

# Journal of Research in Innovative Teaching

Volume I, Issue 1 (March 2008)



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March 2008

Dear Colleagues,

I am pleased to share with you the inaugural publication of the National University *Journal of Research in Innovative Teaching*. This document represents the evolution of scholarship at National University, and supports our mission of providing exemplary levels of instruction to our students.

This annual publication focuses on peer-reviewed, original research in the area of new instructional methods, approaches, and tools. The *Journal* provides opportunities for collaboration, and serves as a forum for sharing noteworthy scholarship activities. I am impressed with and proud of the level of scholarship presented in the first edition.

The *Journal* includes the work of many National University faculty, as well as submissions from external scholars. The publication's Editorial Board is comprised of several prominent University faculty as well as scholars from the University of North Carolina, the University of Graz in Austria, and the University of Twente in the Netherlands. Similarly, the *Journal's* Review Board includes participants from national and international institutions of higher education.

I congratulate all of the participants on their fine work and continued dedication to improving the methods of instruction employed by teachers everywhere.

Sincerely,

A handwritten signature in black ink, appearing to read "Dana L. Gibson".

Dana L. Gibson  
President, National University

## ***Editor's Column***

National University's mission is to make lifelong learning opportunities accessible, challenging and relevant to diverse populations. In accordance with this mission, the National University research journal publication is an important benchmark in the University's maturity. Teaching and scholarship are interrelated; evidence shows that research enriches teaching and is capable of significantly improving student learning outcomes. With this purpose in mind, National University is happy to announce the publication of the first issue of this journal.

The ***Journal of Research in Innovative Teaching (JRIT)*** is an annual multidisciplinary peer-reviewed publication of original research focused on new effective instructional approaches, methods and tools. It is intended to produce momentum to increase efficiency of learning and ensure better learning outcomes of our students.

The Journal is a forum to share faculty research and scholarship. This will ultimately benefit both the university academic community and our students. We believe regular publication of this journal will promote and enhance the growth of the research culture at the university. This journal is offered as a collaborative work; we hope it will be embraced by both National University and the academic community at large.

The Editorial Board is composed of top scholars and administrators from National University, as well as several international and nationally acclaimed scholars. The Review Board includes both internal and external reviewers.

All publications have been conditionally assigned in the following sections:

- General Issues
- Accelerated Learning
- Teaching Specific Subjects
- Online Learning
- Instructional Design, Teaching and Evaluation
- International Experiences

In the **General Issues** section one can find two exciting articles presented by famous scholars; the first features an original approach in dealing with digital web-based plagiarism, and the second discusses

working with the resistant adult learners. Both articles focus on the acute issues faculty face in contemporary universities.

The first article by Narayanan Kulathuramaiyer and Hermann Maurer (University of Graz, Austria), discusses a so-called Copy-Paste Syndrome which is a type of plagiarism arising from today's easily available digital content. It implies the indiscriminate usage of web-based materials which violates intellectual property rights. This amounts to widespread postsecondary cheating which has been observed first-hand in onsite and online venues. The authors offer a non-traditional approach to minimizing the possibility of unwanted copy-and-paste situations based on a holistic view that combines an institutional approach with the application of viable technologies.

The second article presented by Carol Kasworm (University of North Carolina) deals with a unique group of students called resistant adult learners. These individuals do not value the college classroom and are motivated to participate only through acceptable grades and gaining a college credential. The author explores characteristics of these resistant learners and discusses how constructivist learning theory can effectively support instructional strategies to enhance the learning of this difficult category of adult students.

In the **Accelerated Learning** section one can find three articles that discuss various formats and aspects of accelerated learning.

Peter Serdyukov (National University) provides a critical analysis of accelerated approaches in learning. His article discusses the concept, definitions, principles and methodology of accelerated instruction. The author argues that;

- *Accelerated learning is a specific form of education*
- *Its main feature is a compressed course format*
- *It provides the same content and learning outcomes as a traditional semester-long course in a shorter time period*
- *It requires special methodological and organizational strategies for its effective implementation in teaching*

The article also addresses cost- and time-efficiency of accelerated learning. It explores the similarities and differences between accelerated and intensive learning. Finally, the piece outlines a research agenda for this area.

The article by Oleg Tarnopolsky (Dnipropetrovsk University of Economics and Law, Ukraine) discusses theoretical aspects and practical experiences of an immersion approach in teaching Business

English at Ukrainian universities. This approach has proven its effectiveness in foreign language learning since the era of Berlitz' language schools. Two principal types of immersion analyzed here are: 1) immersion through simulation of profession-oriented activities, and 2) immersion through learning professional subjects in English. The implementation of immersion programs in teaching practices of Ukrainian universities are discussed using research data.

Another article focusing on accelerated learning is submitted by Janet Richards (National University). Richards suggests that the critical need to prepare more teachers for the classrooms can be effectively met by providing accelerated learning programs. This article suggests that students enrolled in such programs are getting quality education comparable to conventional college programs. The piece points out that students and instructors appreciate the convenience, shorter time frame, and real-world emphasis that accelerated programs offer.

**Teaching Specific Subjects** section includes articles which focus on particular content area delivery, such as Math, General Physics and Psychotherapy in counseling.

Igor Subbotin (National University) and Nikolai Bilotskii (Kiev National Pedagogic University, Ukraine) discuss their approach of introducing of elementary functions in Precalculus and Calculus courses by representing them as linear algorithms. Their experience in teaching at National University, California, USA, Kiev National University of Technology (KPI), and Kiev National Pedagogic University confirms the effectiveness of this approach.

The article by Nataliya Serdyukova (National University) deals with teaching General Physics courses in an accelerated format. The author suggests that there should be a certain number of repetitions of the same material in the learning process to provide adequate student learning and retention. This article clarifies the fact that simple repetition is insufficient for better understanding and retention. Rather, it takes several spaced cycles to achieve the desired learning results with students. N. Serdyukova applied the Iterative Instructional Model to explain the process of effective learning based on spaced repetitions. This model was successfully applied in teaching accelerated Physics courses.

Four authors (Jan Parker, Charles Tatum, Brenda Shook, and Valerie Alexander (National University)), wrote about the role of psychotherapy education programs for the counseling profession. They

reported the reliability and validity of the Clinical Attributes for Therapists Scale (CATS), an instrument designed to assess the interpersonal skills of students in the Master of Arts in Counseling (MAC) program.

The most populated section of the Journal is the **Online Learning** section, which is understandable due to the growing numbers of universities, including National University, utilizing online program and course delivery.

Angelo Segalla (California State University, Long Beach), and Shandy Hauk (University of Northern Colorado) address some of the benefits and issues of using a free, open source, web-based, interactive mathematics homework system called WeBWorK that helps in individualizing and grading mathematics homework assignments. They connect the use of WeBWorK to an online teaching-learning environment.

Donald Schwartz and Consolacion Fajardo (National University) discuss the addition of live voice/visual interaction to asynchronous online learning environment, utilizing voice over internet protocol (VoIP) technology. They compare the learning activities in a traditional classroom with those in an online learning environment that offer both synchronous and asynchronous learning interactions.

Thomas Gatton, Arun Datta, Pradip Dey, Jose Jorge Martinez and Chaoting Ting (National University) propose a Web-based Intelligent Tutorial System that will present material in an intuitive, interactive, and innovative manner while focusing on ways to integrate qualitative and quantitative methods throughout the learning experience.

In her article, Robyn Hill (National University) discusses ways to strengthen teaching communities through online professional development. She outlines a professional development model designed to achieve these goals, and the results of its pilot implementation at National University in March 2007.

Clifford Tyler and Robert Kibby (National University) address the changing role of instructors teaching on-line courses. Specifically, this article examines the challenges faculty face in promoting instructor/student and student to student interaction. It discusses the new skills needed to effectively operate this technology. These authors compare the quality of on-line instruction with on-ground instruction and compare the advantages and disadvantages of online instruction

focusing on school administrator preparation for major leadership roles.

**Instructional design, teaching and evaluation** are important aspects of an effective educational system. Two articles in this section target program analysis and outcome expectancy measurement.

Cynthia Shubert-Irastorza, Stacy Begin and Dee Fabry (National University) developed a systematic evaluation process for a program review of the Master of Arts in Teaching (MAT) Program at National University. The purpose of this review was to improve the overall program quality while ensuring the consistency and congruity of individual courses within the program. The hope is that this review will ultimately lead to increased student learning.

Brian Tilley revised a measure of outcome expectancies as described in Social Cognitive Career Theory. Results of analysis are indicative of a positive, moderate correlation between educational outcome expectancies and college self-efficacy and a significant correlation between educational outcome expectancies and satisfaction.

The concluding section of the journal focuses on **international experiences**.

Darryl Mitry (Norwich University) and David Smith (National University) suggest that university education must now include more opportunities for students to gain firsthand knowledge of global interdependencies and develop superior cross-cultural skills. This paper examines the reasons behind low enrollment of college students from the United States in study abroad programs, and considers short-term study abroad alternatives. This article proposes critical design elements of competitive curricula offerings. It provides suggestions for developing highly integrated and flexible study-abroad programs that can be much less expensive, more available and widely marketed than traditional programs.

The Editorial Board invites the readers to discuss publications presented in this issue and suggest topics that might be of interest for researchers at National University. We will start publishing letters from the readers in the next issues.

The JRIT also publishes an announcement regarding 2<sup>nd</sup> National University Faculty Research and Scholarship Conference that will take place on September 2, 2008.

The Editorial Board hopes this journal will boost research and scholarship at National University promoting and enhancing its academic culture. Faculty are kindly invited to contribute to the future journal issues.

*Peter Serdyukov*

*March 1, 2008*

# **Learning Ecosystems for Dealing with the Copy-Paste Syndrome**

Narayanan Kulathuramaiyer and Hermann Maurer

## **Abstract**

The fact that people of all walks of life are becoming more and more reliant on a wide-range of easily-available digital content is often called the Copy-Paste Syndrome. It implies the indiscriminate usage of material, i.e. without checking for reliability or a concern for violations of intellectual property rights or plagiarism, a kind of cheating that has become uncomfortably widespread. A holistic approach is required to address this universal problem combining an institutional approach together with the application of viable technologies, rather than a-posteriori checks with software of doubtful reliability. This paper describes a learning ecosystem, ICARE, that addresses the Copy-Paste Syndrome by minimizing the possibility for unwanted copy-and-paste situations.

## **Key Words**

Holistic E-Learning, learner-centered technology support, copy-paste avoidance, guided learning environment.

