we go. Eventually, the learner will not know, nor care, where the learner model is kept, where the content resides, nor how the communication is handled. This will happen as cost drops, product power improves, and design takes into account a wider range of learning styles and lifestyle needs. And that will be true mobile learning" [22].*

The world of mobile and wireless computing is evolving fast and learning technology is moving towards mobile learning era. In order to have proper functioning of the mobile Internet for learning, the e-learning community must focus on the performance and productivity issues rather than traditional lecture style training or courseware. To enhance the mobile learning environment, course content and learning methodology should encompass use of quizzes to test knowledge, summary of main learning points, and interaction with other students and the tutor.

References

[1] Abernathy, D. J. (2001). "Get Ready For M-Learning." Training & Development 55(2): 20-22.

[2] Bunnell, D. (2002). "Just around the corner: The next technology revolution." Upside 14(3): 62-67.

[3] Ally, M. (2004). Foundations of Educational Theory for Online Learning. In T. Anderson & E. Eloumi (Eds). Theory and Practice of Online Learning. Athabasca, AB. Athabasca University.

[4] Anonymous (1998). "Merging the Intellectual and Technical Infrastructure of Higher Education: The Internet Example." The Internet and Higher Education 1(1): 10.

[5] Landers, P. (2002). From E-Learning to M-Learning, Ericsson.

[6] Nancy D, Christopher V. K (2004), Human Resource Executive

[7] Soloway, E. et al (2001) Learning in the Palm of your Hand http://www.handheld.hice-dev.org/readyAtHand.htm

[8] Bransford, J., Brown,A.L., & Cocking, R. (2000) How People Learn. National Research Council, Washington DC. NationalAcademy Press

[9] Dwyer, D.C. (1993) Apple Classrooms of Tomorrow.

[10] Miettinen, R (1999) "Transcending traditional school learning: Teachers' work and networks of learning" in Engeström, Y., Miettinen, R., Punamäki,R., (1999) (Eds) Perspectives on Activity Theory. USA: CambridgeUniversity Press.

[11] Mifsud, L., (2002) "Alternative Learning Arenas – pedagogical challenges to mobile learning in education". WMTE proceedings: IEEE publication.

[12] Fleischman, J. (2001), *Going Mobile: New Technologies in Education*, Converge Magazine.

[13] Paul, H. (2001), "Goin' Mobile" – Learning Circuits ASTD Magazine All about eLearning.

[14] Donna, A. (2002), "@ work; Get ready for m learning" – On line teaching 4 libraries.

[15] Chen, Y.S., Kao, T.C., Sheu, J.P. and Chiang, C.Y. (2002). A Mobile Scaffolding-Aid-Based Bird-Watching Learning System. In M. .Milrad, H.U. Hoppe and Kinshuk (Eds.), IEEE International Workshop on Wireless and Mobile Technologies in Education(pp: 15-22). Los Alamitos. USA: IEEE Computer Society.

[16] Harvey, S. (2003)"Leveraging Mobile and Wireless Internet". ASTD'S Source for E-Learning.

[17] Empowering Technologies (2001). The Mobile Learning Era. Last Retrieved December 2005, from www.empoweringtechnologies.net/mobile.htm.

[18] Desmond, K. (2005). Mobile Learning: The Next Generation of Learning. Distance Educational International. pp: 123-124.

[19] Neil, M.(2003). The M-Learning Paradigm: An Overview. A Report for the Royal Academy of Engineering and the Vodafone Group Foundation.

[20] Paul, L. (2002).The advantages and disadvantages of using WAP in developing mlearning course. Last Retrieved December 25, 2005 from http://learning.ericsson.net/mlearning2/project_one/wap_article.html.

[21]. Kember *Wireless Business and Technology Magazine* at www.wbt2.com.

[22]Quinn, Clark (2000). mLearning: mobile, wireless, in your pocket learning. LineZine Magazine. Learning in the New Economy. Last Retrieved December 19, 2005 from www.linezine.com/2.1/features/cqmmwiyp.htm.