## **Introduction**

The Web is experiencing a phenomenal growth with the explosion of user-generated content. As tools get easier to use, and access becomes more widespread, it also becomes easier for networked learners to misuse the possibilities for plagiarism and IPR violation (Pannepacker, 2007). It also will continue to become much simpler to acquire information from the Web community as opposed to meeting up with co-learners and experts in the real world (Alexander, 2006). The openness of the Web environment thus poses a number of challenges in monitoring and keeping track of the explorative expressions of learners.

The term Copy-Paste is used in this paper to refer to an emerging practice of fast and easy publication by millions of people. The "Google Copy-Paste Syndrome" (GCPS) (Weber, 2006), describes a common

activity of performing a fast, easy and usually “not diligently researched” copying of passages of text by people of all walks of life including scientists, journalists, academics and students. The GCPS has resulted in a proliferation of infringements such as plagiarism and IPR violations. Acquiring insights is performed by “conveniently searching” the Web as opposed to a rigorous process of learning through scientific discovery. Information from Web sources such as Google and Wikipedia are often used without even considering the validity of the source. According to Weber, GCPS and Web mining can actually impede the inquiry-driven scientific process, as answers conveniently pop up, with minimal effort. This syndrome thus endangers original writing and thinking by de-emphasizing the need for deliberate and insightful reasoning (Weber, 2006). This emerging phenomenon in turn encourages mediocrity in published works due to the lack of careful thought and understanding.

Due to the potential danger of the Copy-Paste Syndrome and intellectual property violations, it is vital to explore innovative means of addressing these issues.

We will concentrate our attention on the phenomenon of plagiarism and the Copy-Paste Syndrome (CPS). Current learning environments are often more concerned about identifying problem situations after they actually happen. The detection of plagiarism or Copy-Paste activities after some work is finished is neither reliable nor a good approach. Rather, there is a need to explore preventive ways of making sure that unwanted versions of copy-and-paste just cannot happen. A learning ecosystem coupled strongly with pedagogical aspects and techniques that control copy-and-paste situations throughout will best serve the emerging needs of educational institutions.

### **Dealing with plagiarism (and the Copy-Paste Syndrome)**

Students are often expected to read the policy in the handbook and thereafter comply with a non-plagiarizing attitude. This approach is likely to be unsuccessful as the core problem lies in the student's lack of understanding of the concept of plagiarism and, most of all, their inability to deal with it (Kennedy, 2004). Students are also generally not aware of the full implication of the acts of Copy-Paste. They also do not value the importance of intellectual property or take pride in their ability to produce creative works (Kennedy, 2004). As pointed out by Duff et al. (2006), there is the lack of appreciation of the Western

system of scholarship, especially among new students and foreign students. There is thus a need to teach the skills required for paraphrasing, summarizing and referencing accurately (Kennedy, 2004).

There is a need to instill moral and ethical values in students regarding their education. Students will begin to understand the need to respect other people's copyright when they themselves are actively engaged in creating their own intellectual property (Midolo & Scott, 2003). Best practices in teaching and learning and academic integrity can be further achieved if students are aware that their input has been valuable and considered carefully by instructors (Kennedy, 2004).

Another proposed approach to address Copy-Paste Syndrome is through the employment of well-structured and clearly articulated assessment tasks. Course designers will have to carefully design courses and course content to ensure that they do not indirectly encourage plagiarism. Factors that encourage plagiarism include the same questions being set repeatedly year to year, questions that cannot be understood clearly or when clear criteria are not specified (Kennedy, 2004).

There are a number of approaches that can be employed to reduce plagiarism as suggested by works in Harris (2004). Instructors are encouraged to enforce the use of one or more sources not written within the past year. This approach effectively invalidates results of paper mills (Harris, 2004). By enforcing the use of one or more specific articles or specific information, students can be encouraged to formulate their own thoughts. Another effective technique describe by Harris is to enforce the production of assignments as a series of process steps as they lead to the final completion of projects. Student learning can then be continuously checked and assessed at each stage. The administration of personalized student tracking and assessment tends to overwhelm instructors. A careful selection of viable technologies is required to minimize the effort required. A technological platform also can be applied to guide students in using material from various sources in a constructive way and promote critical thinking.

## Typical Approach for Dealing with Plagiarism (and also Copy-Paste)

A typical approach used in dealing with plagiarism in educational institutions is to employ tools for plagiarism detection such as Turnitin or Mydropbox. However, a single tool by itself is not adequate for Copy-Paste detection. A suite of tools is required to detect plagiarism or Copy-Paste effectively to establish and substantiate the detection of plagiarism with as much evidence as possible. An overview of a broad range of tools required for fighting Plagiarism and IPR violation is presented in Maurer et al. (2006). A layered application of plagiarism detected has been further proposed by (Kulathuramaiyer & Maurer, 2007) to systematically perform elaborate mining by focusing on relevant subsets of documents. Table 1 describes the availability of multiple approaches for detecting the various aspects of plagiarism. Despite the availability of these tools and techniques, their usage has mainly been employed in the detection of plagiarism and Copy-Paste situations. We propose the application of these tools and techniques in preventing the Copy-Paste Syndrome.

Table 1: Tools for Plagiarism Detection

<b>Task</b>	<b>Tool</b>
Manual Technique	Search Engines (Maurer et al., 2006)
Text-based Document Similarity Detection	Dedicated Software, Search and Web Databases (Maurer & Zaka, 2007)
Writing Style Detection	Stylometry software (Eissen & Stein, 2006)
Document Content Similarity	Semantic Analysis (Dreher & Williams, 2006; Ong & Kulathuramaiyer, 2006; Liu et al., 2006)
Denial of Plagiarism	Cloze Procedure (Standing & Gorassini, 1986)
Content Translation	Normalized Representation (Maurer & Zaka, 2006)
Multi-site Plagiarism	Distributed Plagiarism (Kulathuramaiyer & Maurer, 2007)

## **Comprehensively Addressing the Copy-Paste Syndrome Rationale**

In exploring a technological solution to comprehensively address the Copy-Paste Syndrome, the first question clearly is: Will it be ever be possible to comprehensively address the Copy-Paste Syndrome by software to check a paper submitted without any knowledge how the paper was compiled? Our answer is a clear “no.” We have pointed out the existence of paper mills (Paper Mills, 2006) that even prepare papers to order (Kulathuramaiyer & Maurer, 2007). Documents also may contain large portions that are translations of some material in a not-so-common language making it nearly impossible to find out if material is plagiarized. Furthermore, there are large collections of materials available in either closed databases or not in digitized form that are not available to any plagiarism checking software. As such a different approach is needed, we believe the key issue is to monitor the work of learners continuously.

We will discuss issues of an E-Learning ecosystem called ICARE<sup>a</sup>. We are trying out a number of components of a learning ecosystem at Graz University of Technology. We refer to the proposed suite of software and content as ICARE, aimed at controlling Copy-Paste situations.

### **The Main Concept of ICARE**

ICARE stands for **I**dentify-**C**orrelate-**A**ssimilate-**R**ationalize-**E**xpress. ICARE denotes the five steps involved in the cultivation of academic reading and writing. These steps can be elaborated as:

- Identification: Identify key points (relevant) while reading a text document
- Correlate: Associate reading with concepts in the mind map of a learner
- Assimilate: Associate concepts learned with prior knowledge of learner
- Rationalize: Formulate ideas based on concepts arising from student learning
- Express: Express idea in learners own words

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<sup>a</sup> To be read as ‘I Care’

As opposed to the inadvertent (improper) Copy-Paste, ICARE enforces care on the part of the students' understanding of concepts, enabling them to apply learned concepts in the appropriate manner. The proposed approach to Copy-Paste will thus be seen as focusing on deeper appreciation and understanding ("care-why learning") as opposed to a less-diligent focusing on facts ("know-what learning"). Figure 1 contrasts these two forms of learning. Learning should not be based on a mere a collection of facts; it should rather be viewed as a connection to a learner's thoughts (Sathya Sai Baba, 2001). Support mechanisms are required to allow students to connect readings to the construction of knowledge. We believe that E-Learning systems should focus more on personal knowledge management activities and in fostering a deeper understanding. This practice will then effectively reduce the occurrence of improper Copy-Paste.

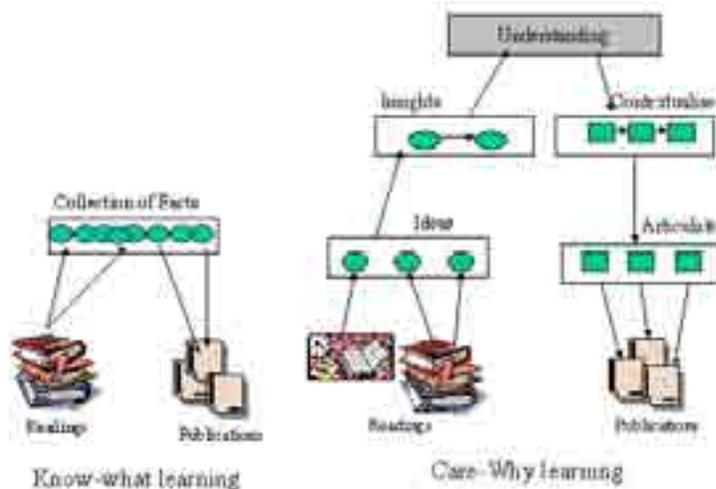


Figure 1: Types of Learning Modes

Practicing a constructive form of Copy-Paste supports a learner's ability of absorbing concepts, and consolidating and assimilating them before expressing ideas with a deeper understanding. The proposed ecosystem guides and allows students to become aware of the correct approach of reading, digesting and applying knowledge. At the same time, the platform fosters creativity in their associational and expressive ability. The proposed ecosystem allows an instructor to view and monitor the learning process of students, in observing and monitoring the rightful practice of "Copy-Paste skills." At the same time, creative expressions of students can be pinpointed, highlighted and recorded.

## Toward a Holistic Learning Ecosystem

Although a variety of forms of E-Learning have been explored, the predominant form of E-Learning employs an E-Book paradigm. For the proposed ecosystem, however, multiple learning paradigms need to be incorporated. It will also need to enable pedagogical aspects of learning via technology-enhanced knowledge transfer (Helic, 2007).

Current E-Learning systems tend to employ a blended learning environment that involves the combination of instructional modalities or the instructional methods via the combination of online or face-to-face instruction (Graham, 2004). Options currently available in such learning systems (Graham, 2004) include self-study options such as Web-based courseware, simulations, systems and books together with live teaching options such as Web-casting, live video, conference calls, and instructor-led training. Each of these are often treated as standalone training objects delivered either via face-to-face (F2F) or computer mediated learning (CML) instruction (Valiathan, 2002). In this case, each training object represents a particular modality of learning where CML training objects are seen as alternative learning modes to classroom-based F2F approaches. The main weakness of this approach is that it does not allow composing training objects that contain both aspects of F2F and CML.

The realization of ICARE requires an E-Learning ecosystem that mixes F2F and CML within the context of a learning scenario that also minimizes the unwanted use of copy-and-paste by guiding the learner through the process. ICARE enables the complementary use of technology to harness the systematic development of both personal learning and collective intelligence. Table 2 describes the differences between blended learning in traditional E-Learning and the proposed learning ecosystem.

Table 2: Comparing the Proposed Learning System Functionalities Against a Typical E-Learning system

Teaching-Learning Activity	Typical E-Learning Environment	Proposed E-Learning Ecosystem
Announcements (Communicating timely messages to students)	Learning Management System or Email	Dynamically Activated from an Event database, RSS feeds
Overview session	Email, E-Books	Reading Scenario ( E-Room)

Self-paced learning	Web-based tutorial. E-books simulations	Learning Specifications, Project-Rooms, E-Books
Student Question Answering	Email , Frequently Asked Questions	Active documents, schedule E-mentoring sessions
Assessment	Simulations, Online test, Submission system	Knowledge maps, Testing scenarios (can be personalized, collaborative, or peer-reviewed); Student Activity Logs and Reports
Collaborative Sessions	Discussion groups, Bulletin Boards, Chat	Brainstorming Scenario, Peer ranking
Feedback	Email	Examination Rooms
Continuous Assessment	Student Records	Student Portfolio, Learning Plans, Performance Monitoring Tool

## Realization of the ICARE Ecosystem

### *Overall Design*

ICARE will incorporate many of the experimental features in WBT-Master (WBT, 2006) coupled with the knowledge management capabilities found in Hyperwave Information Server (Mödritscher et al., 2005). It also will be augmented with a Copy-Paste detection and administration suite together with specifically prepared E-Learning modules to address both the issues mentioned earlier and anticipate future learning needs.

We propose additional functionalities to the E-Learning platform, (currently not available in any E-Learning system we know) for providing personalized guidance for administering academic reading and writing. Our previous works in the development of tools for fighting plagiarism and IPR violation has provided insights on the requirements of the proposed ecosystem (Kulathuramaiyer & Maurer, 2007).

Table 3 summarizes the functions to be incorporated describing the technological requirements for the ICARE ecosystem. The ecosystem employs an effective administration of E-Learning together with powerful tools for guiding and managing student learning and interaction.

The various learning functions together with well-designed assessments are crucial. In the next section components of an experimental system will address these issues. Tracking and analysis will be required to keep track of a variety of student works such as term papers, projects, examinations, etc. Tracking of activities also will be important in providing insights on learning and knowledge creation activities. The Copy-Paste handling suite of tools and techniques are required to assist and support the learner in the mastery of the rightful Copy-Paste skills. Specifically developed E-Learning modules enable the learners to master the fundamentals of academic reading and writing and promote an understanding of academic publishing culture.

Table 3: ICARE Ecosystem: Needs vs. Required Functionality

<b>Supportive Environment Needed:</b>	<b>Functional Requirements of Ecosystem</b>
Effective Administration of Learning	Ability to incorporate pedagogy in a learning environment combined with an ability to structure assessment; this includes the ability to discover and visualize student learning (knowledge maps) and integrate this with assessment. The management of capability-driven student learning, ability to manage and guide collaborative group-centered (project) work and flexible design of assessment tasks to manage learning as a series of steps
Guided Learning Process	Controlled environment for keeping track of learner activities, and workflow management and compliance checking
Tracking Learners' Copy-Paste Activity	Integrated Copy-Paste handling capability enabled by a suite of similarity checking software
Appreciation and Mastery of ICARE Principles and Process	To Incorporate E-Learning Modules on: <ul style="list-style-type: none"> <li>• Western Scholarship</li> <li>• Academic Reading and Writing</li> </ul>

- |  |  |
|--|--|
|  | <ul style="list-style-type: none"><li>• Valuing Intellectual Property and Ethics</li></ul> |
|--|--|

## Key Components of ICARE Ecosystem

The following features from our past experimental developments in projects such as WBT-Master and Hyperwave will facilitate the realization of the learning ecosystem:

- Ability to define training scenarios as training objects or study rooms: A controlled environment can be established to track both the explorative and collaborative activities of students (Helic et al., 2004a).
- Pedagogy driven learning: A teaching scenario or environment can be built where a tutor works with a group of learners in both synchronous and asynchronous mode, leading them to achieve a particular learning goal.
- Project-oriented learning: A controlled learning environment can be built to allow a group of learners working together on a project, e.g., a software engineering project (Helic et al., 2003).
- Adaptive discovery of personalized background knowledge: A reading room paradigm can be created for enabling learners to chart their knowledge discovery process. This can be supported by the automated linking to related contents or background knowledge (Mödritscher et al., 2005).
- Annotations: Annotations allow the attachment of text segments, system or media objects or an URL to a learning object or material (Korica et al., 2005). It is possible to annotate any kind of material such as papers, parts of a digital library, other user contributions, etc.
- Active Documents: The idea of active documents presents an efficient way of students learning in a collaborative question-answering environment. Active documents present an innovative mean to demonstrate student learning and at the same time, an effective way for an instructor to direct knowledge discovery (Heinrich & Maurer, 2000).
- Visualisation as knowledge maps: The cluster of a document with documents containing similar concepts or ideas can be visualized via a knowledge map typical of knowledge management systems. A knowledge map with similar articles can be created and visualized (Helic et al., 2004b). "Knowledge cards" are used to describe a particular concept (i.e. *semantic entity*). Knowledge cards may be combined into a *semantic network*. For example,

the knowledge card "Student's Discovered concept" may be related as "is a part of" to the knowledge card "Course Domain Ontology."

- Workflow management and compliance checking capabilities: Learning can be visualized as a process flow of learning tasks. Non-compliance can then be automatically flagged by the system.

## Controlled Environment for Pedagogy-Driven E-Learning

ICARE provides a controlled environment in which the instructor is able to track the usage of reference materials by students. Such a controlled environment makes it much easier to curtail unethical practices and also promotes constructivist learning among students. Furthermore, user tracking and user activity-logging facilities also can be used to enforce learners to read certain parts of a document before being allowed to annotate an article or ask questions about some part of it (Helic et al., 2004a).

An environment that closely monitors students' knowledge construction and collaborative activities can help the instructor to assess and guide students' ability to publish effectively. Process level support can be achieved via the workflow management and compliance checking capabilities of systems. The system can be trained to recognize non-conforming patterns to be able to flag instructors. Discovered patterns regarding a student's learning can then be captured and stored within a learner's profile. Knowledge profiling is supported in the acquisition, structuring, and reuse of extracted expert knowledge. By maintaining individual learner profiles, personalized learning can be supported. Personalized learning units then can be designed for each student as shown below:



Figure 2: Personalized Learning Units

Interactive collaborative scenarios (Helic, 2007) are employed to administer and respond directly to individual student learning activities. For example, active documents can then be employed to keep track of learner interactions and learning support within the context where learning occurs.

An explicit and implicit profiling of students has to be applied to keep track of the learning process of students. E-Portfolios (Alexander, 2006) enable the recording of student participation and contribution to support the profiling of students. E-Portfolios are important in allowing students to start valuing their own contributions and also other student contributions. An example of a student portfolio structure is shown in Figure 3. As shown here, the ecosystem provides a workspace for students to continuously expand their knowledge base while taking responsibility for their own learning. Records of student achievement then immediately become available to mentors and instructors for personalized evaluation and guidance.

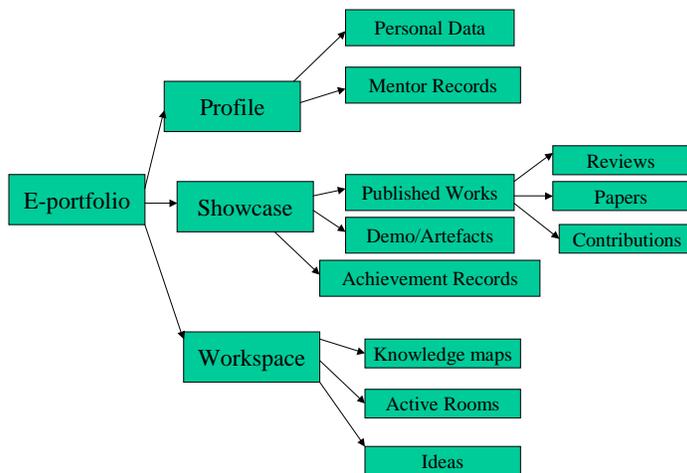


Figure 3: Student E-Portfolio

Incentive schemes can be tied to E-portfolios in order to acknowledge and highlight student achievement. Recommendation systems proposed to make explicit the valuations associated with each student's contribution. Recommendation systems play an important role in the development of rational impartial judgment among students. A combination of human and automated ranking of important topics, ideas, suggestions and contributions can further be applied to personalized interaction among students with a similar background and interests.

A number of tools are available for creating an environment for students to collaborate among themselves and with their instructors and mentors. These include peer-evaluation support, collaborative concept mapping, brainstorming and discussion forums. Brainstorming also incorporates mechanisms for specifying ranks and incorporating personal evaluation (see Figure 4). Annotations are again a key feature to represent and organize collective student learning. Annotations also have been proposed to represent links to Knowledge Cards to reflect the knowledge construction process of students.



Figure 4: Brainstorming Support (extracted from WBT-Master Manual)

Integrated visual tools will be applied in the management and display of information in illustrating student learning and mastery of concepts. The tools allow the instructor to impart particular skills, to refine processes used for a specific task, or to organize information into a structured form. They also can be used by students to express their understanding of concepts. Knowledge visualization tools also will be applied as a form of assessment of students' incremental knowledge gain over a period of time. Learners also need to be supported by means of personalized knowledge retrieval facilities. Such a tool will be effective in identifying potential infringements by students and can be used to aid students in the mastery of useful skills. The visualization capability for concept maps further allows the incremental visualization of concepts formulated by students.

Knowledge Cards (K-Cards) enable the specification of concepts of is-a and instance-of links for ICARE knowledge maps. The semantic relationships built upon K-Cards essentially define a semantic graph. The Knowledge Card mechanism is also used to automatically link to peer-learners and resource persons in collaborative mode. Two types of K-Card usage have been defined: personal Knowledge card attached to each learner, and context-based Knowledge Cards attached to assignments or scenarios. The use of K-Cards supports the creation of points of interests by students. A knowledge card also can be linked to other related readings that students may associate (if required). These K-Cards will then allow students to link to a concept map, which will demonstrate the students' understanding process.

### **Incorporating the Ability to Handle Copy-Paste into ICARE**

ICARE benefits from the administration of academic reading procedures that can be integrated directly into the ICARE ecosystem. By enabling a business process model view of E-Learning (Helic et al., 2003), the learning process can be supported at each step.