About the Author

Nitin Upadhyay is an acknowledge teacher and prolific writer. He is currently working as Faculty in the Department of Computer Science and Information Systems, BITS, PILANI-GOA Campus. He has created a definite niche for himself in the field if Computer Science by contributing eight books. His research and creative zeal has enabled him to contribute research papers for journals and conferences

Nitin Upadhyay
Faculty, Department Of Computer Science & Information Systems
BITS,PILANI-GOA CAMPUS
GOA, India

E-mail: nitinu@bits-goa.ac.in, upadhyay.nitin@gmail.com Phone (M): 9326815639

Editor's Note: Online learning and higher education certificates and degrees place added emphasis on writing skills. Brent Muirhead addresses these suggestions to students and professionals to enhance their communication skills in print and online. The editors are grateful for permission to republish this article from the print edition of i-manager's Journal of School Educational Technology in Kerala, India. The original reference is: Muirhead, B. (2005). Using Outlines to Improve Online Student Writing Skills. i-manager's Journal on School Educational Technology, Vol. 1, No. 3., ISSN-0973-2217, 17-23.

Using Outlines to Improve Student Writing Skills

Brent Muirhead

Abstract

Assisting students with written work continues to be a challenging task for today's teachers. Outlining represents a relevant instructional technique to help students develop self-regulated writing skills and promote higher order thinking.

The Art of Effective Writing

A growing trend in today's K-12 educational institutions is utilizing outlines to enhance the quality of student writing. Developing a writing plan is a vital step towards improving an individual's writing skills. The plan should reflect an emphasis on realistic strategies that foster constant improvement and help students create quality papers. Veteran writers recommend establishing a writing plan based on assignment due dates. A good writing plan will involve calculating the approximate amount of time needed to effectively complete the paper. It will take personal discipline to consistently work on the paper. A writing schedule will reduce stress by integrating enough time into the individual's daily routine to edit the paper and meet the deadline for the assignment. Writing plans help procrastinators who need to get started earlier on their on work and perfectionists who continually want to make revisions by giving them a time line to finish each phase of their paper. A time line should include a degree of flexibility to insure that adequate time is allocated to devote more attention to different aspects (i.e. research) of the writing process (Sawers, 2000).

The planning process is essential step towards improving written work. It will involve selecting an appropriate topic, designing a thesis statement, conducting preliminary research to make sure there is adequate information on topic and developing a basic outline of the paper. Students who rush into their writing project and skip these steps are taking a risk that could cost them precious time. The preparation phase is an essential element in laying a solid foundation for the actual writing process which helps students to have a focused paper with appropriate information sources to support their ideas.

Students should strive for precision and impact in their papers. Students need to be reminded that contemporary readers are opposed to any form of media that appears to waste their time and people will often skip over journal or magazine articles that lack conciseness and visual appeal. Contemporary Americans are well known for surfing through an assortment of television or radio programs and web sites. Therefore, individuals must evaluate their use of language and decide whether it has the dynamic quality that captures the reader's attention or it reflects verbiage which repels potential readers. Brohaugh (2002) describes flabby writing as "any that slows the reader down ---anything that physically slows the sweep of the eyes across the words, that stands physically in the way of the reader's mind absorbing the meaning of the words as quickly as possible" (p. 2).

Students who tend to be verbose will write an excessive amount of words but the extra words produce confusion in the mind of the reader. For instance, redundancy is one type of wordiness

and it can appear in several forms: use three illustrations to support a single point, constantly repeating a major point and frequently using a term like "perspective." Redundancy is a misuse of words when writers cluster certain terms together for emphasis but clarity and the student's voice is lost in the process. Brohaugh (2002) relates that "pesky tautologies simply clutter things up saying 'mental telepathy' when 'telepathy' is enough or saying 'past achievement' when 'achievement' itself communicates that it happened in the past" (p. 17).