E-Learning modules on effective Copy-Paste would then be embedded to educate students on the rightful procedure of academic publishing (reading and writing). Apart from employing a plagiarism or Copy-Paste detection suite for summative assessment of a breach of conduct, we propose the formative application of such tools for self-plagiarism checking and in cultivating constructive "Copy-Paste skills." For example, existing document similarity detection (as used in plagiarism detection tools) can be applied in conjunction with a learning scenario paradigm for facilitating students to master academic publishing. By consolidating the results from similarity search engines on local databases as well as the Internet, a plagiarism detection tool can be applied to assist students to teach them how and when to cite another publication.

### **Copy Paste Handling Software Suite**

The Copy-Paste Handling Software Suite incorporates self-plagiarism checking tools and techniques to help students in mastering Copy-Paste. Both simple and advanced forms of Copy-Paste checking are supported. We propose the use of the plagiarism detection tools and techniques to achieve this task (see Table 1). This suite will be applied in two modes: closed world and open world modes. These modes will

allow the operation of the Copy-Paste handling in both a supervised mode (assisted by an instructor) and an unsupervised mode (self learning).

In the closed world mode, a student uses the Copy-Paste wizard as guide for the academic reading and writing process. This wizard is described in the next section. Here the text that students select for Copy-Paste will be used as a fingerprint and applied as query string to search the whole published text of the student for a weak or blatant Copy-Paste case. The similarity checking engine identifies the degree of similarity in determining the extent of paraphrasing (or the lack of it). The system also is able to check for compliance or negligence citation. A string similarity checking mechanism is applied for this purpose. In the case of identifying an improper Copy-Paste, the system presents its findings as an advice to students. The changes made by students are noted by the system and can be used in a mentoring session.

In the open world mode, students are not guided or restricted in terms of usage of specified references. Similarity detection is then applied to a larger collection of documents where it checks the Web for all possible improper Copy-Paste actions performed by the students. Student's past years papers also are checked for similar text strings to determine improper Copy-Paste and lack of citation. The system produces statistical information for the instructor to assess the mastery level of students.

A number of learning scenarios can be built by a selective application of one or more Copy-Paste handling tools. As described here, these scenarios could either be applied in a supervised manner assisted by an instructor or a mentor or the unsupervised manner with system inputs.

During the mentoring process, a manual selection approach for plagiarism detection may be employed checking with one or more search engines. This process can provide the system a set of constrained documents to be used for similarity checking. Specific tools to approve or disprove suspected plagiarism such as Cloze may also be applied when a dispute arises. A Cloze procedure (Maurer & Zaka, 2006) has been used to judge the originality of authorship of published works. As part of the Copy-Paste detection, alternative techniques such as stylometry can be applied to discover similar (or dramatically changing) stylistic patterns such as syntactic forms

usage, text structure of published works and the usage of key terms to indicate that some copying may have taken place.

### **Copy-Paste (Academic Reading and Writing) Wizard**

This wizard has been proposed to enable learners to acquire the skills of academic reading and writing in a controlled environment. The wizard can be used by learners to perform the following:

- Highlight key points and annotate selected phrases, using the annotation feature of WBT-Master. A highlighting mechanism is supported to allow learners to highlight key points.
- Create a Knowledge Card for the point discovered, label it and link it to known concepts (or form a new concept).
- Review the internal concept map and assimilate new ideas found in reading. This may range from concept links to concept map restructuring. This stage involves substantiating the body of Knowledge Cards with links and metadata.
- Formulate an idea and add information to Knowledge Cards.
- Express an idea and present it as a descriptive text.

Annotations will be employed in linking original document to relevant information sources to perform the above steps. This enables the tracing of students' activities to check on process-flow of academic writing. Separate readings can be assigned to each student to track individual student activities and also to avoid plagiarism. At the same time, a single document may also be used for an entire class or a smaller group of students. In this way a comparative analysis of students' learning can be visualized and studied. These documents can then be constructed as active documents that allow collaborative learning to take place, built upon students' comprehension and ability. As with our previous experiments on active documents, we know that when 500-1,000 users have viewed a particular document, all possible questions that need experts become answered (Dreher & Maurer, 2000).

The technological support to prevent blatant copying by students is realized by imposing the use of annotations (through specially designed interface templates), which overcomes the need to duplicate content. Figure 5 illustrates the interface that allows students to express ideas, opinions, contribution to collaborative sessions, ask questions, etc. Additionally, the Copy-Paste interface further displays the highlighted text, representing key points with a ranking of

importance, paraphrased text, comments, etc. Students' published works will then be stored as annotations to the original text and visualized separately by the instructor for evaluation.

The use of annotations can be explored as a means of training students' use of the correct form of citations and referencing. By using annotations, a much simpler similarity checking system would suffice to overcome plagiarism to a large extent in ICARE. Annotations and its sophisticated communicational and collaborative features play an important role in the realization of a culture of Web-based reading and writing.



Figure 5: Interface for Learners to Annotate Documents

## Design of Assessment

ICARE also includes mechanisms for the careful design and execution of assessments. The pedagogy driven learning together with the ability to define learning scenarios and rooms allow for highly personalized assessment design and curriculum development.

Beyond the features of the ICARE system as described, the ability to operate in the following modes is instrumental:

- Guided Mode: Interactive session (system auto-suggestions) with closed systems monitoring.
- Self-Learning Mode: Minimal non-interactive feedback, closed world systems monitoring but with feedback provided only on student request.

- Diagnostic Mode (formative): Closed world systems monitoring but with no feedback, results are archived for self-driven assessment.
- Evaluative Mode (summative): Open world mode, with text analysis performed (Copy-Paste analysis) and used as support for self-paced assessment.
- Mentor-Assisted Mode: Similar to diagnostic mode but with feedback sent to a mentor, who responds to students.
- Peer-Learning Mode: Open world learning mode, with the system tracking learner participation and contributions.

These modes of operation can be realized as scenarios (training objects) in WBT-Master. This system also allows assessments to be broken up into smaller parts as a means of supporting continuous assessment, and in the monitoring of student learning process.

As an example of the application of ICARE in a classroom, we propose the following illustration:

1. Students in a class are first asked to collaboratively construct a collective concept map for a domain of study.
2. Individual students are then required to construct a personalized concept map representing their personal learning space.
3. Subsequently, students are assigned selected reading material. An online copy of the reading material is placed in the reading room of each student (or a group of students).
4. Students are then required to identify key points by using the wizard in closed monitoring mode with all activities tracked by system. The highlighted text segments by students can be used to reflect their understanding. Both individual student learning and group learning can be highlighted.
5. The highlighted texts are then visualized for the instructor as annotations attached to the selected document. Statistical information is used to demonstrate student learning, e.g. common mistakes made by student, misunderstanding of text, etc.
6. Instructors' comments can either be placed in personal spaces of students or public spaces for the whole class.
7. Students are then requested to paraphrase the texts selected in guided mode.
8. A visualization of all student inputs is then made available for the instructor. Additional statistical information is presented to support student evaluation. Non-compliance in student learning workflows is visualized.

9. The next step involves a peer-learning mode, where student are requested to discuss the points selected by their peers in the brainstorming room. All points being discussed are referenced and the system links them together for visualization. The instructor or facilitator then provides interactive feedback in the brainstorming room.
10. Students are then required to update their personal concept maps, with the knowledge gained in step 9.
11. Statistics of popular concepts in knowledge-map, popularly selected key points, list of questions posed during brainstorming or during any other phase in the exercise are all presented to the classroom.
12. As the final task, students are asked to collaboratively construct a single concept map while continuing with discussions in the brainstorming rooms. All concepts in the knowledge map are uniquely identifiable as they are implemented using Knowledge Cards. Thus, students are able to discuss the addition of particular concepts or places for links and types of links as well.

The above hypothetical assessment has been defined to illustrate the various functions for the explorative employment in a classroom. A typical classroom usage may only require a subset of the tasks listed. This clearly highlights the power and potential of the proposed ecosystem, to serve as basis for the design of future E-Learning systems.

## **Conclusion**

We have adopted the stand that Copy-Paste need not be entirely considered a wrong-doing. Students would then need to be educated and guided on the constructive use of Copy-Paste skills as a learning mechanism. We have presented an academic ecosystem with technological support to comprehensively address the Copy-Paste Syndrome.

We proposed the use of an advanced E-Learning system, together with carefully planned student assessments and the close monitoring of student learning to address the problem. Plagiarism and Copy-Paste Syndrome avoidance mechanisms and procedures are integrated into the ecosystem and applied throughout the program of study. E-Learning modules together with a suite of Copy-Paste handling tools enable the formative development of "effective Copy-Paste skills." A

complete suite of Copy-Paste detection and avoidance tools will need to be established in all educational institutions.

By effectively addressing the Copy-Paste Syndrome many of the social problems that we are likely to face (arising from the degradation of scientific quality and even possibly leading to quality of life) in future can be averted. Without the full institutional backing and commitment of academics, however, a culture that withstands and compensates the prevalent Copy-Paste culture cannot be achieved.

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# **What Are They Thinking? Adult Undergraduate Learners Who Resist Learning**

Carol Kasworm

## **Abstract**

A unique learner group, resistant adult undergraduate learners have rarely been discussed in the literature. These individuals do not value the college classroom and are motivated to participation through acceptable grades and gaining a college credential. Although they are physically in the classroom, they act only for compliance to the grading system, not for long-term retention of learned knowledge. This article explores characteristics of these resistant learners and the value of constructivist learning theory to support instructional strategies for faculty who create learning engagements for resistant adult learners.

## **Key Words**

Adult learning, resistance, meaning-making, adult undergraduate students, constructivist learning.

## **Introduction**

The task of a college instructor is to create learning engagements that support the growth and development of adults in relation to current discipline understandings and their complex adult worlds. However, these understandings were challenged during my research of adult student learning in a college classroom. I discovered a different kind of adult learner group, learners who made good grades (by definition – good students), but, who by their own admission, did not engage in learning. In the classroom, they resisted learning new content beyond their current world of understanding.

## **Profile of resistant adult learners**

*Ervin, a resistant learner.* Ervin, a 34-year-old male adult, was back in the college classroom seeking an undergraduate degree in engineering. [Ervin represents a composite profile from my interviewees.] Ervin had completed a two-year engineering technology degree some years earlier and found his current work world in the

midst of changing expectations. Not only was a college degree a desired company expectation for supervisory positions, he also was told in his yearly performance appraisal that he would not receive further salary increases without a four-year college degree. As Ervin stated in an anger tone, "I had to get a college degree to survive in this company, although I was one of the top performers."

When I interviewed Ervin for my study on adult learning in the undergraduate classroom, he was completing coursework in his senior year of engineering. When queried about his motivation for college, he was straightforward by noting that he was seeking a credential for his employer. "It's an expensive, but necessary piece of paper to justify continuing in my job." Ervin saw himself as already a competent adult worker, someone with significant expertise in the field of engineering. He softly questioned that the university classroom could make him more competent. It was evident that Ervin had his own beliefs about what was valuable knowledge and learning in relation to his adult world of work. He assumed that classroom content was only snippets of information that would be tested to prove he could "jump through the hoops." In essence, he was a learner who resisted most classroom learning, because he judged the theory and content as irrelevant.

*Background research identifying resistant adult learners.* Is Ervin an atypical person in our undergraduate classrooms? In my research, approximately 11% of interviewed adult undergraduates were identified as resistant learners. These interviews represented more than 120 adult undergraduates in varied collegiate settings (community colleges, four year liberal arts institutions, regional universities, and research universities, adult accelerated degree programs, and evening programs for adults). This research, "Adult Meaning-Making in an Undergraduate Classroom" (Kasworm, 2003), identified five knowledge voices of adult undergraduates. These voices represented the adult learners' epistemological beliefs, with knowledge often categorized by these students between two worlds of academic of real-world knowledge and theoretical or academic-world knowledge. These voices also represented the shifting identities of the adult learners negotiated through their place and engagement in various action contexts of work, classroom, family, community citizen, and other unique settings. For this research, the knowledge voice pattern for the resistant learner was identified as the *Cynical Voice*, adult learners who expressed cynical perspectives regarding the value and relevance of academic knowledge.

Further substantiation to these findings came from numerous discussions with instructors and administrators of adult undergraduate programs. These individuals, through workshops and presentations on adult learner engagement and knowledge voices, personally noted their own experiences with resistant adult learners and often dwelled upon their need for strategies to work with these individuals. Thus, the Cynical Voice pattern became known as the Resistant Adult Student, because these students were often not only cynical, they were purposefully not engaged in learning.

From this research study, adult undergraduates who were identified as resistant learners often had certain types of background characteristics. Most of these resistant learners were full-time workers or currently dislocated workers, and more often in their 40s to late 50s in age. These individuals were typically enrolled in collegiate professional degree programs congruent to their work roles, such as business, accounting, teacher education, horticulture, chemistry, ministry, forestry, human services, and engineering. Most of these individuals suggested that external pressures pushed them into completing their collegiate degrees. The majority of these individuals were predominantly in upper-level programs in both age-integrated and adult degree programs, with one interviewee from a community college context with previous participation in four-year institutions.

*Identifying resistant adult learners in the classroom.* Through these research interviews and subsequent analysis, I identified three subgroupings of the resistant adult learner. The first type of resistant adult students was outwardly compliant and did attend class sessions, hand in all assignments, and did receive passing grades. However, these resistant learners often were not actively engaged in the classroom; they often appeared to be quiet or reticent learners. This type of resistant student suggested that they mentally contradicted the statements of a faculty member, but didn't openly speak up in class. They did not wish to be judged as disrespectful or antagonistic. So, these students had noted staying below the radar screen of their faculty instructors by not raising questions or comments, by not looking at the faculty member and therefore not being asked questions in class, and by looking continuously preoccupied with writing notes. These students faked interest and compliance to learning within the classroom.

Another subgroup of resistant learners could be identified through their vocal questioning engagement in the classroom. Often these learners would raise issue about the lack of congruence of concepts

presented in class with their work world realities or raise questions regarding the simplicity of the ideas in relation to the complex nature of their current adult environments. Sometimes these adults approached a faculty member to renegotiate an assignment. They would desire to pursue learning that was more narrowly focused and directly applied to their work lives, when class assignments often suggest a broader, or more theoretical cognitive engagement.

Finally, there was a third subgroup of these adults, a group that was openly resistant learners, probably identified by the faculty member as openly belligerent or conflictual learners; these adults often challenged the content, the disciplinary understandings, and the faculty authority in the classroom. For example, one adult student suggested, "When he (the faculty instructor) says something that contradicts my experience in the field (forestry), I tell him and these younger undergraduates, 'That's not the way it is.' The faculty and these students need to know that the real world isn't like that." Thus, these students spoke up in class, often with their real-world experiences that ran counter to the text or the faculty member.

*Beliefs about faculty by these students.* For most of these resistant learners, they suggested that many of their faculty didn't respect the expert knowledge of adult students. These adults believed that the collegiate world doesn't value the work world and their developed knowledge of how these work environments operate. While some adult students noted supportive faculty who supported listening to student comments and conversations with diverse perspectives, most of these students noted that the majority of their classes weren't supportive of their beliefs and perspectives. Some believed that faculty instructors didn't want to listen to their perspectives, their experiences, and their opinions. Others suggested that faculty didn't view adult learners as more knowledgeable and competent than traditional undergraduate students (who haven't worked in the positions of knowledgeable authority). Many of these resistant adult learners experienced a chilly or hostile environment, because they believed they were treated as less capable than the naive, younger undergraduate students. They saw themselves as not valued by faculty and therefore quietly humiliated. A few suggested that they had experienced tension in the classroom because they implicitly believed that some of their instructors (particularly graduate teaching assistants) were incompetent to teach class content. They knew enough background of the content of the course that they judged the inability to present complex understandings as lack of sophisticated and in-depth knowledge and understandings of faculty.

*Acting inwardly as a non-learner.* In discussing their engagement in classroom lectures, class projects and readings, these resistant adult learners noted that they had a tacit judging system to screen class content and their involvement in learning. They described these judgments as learning to meet short-term testing and required class papers/projects, jettisoning this knowledge after the ending of the course. In a few cases, learners judged specific content or a classroom activity as valuable and worthy of long-term learning. These moments of committed learning were typically additive knowledge to their already rich understandings of real-world content.

Thus, these adults suggested a highly complex and evolving judgment world in and out of the classroom. These moment-to-moment decisions of short-term or long-term learning retention were based upon congruence of the classroom learning experience with their current understandings of their adult work or other adult expertise roles. For example, one individual noted, "I have to decide how valuable my information is, or how my information will be accepted. In some classes, I am really able to do that; in other classes I can sit back and say, 'It's really not a good idea in this class...It's better for me not to have an opinion about anything...'" In essence, these adults continually monitored the course, the faculty, the students and the situation for judging how and when they would engage.

Most adult students in this group actively critiqued their texts in relation to these beliefs of learning for the real work world. "I tend to take everything with a grain of salt because I know what we're learning in school is book learning. It's not practical application outside the classroom. Some of the instructors tend to forget that." Another individual who was a bookkeeper studying for an accounting degree noted, "...[the text]book has the unreal situations—when you've done real live situations all day. You think, "This is garbage. How do they [text authors] get a hold of this unreal material?"

These adults screened and judged the value and worth of content and discourse. They determined whether they must learn it for the short-term for tests and related assigned or learn for long-term use after the class and within their adult work environments.

## **How can we come to understand this learner for effective instruction?**

Resistant adult learners challenge the efforts of both instructors and the collegiate environment. Instructors typically assume that participation in classes and demonstration on tests and class papers of gained knowledge provides substantiated evidence of learning. However, these adults suggested that they had developed a system of compliance and of short-term learning to gain grades, but had not changed their sense of knowledge of the world and not gained knowledge for long-term retention. The theory and application of constructivist learning provides key insights, conceptual understandings, and potential strategies for a faculty instructor in creating learning engagement for these resistant adult learners. This framework suggests that adult students construct and negotiate their learning based in social, cultural, and developmental ways. Thus, adult learning is viewed as a:

- a). Self-regulatory process of struggling with the conflict between personal models of the world and discrepant new insights, constructing new representations and models of reality as a human meaning-making venture with culturally developed tools and symbols, and further negotiating such meaning through cooperative social activities, discourse, and debate. (Twomey Fosnet, 1996, p. ix)

Adult learners in the undergraduate classroom struggle with personal meanings, meanings from classroom knowledge that may expand or contradict their current meaning structures. These adults create their learning engagement based in this epistemology, the nature of their beliefs of "truth." Each moment-to-moment infusion of information interacts with the learner's sense of what is true, what it means, and how it represents their beliefs of the world and how it works. As learners experience a learning situation, they experience intersubjective and co-constructed understandings based within the learner, the source or sources of information, and the instructor. In particular, learning for long-term retention or deep learning (Entwistle & Ramsden, 1983; Marton & Booth, 1997) is based in this making of meaning by the learner. These learners struggle in understanding how different knowledge and concepts would suggest that the world is structured and works in a different way than their assumptions and beliefs. Thus, the challenge of adult learning is to both incorporate new knowledge into current knowledge structures and to modify past personal learner models into new conceptual structures of knowing the

world. The challenge for instructors is to create learning environments and involvements that both provide connection and support an adult's understandings of the current world, but also present new knowledge and learning that may challenge and open the learner to modifying past models into new conceptual structures of knowing the world. Thus constructivist learning is both additive and developmentally supportive of growth and change.

It was evident that for this group of resistant adult learners, they were not connecting with the content in a purposeful way, they were not voluntary learners. Their resistance potentially was based in the external pressures to get a degree for their work and their livelihood. For these adults, they needed to see value in a college degree, and they needed to find ways to consider knowledge from a college classroom as valuable. One of the first challenges for instructors and programs of adult learners is to create mutual understandings between the adult students and their involvement, of creating a relevant rationale for participation beyond getting a credential. Some programs and courses have suggested they provide practical, utilitarian courses that can be applied directly to the work environments. Other programs focus upon the rapidly changing world of work, of a global information rich environment, and of the need for a different type of adult worker, a knowledge-generating worker who continuously engages in a changing work economy and a changing set of understandings of the work environment. However, many programs and instructors never speak directly to the connection of adult workers with collegiate education. It was evident from these adult students that are they were disconnected from collegiate understandings. What can programs and instructors communicate to adult learners to connect their interests and desires with the intent of the program and the college? This is one of the first challenges in working with resistant adult students.

Secondly, there is need to create *connected classrooms*, classrooms that offer psychological and cultural connections between the adult student lives and the work of the class objectives (Kasworm, Polson, & Fishback, 2002). Often these adult learners experience alienating classroom environments, both by instructor design and by the collegiate climate. The instructor should determine how to create meaning-making connections through the design of the course, the presentation and engagement in content, the development of classroom discussion and in-class experiences, and the nature of assessment of learning through presentations, papers, and tests. How does the class experience create connections to the adult's making of

meaning in relation to their other past and current worlds? Constructivist theory suggests that classes should not be created solely as knowledge stepping stones to build enhanced and more complex theories and content. Rather, classes should focus on how to engage learners in meaning development and through those efforts engaging learners in the value of alternative perspectives, such as complex theories and content, as well as enhancing critical thinking skills and judgments. In essence, constructivist thinking expects instructors to start with the learners and provide a journey that integrates in meaningful ways theories and content in relation to those adult role and individual learner needs and requirements.