Student writers can enhance their writing skills by following a basic writing plan that helps them to effectively edit their work. Hostetler (2004, pp. 24-26) offers ten practical steps to polish their papers to which the author has appended with explanatory comments:

- **Ask who cares**- focus on relevant knowledge that interest readers
- **Edit for weaknesses**- enlist individuals who can provide constructive advice
- **Use computer tools**- use spelling and grammar software
- **Proofread your work later-** wait three days to edit to keep a fresh perspective
- **Delete unnecessary words-** aim to create clear sentences
- **Highlight all verbs**- select verbs to change from passive to active
- **Highlight adjectives and adverbs-** delete redundant adjectives and verbs
- **Eliminate clichés-** avoid using terms such as downsizing
- **Sprinkle in variety-** vary sentence length, mix simple and complex sentences
- **Read aloud-** identify sentences to changes such as location of verbs

Utilizing Outlining Techniques

Writing an outlines provide opportunities for students to refine their outlining skills and increase their understanding of critical thinking. Teachers can develop instructional plans that assist the student's cognitive information processing skills (Driscoll, 2005).

Hillocks' (1989) investigation identified the four effective instructional approaches to student writing:

1. **Models** – share good examples of writing and assisting students to identify parts of the model and stress is placed on the producing a quality product.
2. **Sentence-combining** – students learn to combine several sentences into one complex sentence and the emphasis is on the process of writing.
3. **Scales** – students learn how to evaluate the quality of compositions and revise the weaker works and the stress is upon revision.
4. **Inquiry** – students are given data and they are given directed to use the data in their writing which can range from descriptive to theoretical essays on the data. It encourages students to develop plans and organize their ideas.

Studies reveal that an excessive emphasis on grammar can actually promote weaker writing skills. A review of the literature on best writing practices affirms that importance of avoiding instructional approaches that create passive learning situations. Students should be challenged to use their metacognition skills to learn about the writing process (i.e. planning and revising) and devote time to comparing good and poorly written work to gain insights into the nature of quality narratives (Brynes, 2001).

Students who struggle with procrastination often find that it can have a negative impact on their ability to complete assignments and effectively meet course deadlines. O' Callaghan (2004) highlights research on students who procrastinate in their work by noting that students who struggle often have unwarranted negative appraisals of their writing and avoid starting papers because it seems comforting to them. Also, the researcher found individuals had unrealistic writing expectations (i.e. it should be easy) and their emotional concerns overwhelmed their intentions to get started on tasks. Teachers can use outlines as a learning activity that addresses issues related to procrastination and anxiety. It is vital that the description of the outline assignments must be detailed and specific enough to provide adequate guidance.

The writing process involves several distinct phases: invention (i.e. brainstorming), organization, drafting, revision and sharing work with others. The author's assignment will stress the organizational element of writing. The assignment enables readers to use an expressive mode of writing which is common among novice writers. Creating outlines give students practical writing experiences which provides a basis for them to be prepared to move on to more sophisticated types of writing. "The writer is able to express thoughts in different ways, moving from the intimacy of his or her own thoughts to accommodate communication framed by different contexts and for different audiences" (Danielson, 2000, para 5).

A recent trend in K-12 instruction has been the use of mind mapping software programs (i.e. Inspiration Software, Inc., 2005). Teachers can use the mind maps to help provide visual images of complex ideas or concepts. Contemporary mind mapping software enables students to create a diversity of outlines that help them to experiment and organize their ideas into meaningful sentences. The author recommends Mind Manager (2005) for teachers because it is superior to Inspiration and it can address a wider range of audiences and offers more sophisticated design options. Mind Manager can translate textual material into visually appealing and innovative charts (see Figure 1).