Thirdly, constructivist learning also suggests that instructors should seek insights into understanding learners' mental models and use those models as one aspect of engaging learners in the content and perspective of content on the world. For example, active learning strategies offer an important venue for displaying learner meanings and creating new understandings in meaning making. Many instructors have specifically used problem-posing inquiry as one effective tool. Adult instruction should engage adult learners through meaningful engagements that make sense and meaning to the adult learners, as opposed to environments based in unconnected knowledge concepts with a sole requirement of rote memorization. For adults, learning designs need to be thoughtfully structured when presenting information and ideas that aren't congruent with the learner's world. In particular, these adult learners suggested that faculty who offered conversation space in the classroom for sharing a range of ideas and opinions was valued. These spaces allowed these adults to share their real-world perspectives and beliefs, thus potentially reinforced and validated in their view of the world and honoring contributions of their knowledge in the classroom context.

Given these general understandings of constructivist approaches to classroom learning, there are a number of suggested possible actions to work with these resistant adults:

- 1) Instructors need to design their courses and learning engagements based on understanding their adult learners, their background experiences and background knowledge, and their potential rationale for engaging in learning new concepts and theories that may be discrepant with their current beliefs and worlds.
- 2) Recognize that many working adult learners do come oriented to a more limited perspective of learning and understanding

based in their adult worlds of experiences. Instructors should start each new course with various activities to collect information on adult backgrounds and perspectives, to develop understandings of needed broader perspectives and engagements and to potentially identify ways that adult students could find value in those broader understandings.

- 3) Develop conceptual discussions that provide opportunities for inferences and application into adult worlds of work and life. These efforts could include in-class exercises, simulations, course projects, or other forms of active learning. Meaning-making comes from active learning, rather than passive listening of didactic lectures and text readings.
- 4) Create supportive spaces within the classroom for adult learners to feel respected and be able to speak from their understandings and perspectives. Develop strategies to encourage and orchestrate different perspectives and beliefs, drawing upon current best theory and practice for more effective and robust classroom discussions.
- 5) When appropriate, provide opportunities for debate or role playing that places the adult learner into an alternative perspective or understanding. Specifically consider ways to create spaces for adult learners to engage in alternative ways to understand and judge through different theories of frames of understanding.
- 6) Respect the learner, even when the individual disagrees with the content or your beliefs.

Although we still have much to learn about resistant learners, the use of constructivist theory to shape strategies and designs will significantly enhance the creation of connected classrooms. It will also impact the growth of adult students who will engage in long-term learning and will see themselves as lifelong learners choosing to engage in ongoing exploration of new knowledge and ideas.

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# Accelerated Learning: What is It?

Peter Serdyukov

*"If the rate of change inside an institution is less than the rate of change outside, the end is in sight." (Jack Welch, CEO, GE)*

## Abstract

A growing demand for accelerated and intensive short-term educational programs is notable in the USA and internationally. Many colleges and high schools are introducing such programs in their curriculum; some completely transform into accelerated institutions offering only accelerated programs. The concept, definitions, principles and methodology of accelerated instructional approaches described in literature are often contradictory and incomplete. There is also concern regarding the quality of learning outcomes of courses delivered in a compressed format. This article discusses this issue focusing on cost - and time-efficiency of this type of learning, the concept of accelerated learning, definitions, similarities and differences between accelerated and intensive learning, and research agenda in this area.

## Key Words

Accelerated learning, intensive learning, learning productivity, learning efficiency, time-efficiency, cost-efficiency, instructional approach

## Introduction

Accelerated learning (AL) is a rapidly growing trend in education that started developing since World War II. It manifested itself in a number of accelerated and intensive approaches and programs in both adult and high school education in many countries, numerous foreign language courses around the world, and in particular college offerings in the USA. According to the Council for Accelerated Programs' (CAP) data for 2006, for instance, more than 800 U.S. colleges and universities are using an AL approach today, as compared to only about 200 in 2002 (Wlodkowski, 2003). Some schools, e.g., Cornell College, Colorado College, Tusculum University, Maharishi University of

Management, and National University, have curricula totally based on AL approaches.

This abrupt growth becomes understandable when we realize that we are living in a transition period characterized by widespread economic, political and social change, massive integration of technological innovations in all spheres of life, soaring growth of information and knowledge in all areas, instantaneous exchange of communication, mounting manufacturing, business and scientific complexity, and competition at local and global levels that leads to escalating life and work demands. The life itself, according to recent research, is accelerating (Panov, 2005; Snooks, 2005). The pace of change has become so rapid that it affects every individual requiring prompt reaction and adaptation to the constantly shifting environment. This pace creates an increasing demand for fast short-term educational and training programs. There are urgent reasons for that. First of all, contemporary jobs necessitate not only continuous, life-long learning, but also concise, on-demand, occasional or regular professional development activities. This includes educational or training activities aimed at upgrading or changing specialization, which should be accomplished in minimal time. An example can be accelerated and intensive programs in high-demand languages (Scott & Conrad, 1992; Lozanov, 1978; Kitaigorodskaya, 1995; Serdiukov 1984).

Another rising trend is a growing demand for shorter degree programs (e.g., three instead of four-year undergraduate programs), which may be one of the manifestations of the increasing speed of life. The opportunity to obtain a degree or a required preparation for a job in a short time opens careers that had been previously unavailable and, at the same time, saves the student both time and expense. Incidentally, working adult learners (above 25 years old) who constitute almost 40% of today's college student body (NCES) cannot afford long-term, full-time learning. Adult students have hectic lifestyles due to numerous job, family and social responsibilities; therefore they cannot participate in conventional college programs intended for young students that extend across many years. John Brennan, president of Green Mountain College in Poultney, VT, writes, "accelerated degree programs ... enable students to graduate more quickly with less student-loan debt, and a chance to go on a payroll a full year earlier" (Brennan, 2004). Consequently, the demand for accelerated and other short-term educational formats is on the rise and will definitely continue to grow. It is astonishing, in view of this trend, NCES does not have any data for accelerated programs and courses even in their latest statistical review of 2006.

A critical factor that affects the duration of college courses and programs is an escalating cost of education. Universities and colleges are striving to increase enrollment and decrease their expenditures, whenever possible, hence the search for more cost-effective instructional approaches. Shorter and thus faster than traditionally delivered programs, accelerated programs can be one of the solutions. Low-budget AL systems can potentially hold both college expenses and student tuition fees within mutually acceptable ranges, which may help to increase enrollment. It is no secret that schools are competing for students in view of both increasing supply of opportunities on the educational market and rising costs. An indication of the enrollment problem facing U.S. colleges came from Harvard's President James Bryant Conant. He predicted a sharp decline in enrollment, pointing out that enrollment in British universities was 50% of normal (Accelerated education, 2007). Students are looking for ways to complete their education both at a minimal cost and in a minimal time. Alternative degree programs, especially online ones, are abundant.

According to the Chronicle of Higher Education, professional associations, consulting firms, and professional-training providers are all used more frequently for professional training than are colleges and universities. Corporate and government employers already spend about \$13.3-billion a year on third-party training, but only a fraction of that amount — approximately \$ 670 million — goes to colleges. In part that pattern reflects employers' focus on customization and timeliness, and their preference for accelerated programs over degree programs (Ashburn, 2006). These realities should upset traditional colleges and universities and set them on the progressive course to introduce more accessible, effective, adaptable, applicable, flexible and convenient programs (Greiner, Serdyukova, et al. 2005).

Raising the efficiency of education at all levels has become a critical goal because society needs more and more qualified specialists with advanced college degrees prepared in a short time. AL, as one of the perspective approaches, has been effectively integrated in many educational institutions; however, the rate of this process is disproportionate to the challenge. In view of all these considerations, there is a need to identify AL as a methodological system and define its theoretical foundations.

We argue that

- *AL is a specific form of education*

- *Its main feature is a compressed course format*
- *It provides the same content and learning outcomes as a traditional semester-long course in a shorter time period*

Thus it can be regarded as a specific instructional approach that utilizes a non-conventional, effective methodology. To successfully achieve the planned learning outcomes, both instructors and students should be specially prepared for teaching and learning in this innovative, productive and attractive but quite demanding format. This paper identifies major principles and aspects of AL methodology that can serve as a platform both for further research in this area, and for enhancing student learning productivity in existing college classrooms.

### **Efficiency of Learning: Cost versus Time**

Until extensive integration of computer and information technologies in education which started about 50 years ago, there has been little if any research in the costs of learning and in evaluating the efficiency of learning. With the increasing demand for learning, rising costs of education and growing claim on time for learners, especially the adult ones, the efficiency of learning becomes an acute issue for the learners and educational institutions alike (Rumble, 2001). In one of his earlier publications, Rumble (1989) argues that a [learning] system is "cost efficient if, relative to another system, its outputs cost less per unit of input." In other words, the less money we spend on the delivery of the instruction per course or per student, the more efficient is the education provided the learning outcomes remain at least the same.

Addressing today's learning organization and discussing corporate training, White & Olson found that the challenge is twofold: (1) increase the business value generated from enterprise learning, and (2) do it for less... Achieving that balance—between delivering rich, "phenomenal" learning experiences and being as cost efficient as possible—was critical to the success of the enterprise learning transformation (White & Olson, 2007). This is clearly an opportunity for raising cost-efficiency of higher education. Caterpillar University, as reported by Walliker (2005), constructed a mathematical model for calculating the key cost components of online learning. According to this model, the greater the number of students who take classes, and the longer the lesson duration, the more efficient the instructional system will be. While we realize that student enrollment is the major factor in building college revenue, we strongly doubt that the extension of classes is the best option, nor is the class size. On the

contrary, students are often attracted to the accelerated programs just because they are short-term, therefore a college program can be covered faster than in a traditional college, according to our research (Serdyukov, Subbotin & Serdyukova, 2003). As a regular accelerated college course at National, for instance, takes one month, an 18-course Master's program can be done in 18 months which is the major factor in students making the choice of a school or selecting a class. Actually, we can see two opposing tendencies here: extensive —the building up the number of students and extending the length of education, and intensive — accelerating the pace of learning and increasing the turnover of the programs of study. Cost efficiency of education, among other factors, is determined by time expenses involved, including the duration of courses and programs. It is reasonable to expect that the latter, intensive approach may lead to reducing the cost of education due to time savings.