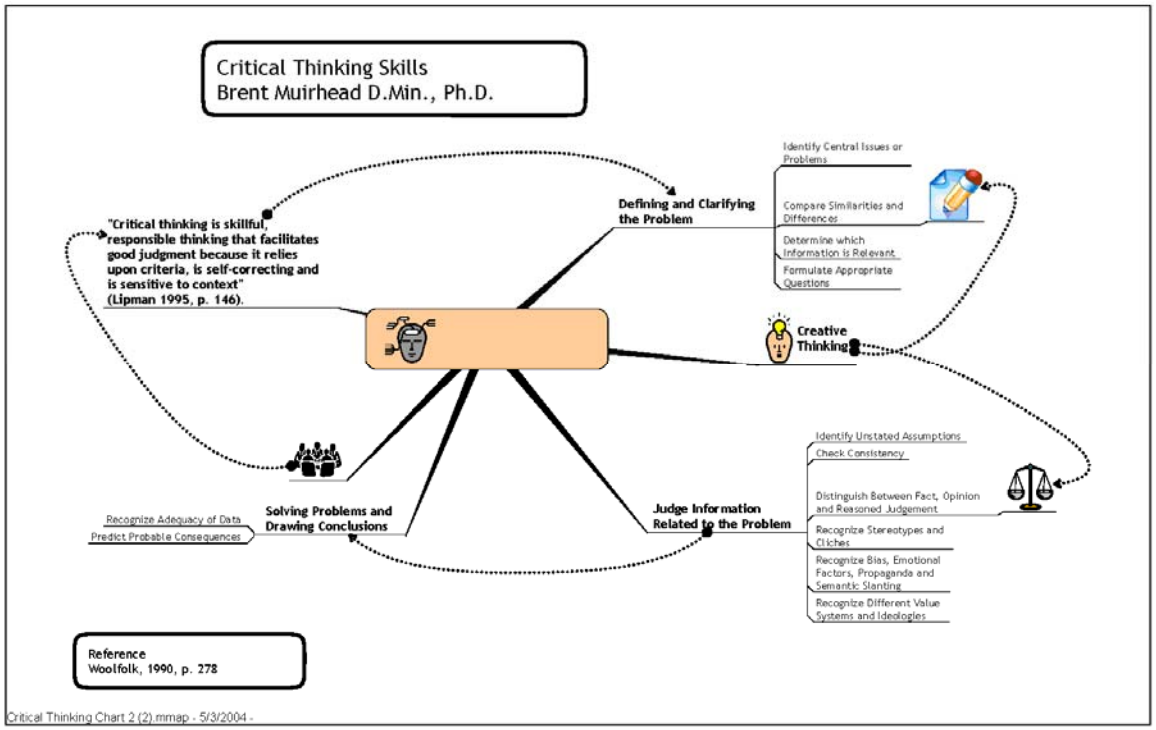

Figure 1 Critical Thinking Skills

Students must learn to ask questions and examine the quality of their work. The author recommends that students begin with checking whether their thesis or purpose statement is affirmed in their outline. It is vital to ask questions about developing each point and check for gaps in knowledge. Often, individuals struggle with giving adequate attention to opposing perspectives on social issues and an outline can help identify this problem (Darmouth writing program, 2004). Also, outlines promote self-regulation writing and thinking skills by helping students learn how to evaluate their work and make appropriate changes before completing the assignment. Students can become skilled at using a set of self-instructions that provide guidance and focus their thinking on key outline elements. Ultimately, outlines can relieve student frustration and anxiety because they have framework to start and refine a project (Harris & Graham, 1996).

Outlines should reflect logical thinking and have an organizational structure that enables the reader to quickly identify the purpose of the assignment. Teachers should share examples of excellent outlines that demonstrate logic, clear classification system and shows relationship between ideas. A useful classification system: criteria, self-correcting and context. Students must be reminded that the outline is a first step in the writing process that helps them to translate their ideas into an organized format. The outline provides a form of self-regulation to learn how to check on the quality of their work and examine whether it properly aligns with the purpose of the assignment. Additionally, it encourages students to see outlining as a positive part of the writing process. Outlining promotes a deeper understanding of the material because it requires taking the time to create and arrange information into sentences which reflect distinct aspects of critical thinking.

The teacher can utilize outlines as a tool to promote constructive student self-talk or self-speech to monitor and reflect on their work. Outlines help students focus their thinking toward completing a specific set of writing steps and avoid making impulsive responses. Students appreciate having a set of specific expectations that helps reduce feelings of anxiety and frustration about written assignments (Harris & Graham, 1996).

Outlines should affirm the writer's thesis or purpose statement. Students need to be careful that their outlines reflect an organizational design that fits their topic. The organizational structure of the paper which might involve one or more of the following formats:

- **Narrative**: telling a story
- **Descriptive**: relating what you see, hear, taste, feel, and smell
- **Process**: describing a sequence of steps necessary to a process
- **Definition**: illustrating the meaning of certain words or ideas
- **Division and Classification**: grouping ideas, objects, or events into categories
- **Compare and Contrast**: finding similarities and/or differences between topics
- **Analogy**: make a comparison between two topics that initially seem unrelated
- **Cause and Effect**: explaining why something happened, or the influence of one event upon another (Darmouth writing program, Modes of Arrangement, para 2 2004).

Writing is known as a complex activity that involves an assortment of cognitive tasks. Bruner et al (2004) states it includes "…working and long-term memory, procedural and declarative knowledge, motivation, self-regulation, and beliefs and attitudes" (p. 291). A theoretically sound cognitive model of writing is able to effectively recognize variances in writing such as different types (i.e. poetry, letter or essay), variety of tasks which have different intent, narrative length and creative expectations, writer's goals, experience and age and degree of complexity. Outlining

requires students to use essential cognitive processing elements "…include understanding main ideas, generating inferences that link these ideas together, and relating them to related information in the memory" (Bruner et al, 2004, p.31).

Contemporary writing theories reflect different philosophical and theoretical approaches. Daiute (2000) relates "most notably that the cognitive strategy approach characterizes writing as primarily problem solving, while process theory characterizes writing as primarily creative discovery. These theories have led to different applications of computers as writing tools" (p.255). Teachers strive to have work that stimulates intellectual growth and assignments must be aligned to the cognitive maturity of their students. Outline assignments can emphasis a variety of instructional objectives but there will be elements of critical thinking due to the need for problem solving and creativity to develop sentences.

Flowers and Hayes' (1984) writing model emphasizes three major phases: task environment, long-term memory and working memory. The task environment involves a description of the writing assignment which would include a specific topic and target audience. The outline assignment will stress a critical thinking topic and the author is the audience. Motivational cues are often grades and the outline represents graded work. Teachers must strive to make clear assignments because confusing directions can cause students to miss the original purpose of the task and not produce their best work. The external storage is second aspect of the task environment which is the text produced and the use of resources such as student notes from articles, drafts of paper, teacher lecture notes, handouts and previous student papers. External storage plays a key role in reducing the writer's memory load which enables individuals to work on new knowledge to write and revise new material. The writer's long-term memory according Flowers and Hayes (1984) impacts the entire writing process. "Cognitive processes interact continually in working memory and long-term memory as writers think through their goals, search for ideas and vocabulary, and evaluate and review text that they have written" (p. 294). Students can use brainstorming techniques to stimulate their long-term memory to recall ideas and concepts as they seek to develop their outlines (Furneaux, 1998).

Creating outlines offers distinct opportunities for students to develop self-regulation cognitive strategies that often are called self-talk. Harris and Graham (1996) note six types of useful self-instructions during the writing process:

1. problem definition
2. focusing of attention and planning
3. strategy
4. self-evaluating and error correcting
5. coping and self-control
6. self-reinforcement (p. 139).