While cost-efficiency of learning is a critical factor for both colleges and individuals, time-efficiency, according to our research (Serdyukov et al., 2003; Serdyukov & Serdyukova, 2006a), has become a decisive factor for students in choosing a school or a program and remaining in it to the end. Time for adult learners is even more precious than money; therefore, many of them would prefer to pay more for the learning accomplished in a less time. Hence the demand for various short-term, accelerated, and intensive programs and courses that, together with educational technology applications, are promising venues for improving the productivity of learning. Cost-efficiency of the learning is discussed in a number of sources (Rumble 2001; Walliker, 2005; White & Olson, 2007, et al.), and time expenses in education are the subject of several other publications (Cotton, 2001; Hottenstein, 1998; Kane, 1994; Barkley, 1999; Buchler, 2003; Metzker, 2003). Scott & Conrad suggest that the correlation between learning and allocated time must be better investigated (1992, 418).

Making learning more productive and time-efficient through integration of AL approach may help achieve both goals. According to *Time*, at Princeton 70% of the students elected the shorter, two- or three-year degree programs. The Association of American Colleges found that 89% of the colleges had already jumped for year-round operation to carry out the accelerated programs (Accelerated education, 2007). It can be reasonable to expect that "making the learning process intensive by minimizing waste of the learning time, we may expect higher speed of learning which will result in achieving the planned outcomes in a shorter time" (Serdyukov & Serdyukova, 2006b). Quite a few publications support this idea (Scott & Conrad, 1992;

Kitaigorodskaya, 1995; Rose & Nicholl, 1997; Meyer, 2000; Bowling et al., 2002; Wlodkowsky, 2003), but there is an acute need in substantial, systemic research in this area and expanded applications.

### **Accelerated and Intensive Learning: Concepts and Definitions**

There are numerous, often ambiguous or conflicting definitions of AL. Some may be incorrect lacking understanding of AL basis concepts, others may highlight various secondary factors contributing to acceleration or individual techniques used in this approach, e.g., music, play or relaxation. Those can be taken for its essential features, whereas they are merely supportive elements. AL, unfortunately, is seldom regarded from a holistic point of view though it is a well-established instructional methodology. Only a systemic approach, as practical applications demonstrate, can provide the desired enhancement of learning, which is the case of Lozanov's suggestopedia (1978), or Kitaigorodskaya's Method of Activating Individual Learner and Group Potential (Kitaigorodskaya, 1982).

Sometimes AL is equated with intensive learning (IL), which is another trend. Despite many similarities, nevertheless, there is a significant difference between these two approaches, as will be demonstrated later. Frequently AL is associated with foreign language learning because this subject area is often a proving ground for many innovative approaches in education, yet many of such applications can be beneficial for any content area and at every level of study (*Methods* 1988). It has become a tradition to identify Georgi Lozanov as the originator of AL approaches (Imel, 2002; Boyes, 2004, *The Free Dictionary*), though, without diminishing his outstanding role in creating a comprehensive and effective system of IL, we ought to note there had been other precedents of fast learning in history (Scott & Conrad, 1992), even if at a lower level of sophistication, completion or results.

When discussing AL definition, Susan Imel, for instance, remarks, "The different uses and definitions of accelerated learning are an issue" (Imel, 2002, p. 1). She separates AL in adult education where the term is usually associated with programs designed to meet the needs of adult learners, and AL in the field of corporate training and development where the term is used to describe an approach that is multidimensional in nature and that places the learner at the center of the experience. There is a clear distinction between higher adult education and corporate training not only in the content, structure, or

learning goals but also in applied methodology. Here we will focus only on higher education applications of AL.

A very extensive analysis of accelerated/intensive learning by Patricia Scott and Clifton Conrad (1992) does not attempt to define AL or IL; it just mentions there is a “rapidly growing interest in intensive courses — semester — or quarter-equivalent classes offered in compressed formats...which better accommodate students’ schedules” (411). Bowling et al. (2002), continue in the same manner writing that, “The feature distinguishing such [compressed course] formats from traditional formats is that compressed courses are completed in a relatively short amount of time” (1). Short-term, compressed course format allowing students to cover a semester-long course within 4-8 weeks is actually the main feature of both AL and IL; however, there are other distinctions among them that will be discussed later.

One of the most thorough investigations of AL (Boyes et al., 2004) offers the following interpretation of the term: “A definition of accelerated learning is arrived at that includes brain-based techniques, philosophical approaches to what counts as intelligence, as well as classroom dynamics. The following are included in the overarching definition offered in this report:

- that which justifies its approach to teaching and learning by citing scientific research into ‘way the brain physically works’ and/or brain architecture, commonly referred to as ‘brain-based’ learning;
- that which supposedly accelerates learning by using the techniques and practices referred to in 2.1, such as NLP, the power of positive suggestion, supportive environments, and the enhancement of self esteem;
- that which includes multiple intelligences theories, including emotional intelligence; and theories attached to multi-sensory (visual auditory kinesthetic: VAK) engagement;
- that which supposedly accelerates learning by stimulating the learner to be motivated and attach meaning to the content of what is being learnt;
- the use of recall-enhancing techniques such as mind mapping, mental rehearsal techniques, and brain exercises and mental stimulation techniques such as Brain Gym®.

These are considered to be the core dimensions of accelerated learning in this literature survey” (Boyes et al, 2004, p. 3). These attributes are

critical yet incomplete. Here we should underline a clear identification of three fundamental principles of AL:

- Expectation of the learner's high motivation
- Wide utilization of the learner's intellectual and emotional capacities, and
- Application of all potentially beneficial methods and techniques to activate and enhance these capacities.

The definition offered by *The Free Dictionary*, though limited to the language learning, seems to be the most detailed:

Accelerated Language Learning developed based on the research and theories of Georgi Lozanov's suggestopedia. The term now associated to many methods in education that work to accelerate learning. The term 'accelerated learning' is a very broad term and encompasses many different techniques, methodologies and approaches to teaching and learning. Some methods which would generally be considered to fall under the title of accelerated learning would be: mind maps, Brain Gym or Edu-Kinesthetics, concert texts, reading to music, multiple intelligences theory, various memory techniques, the use of music to influence the emotional and mental state of learners, state setting in a broader sense, the use of songs to aid learning, pattern spotting, the implementation of chunking, suggestopedia, Neuro-linguistic programming, the use of drama, suspension of disbelief etc. (*The Free Dictionary*)

The list of methods and techniques used to accelerate learning can be extended.

In short, AL can be defined as "Combining adult learning theory and whole brain learning theory in the learning environment to achieve a faster learning rate" (Glossary of Terms).

AL is sometimes interpreted as accelerated or intensive scheduling in which colleges fill the summer semester or offer courses during interim, modular, regular term, and over the weekends thus compressing the total length of the undergraduate program to two or three years. An example of such an approach can be seen in the accelerated schedule at Cooley Law School: "This schedule is an intensive, full-time program recommended only for those students who are advised or feel confident they can manage five classes (15 credits) per term. Students selecting this option attend classes five days per week for two years (24 months)" (The Accelerated Schedule). Another

version of such scheduling is given in Doyle and Yantis (1977) who define intensive scheduling as “an innovative approach to scheduling courses in which students study one subject for concentrated period of time and in which formal classroom contact time between the students and the instructor is limited to time-compressed format” (1). Andersen (1982) discusses intensive scheduling as an alternative to the concurrent method of arranging high school students' classes. He defines intensive scheduling as the placing of students into one class for three or four hours a day for four or five weeks. Intensive scheduling has been shown to be an effective educational medium (Hottenstein, 1998). This is actually one of the factors that ensures the success of AL, as will be demonstrated below.

To complete the discussion of the AL definition, it would be interesting to cite Meyer, the author of the Accelerated Learning Handbook, who, leaving pedagogy aside, offers his pragmatic interpretation of AL:

Accelerated learning is, first and foremost, an end, not a means. ...accelerated learning is the results, not the methods used. It is essential to associate accelerated learning with outcomes, not particular methods (games, music, color, activities, etc.). And whatever methods do not produce an accelerated or enhanced learning are not [AL – P.S.] — no matter how clever, or creative, or fun they might be... The purpose of AL is to awaken learners to their full learning ability. (Meyer, 2000, xxi).

This elucidation may be attractive for learners; however, what is important for educators is, first of all, the means to achieve the goal of AL, i.e., methodology. Recall, how we learn determines what we eventually learn (Ryan, 2008). In a sense, AL is both a means and an end.

Due to incomplete or conflicting interpretations of AL and IL and insufficient research, these effective instructional methods do not find wider application in universities and colleges though corporate training systems, as mentioned above, are often completely based on accelerated approaches. Misunderstanding about AL can be seen in the Glossary of Terms on the British Government Standards Site, which omits the main characteristics of AL, i.e. its short-term format, calling it just “An approach to learning based on research into learning styles and how the brain works. Draws particularly on ideas from multiple intelligences and brain-based learning” (The Standards Site). The Glossary of NCES defines accelerated programs as, “Completion of a college program of study in fewer than the usual number of years,

most often by attending summer sessions and carrying extra courses during the regular academic term" (Glossary NCES), which points to a very limited attribute of AL. Even professional studies done by experts on the basis of existing literature without direct exposure to or experience in accelerated teaching and learning demonstrates deficient understanding of AL (e.g., Boyes, 2004) and leads to flawed conclusions.

Taking all available interpretations of AL into consideration and addressing what is common in all of them, we can identify the following characteristics of this approach:

- AL is a specific form of education aimed at achieving the desired learning outcomes in a shorter, compared to the conventional learning, period of time
- It is a complex methodological system advocating holistic approach to learning
- It utilizes all available pedagogical and psychological means to enhance learning
- It integrates a number of advanced and effective educational and psychological theories, teaching practices and instructional tools
- It appeals to the learner's intellectual and emotional potential and counts on high intrinsic motivation
- It focuses on the adult learner's needs, goals, life conditions and learning outcome applications
- It is a truly learner-centered and practical approach to learning

AL is actually a compressed, condensed, fast, short-term delivery of regular courses. Two major quantitative parameters distinguish AL from the conventional instructional format accepted at most colleges and universities: duration and frequency of the lessons. AL in its typical form presents an attempt to compress a conventional semester 17- or 18-week long course into eight, six or even four weeks. It is evident it would be extremely hard to keep students focused and excited about learning for more than a few weeks at a time. Commonly this compression is achieved through extending the duration of each lesson from one to three, four or more hours, and increasing the frequency of these lessons from one or two per week to three or four and more per week. Thus, the whole course becomes shorter in duration and is perceived by students as a more doable and time-efficient. A comparison of the accelerated and conventional courses can be demonstrated based on these quantitative parameters.

Table 1. Comparison of major quantitative parameters in conventional and accelerated formats.