It is important for teachers to balance their teaching activities to provide students with subject content knowledge, instructional guidance to assist in learning writing skills. The working memory is where the majority of the writing tasks take place and three major processes are associated with it: planning, translating and reviewing. Planning requires individuals to develop goals and generating ideas which might arise from their long-term memory. Generating content and relevant ideas flows throughout the writing process as individuals organize their material into coherent structures. Working memory does involve the writer's translation of ideas by accessing their semantic memories and locating the vocabulary to express their thoughts. Researchers have noticed a trait of good writers is their automatic translating skills enable them to reduce stress of items on their working memory (McCuthen, 1996). The reviewing process in the working

memory pertains to evaluating and revising the writing. Good writers are better at understanding of how to integrate their subject content and discourse knowledge. Outline exercises offer students the opportunity to create and revise their ideas that will reflect greater coherency as they become more skilled in this aspect of the writing process. Also, good writers are able to identify flaws in their work such as the choice of words or excessively repeating a term or phrase. Graham and Harris (1993) noticed that less sophisticated writers had problems seeing the value in editing their first draft. Often, those who struggle with writing will neglect devoting adequate attention to revising papers. This affirms the need for teachers to help students cultivate self-regulation skills and use outlines as a valuable tool for communicating ideas which can be transformed into a formal paper.

Bruning et al (2004) observes stresses the dynamic nature of the writing process. Writers will float back and forth between steps and revise their work. It is not linear process because individuals will add or delete content or revise sentences. Therefore, outlines should be viewed as flexible documents that offer direction to work but they can be revised and changed.

The author recognizes the value of using computers and Word processing tools when doing written assignments. Word processors offer distinct advantages by providing accessible spell and grammar checkers to edit sentences. Students must be given guidance in using Word processors because they are not a substitute for the editing textual material and students need to be instructed in how to properly document ideas taken from Internet sources.

A new technological trend is evolving with the development of online writing labs at distance education universities. Students at the University of Phoenix (UOP) can electronically submit their papers to The Center for Writing Excellence. The Tutor Review service provides feedback on the first four or five pages of the student's paper in the following areas: grammar, word usage and organizational issues. Often, students will receive their Tutor Review feedback within 48 hours but periods of higher paper submissions will result in feedback coming in 4 or 5 days. The Tutor Review program has become quite popular with students who appreciate the relevant and specific remarks. The WritePoint^{sm} Automated Review system offers detailed feedback within minutes to students. The K-12 schools would benefit from having access to similar Internet based writing labs.

Conclusion

The Flower and Hayes (1984) model of writing has been criticized for being too vague by failing to offer specific insights into the actual mechanics of text production. Yet, the model has been very influential among writing experts (Furneaux, 1998). Creating outlines encourages students to devote more attention to organizing their ideas and make thoughtful decisions about their choices of words to communicate their ideas. Outlines can play a vital role as part of a comprehensive set of instructional strategies that can improve the quality of student writing and foster critical thinking skills.

References

Brohaugh, W. (2002). Write tight: How to keep your prose sharp, focused and concise. Wilmington, DE: ISI Books.

Bruning, R. H., Schraw, G. J., Norby, M. N., & Ronning, R. R. (2004). Cognitive psychology and instruction (4th ed.). Upper Saddle River, NJ: Pearson.

Bruner, C., Elias, V., Stein, D., and Schaefer, S. (2004). Early learning left out: An examination of public investments in education and development by child age. Washington, DC: Voices for America's Children and the Child and Family Policy Center.

Byrnes, J. P. (2001). Cognitive development and learning in instructional contexts (2nd ed.).Boston, MA: Alyn & Bacon.

Danielson, L. M., (2000). The improvement of student writing: What research says. Journal of School Improvement, 1 (1). Available: http://www.ncacasi.org/jsi/2000v1i1/improvement

Darmouth writing program (2004). Available: http://www.dartmouth.edu/~writing/materials/faculty/pedagogies/process.shtml

Daiute, C. (2000**).** Writing and communication technologies. In R. Indrisano, & J. R. Squire (Eds.). Perspectives on writing, research, theory, and practice, 251-276. International Reading Association

Driscoll, M. P. (2005). Psychology of learning for instruction (3rd ed.). Boston, MA: Allyn & Bacon.

Flower, L. & Hayes, J. R. (1984). The representation of meaning in writing. Written Communication, 1, 120-160. In Bruning, R. H., Schraw, G. J., Norby, M. N., & Ronning, R. R. (2004). Cognitive psychology and instruction (4th ed.). Upper Saddle River, NJ: Pearson.

Furneaux, C. (1998). Process writing. Encyclopedia dictionary of applied linguistics, 257-260. Oxford, England: Blackwell. Available: http://www.rdg.ac.uk/app_ling/process.htm

Graham, S, & Harris, K. R. (1993). Self-regulated strategy development: Helping students with learning problems develop as writers. Elementary School Journal, 94, 160-181. In Bruning, R. H., Schraw, G. J., Norby, M. N., & Ronning, R. R. (2004). Cognitive psychology and instruction (4th ed.). Upper Saddle River, NJ: Pearson.

Gregg, L. W., & Steinberg, E. R. (1980). Cognitive processes in writing. Mahwah, NJ: Erlbaum.

Halpern, D. F. (1997). Thought and knowledge: An introduction to critical thinking (3rd ed.). Mahwah, NJ: Erlbaum. In Bruning, R. H., Schraw, G. J., Norby, M. N., & Ronning, R. R. (2004). Cognitive psychology and instruction (4th ed.). Upper Saddle River, NJ: Pearson.

Hancock, E. (2003). Ideas into words: Mastering the craft of science writing. Baltimore, MD: The John Hopkins University Press.

Harris, K. R. & Graham, S. (1996). Making the writing process work: Strategies for composition and self-regulation. Cambridge, MS: Brookline Books.

Hillocks, G. (1989). Synthesis of research on teaching writing. Educational Leadership, 44, 71-82. In Byrnes, J. P. (2001). Cognitive development and learning in instructional contexts (2nd ed.).Boston, MA: Allyn & Bacon.

Hostetler, B. (2004, September). 10 simple exercises to improve your craft. Writers Digest guides presents start writing now: Your introduction to the writing life, 24-26.

Inspiration Software, Inc. (2005). Available: http://www.inspiration.com/home.cfm

Lipman, M. (1995). Critical thinking - what can it be? In A. L. Ornstein & L. S. Behar (Eds.) Contemporary Issues in Curriculum, Boston, MA: Allyn & Bacon, 145-152.

McCuthen, D. (1996). A capacity theory of writing: Working memory in composition. Educational Psychology Review, 8, 299-325. In Bruning, R. H., Schraw, G. J., Norby, M. N., & Ronning, R. R. (2004). Cognitive psychology and instruction (4th ed.). Upper Saddle River, NJ: Pearson.

MindManager (2005). Available: http://www.mindjet.com/us/

O"Callaghan, J. (2004). A narrative approach to procrastination in academic settings. In H. C. Schouwenburg, C. H. Lay, T. A. Psychyl & J. R. Ferrari (Eds.). Counseling the procrastinator in academic settings, 167-180. Washington, D.C.: American Psychological Association.

Sawers, N. (2000). Ten steps to help you write better essays & term papers. Edmonton, Canada: The NS Group.

Woolfolk, A. E. (1990). Educational psychology (4th ed.). Englewood Cliffs, NJ: Prentice-Hall

About the Author

Brent Muirhead

Brent Muirhead has a BA in social work, master's degrees in religious education, history, administration and e-learning and doctoral degrees in Education (D.Min. and Ph.D.). He is currently taking graduate classes in cognition and technology at The Teachers College, Columbia University.

Dr. Muirhead is the Lead Faculty and Area Chair for Business Communications in the graduate department at the University of Phoenix campus in Atlanta, Georgia. He teaches a diversity of undergraduate and graduate level courses in Atlanta and online and mentors faculty candidates and doctoral students. He is an Associate Editor for Educational Technology and Society and he has worked as a visiting research fellow to Robert Gordon University, Aberdeen, Scotland. He may be reached via email at: bmuirhead@email.uophx.edu