<b>Type of the course</b>	<b>Conventional</b>	<b>Accelerated</b>
Duration of lesson (hours)	1	3 – 4 and more
Frequency per week	1 - 2	3 – 4 and more
Duration of the course in weeks	17 – 18	4 – 6 – 8

In reality, as seen in the Table 1, students ultimately do not gain any time savings because they need to spend the same amount of hours in the class, for instance:

- Conventional format: 1hr x 2.5 classes/week x 18 weeks = 45 hrs
- Accelerated format: 3.75 hr x 3 classes/week x 4 weeks = 45 hrs

The reward of taking an accelerated course, however, is a reduced duration of the overall learning process that may result in faster completion of the program. This factor, in many cases, may be critical for working adult learners. Though attractive to many learners, this compression of the courses invites some educators' and researchers' critique (e.g., Boyes et al., 2004), which necessitates a better explanation of what AL really is and how learners can achieve quality outcomes in a short learning time.

### **Accelerated or Intensive Learning: Similarities and Differences**

AL is also linked to intensive learning (IL), however these two approaches, though very much alike, are different. Actually, there are five terms that refer to both such programs; accelerated, intensive, fast, compressed or short-term. All these programs are fast, compressed and short term, implying that one and the same course material can be delivered in a significantly shorter period of time as compared to the conventional course format. For instance, a Beginning Algebra course that at a traditional university is normally taught during one semester, in an accelerated format may be covered in one month. Therefore, all of such programs can be called accelerated; however, the term intensive learning, besides a compressed format, entails also an increase in the productivity of learning (Serdyukov & Serdyukova, 2004). This means that by taking an intensive course rather than an accelerated one a learner can expect either to go through an even

shorter learning process obtaining the same learning outcomes as in an accelerated course, or to gain more knowledge and skills within the same time frame. To differentiate the specificity of each approach, the following definitions were offered:

***Accelerated learning*** is attributed to a specially organized short-term course in which the same learning outcomes can be achieved in the same number of class hours as in a traditional course but delivered in shorter course duration (e.g., in 4-6 weeks instead of 15-16). It does not necessarily imply the use of special accelerated techniques. It is usually taught in longer and more frequent sessions (e.g., 4 hours twice a week), and also can be called a compressed course. (The major characteristics signify a *quantitative* change).

***Intensive learning*** is similar to AL having a compressed, short-term course format; however, in an intensive course the same or better outcomes can be achieved in fewer class hours than in a traditional or in an accelerated course due to more effective instructional methods and increased productivity of learning. It is taught in longer and normally very frequent sessions (e.g., 4 hours 4-5 times a week). (The major characteristics are both *qualitative* and *quantitative* changes). (Serdyukov & Serdyukova, 2006b, 46).

Whereas accelerated learning pursues only the goal of compressing the duration of the course by shortening the course format through scheduling that is a quantitative change, intensive learning also attempts to achieve greater efficiency of learning through both compressing instructional time and applying effective instructional tools and strategies thus increasing cost and time efficiency, which is both quantitative and qualitative change. The comparison between conventional, accelerated, and intensive courses of English as a Foreign Language helps to illustrate the difference (Table 2). Two parameters are utilized for comparison here: the learning outcome which is constant and evaluated as the number of words necessary to achieve a certain level of communicative competence, and the number of hours required to attain this goal, which is variable.

As seen in Table 2, the learning outcomes in all three course formats were the same (the number of words necessary for everyday communication). The time it took to develop communicative competence, however, varied from 500 hours in the conventional 10-month long course, and the same 500 hours in an accelerated 5-month long course, to only 120 hours in an intensive two-month long course.

Table 2. Comparison of instructional formats for English as Foreign Language courses

<b>Instructional Format\Course Duration</b>	<b>Conventional</b> 10 months	<b>Accelerated</b> 5 months	<b>Intensive</b> 2 months
Number of hours needed to acquire a communicative competence based on a 2000-word vocabulary	500 Hours (4 words/ hr.)	500 Hours (4 words/ hr.)	120 Hours (16.6 words / hr.)

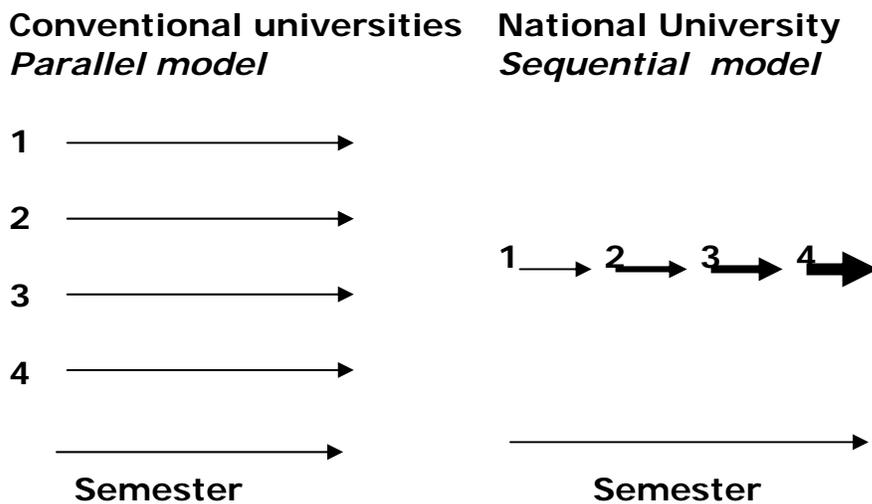
Clearly, the intensive format is more efficient as students acquire the same vocabulary in significantly shorter course duration and in fewer instructional hours. The measure of efficiency in this case is taken as the ratio of two quantitative parameters: the number of words in the exit learner vocabulary and the number of hours it takes to master them, so eventually it equals the number of words learned per hour. This comparison proves that an intensive course is more efficient than a traditional and even an accelerated course: 16.6 words/hour vs. 4.0 words/hour. So, the factor of efficiency of this intensive course is 4.15 (16.6:4.0) (Serdyukov & Serdyukova, 2006b); hence, the benefits of an intensive course versus an accelerated course.

Many ESL/EFL programs in the USA are called “intensive” only because they are conducted in a relatively short period of time due to the concentration of classes. We argue that “intensive,” according to Merriam-Webster’s Collegiate Dictionary, means not only “concentrated,” but also “constituting or relating to a method designed to increase productivity,” which in learning means achieving the same outcomes in a shorter time, or better outcomes in the same period of time as in non-intensive, traditional or even accelerated courses.

Another essential aspect of both AL and IL is a single-subject delivery, i.e. when the courses of the curriculum are taught consecutively, one at a time, rather than a number of parallel courses traditionally taught simultaneously (sometimes up to four or even more) each day during a semester. In this format students can focus like a laser on one course at a time rather than on several courses in the traditional model that sacrifices depth of understanding for the curricular breadth.

Instruction at practically all conventional universities is based on a parallel model of instruction that is implemented in the several-subjects-at-a-time format. This format engages students in a number of different courses per day during the whole semester. In the AL model used at National University, as well as in some other schools (e.g., Cornell, Tusculum, St. Olaf, Elizabethtown, and Colorado Colleges, LeTourneau and Breyer State Universities), however, students enjoy a sequential (linear) model taking one course at a time.

These two models can be represented graphically (Greiner et al., 2005) covering four courses per semester each:



Thanks to this approach students obtain not several separate, loosely connected outcomes but well-organized, interrelated and cumulative learning outcomes building a cohesive system of knowledge. We argue that a sequential, one-course-at-a-time model of adult higher education meets the needs of adult learners better than the traditional parallel, several-course-at-a-time model.

The advantage of this approach is self-explanatory: a "one-course-at-a-time" instructional model reduces the complexity of the instructional process organization and, at the same time, of learning thus allowing its easier adaptation to an individual learning style. According to National University students' comments, this format helps to liberate students' minds and gives them an opportunity to focus their attention and energy on one subject, as well as adapt to one teaching/learning style at a time. Csikszentmihalyi's research suggests that "deep concentration", "immersion" in an activity, and "undivided intentionality" lead to increasingly rewarding "optimal experiences" which nourish and strengthen the self (1982). He comments: "Optimal

experience stands out against this background of humdrum everyday life by excluding the noise that interferes with it in normal existence" (ibid. 22). This is true when we consider adult working learners' hectic lifestyles and complicated everyday experiences. Scott and Conrad (1992) also assert that "concentrated study may cultivate skills and understandings which will remain untapped and undeveloped under the traditional system" (ibid 417).

A theoretical hypothesis can therefore be formulated: the lesser the logistical complexity of a learning process, the more focused the students remain, and the better the eventual outcomes. By reducing the complexity of the traditional parallel model, the efficiency of learning can be increased (Serdyukov & Serdyukova 2004). This concept is well aligned with the adult learning theory allowing flexible adjustments of learning to working adults' idiosyncratic lifestyles.

Making the learning process intensive by minimizing waste of the learning time, a faster rate of learning may be expected which will result in achieving the planned outcomes in a shorter time. The formula of intensive learning therefore can be devised: *The more organized and effective is the instructional system, the more the student is focused, the more effort produced, the better the effect of learning, the faster rate of learning, and the shorter the process duration.* That is why all accelerated and intensive courses are always short, from two weeks to one or, at most, two months in duration. If there is no significant effort applied in learning, then there is no effect, no increase in productivity and consequently, no opportunity to shorten the duration of the course.

Intensive learning can be explained by the Uniform Motion Equation:

$$d = v \cdot t$$

where  $d$  is distance,  $v$  is velocity, and  $t$  is time. If we take  $d$  to be the learning outcomes,  $v$  the learning effort, and  $t$  the course duration, we will see that when we take  $d$  for a constant, and increase  $v$  (the effort), then  $t$  (duration of the process) will decrease (Serdyukov & Serdyukova 2006a), which can be calculated by dividing the outcome  $d$  by the effort  $v$ :

$$t = \frac{d}{v}$$

AL and IL approaches are sometimes associated with immersion programs that intend to achieve certain learning outcomes in a short time (Shekhter, 2005). The essence of the immersion learning is a

consistent concentration of the learning and learners on a subject area or a certain learning process that may allow accomplishing the course goals in a very limited time (see, for instance, the article 'Varieties of immersion in teaching business English to university students of business and economics: the Ukrainian approach' by Oleg Tarnopolsky in this issue). M. Berlitz introduced this concept in foreign language instruction insisting that only the target language should be spoken in class, starting with the teacher's greeting on the first day. The method of complete or total immersion learning is based on incessant intensive target language communication (See Immersion Method). Using the principle of immersion some foreign language programs produced outstanding results. As an example we can point to once popular English language boat cruises in Russia that immersed a large group of adults in learning a foreign language (usually English) in isolation from their native (Russian) language for some 20 days. The main condition for all participants was not to use Russian in any situation while on board the ship where an English language environment was strictly enforced during all 20 days of the cruise combined with regular English classes every day. The outcome was that learners were actually unable to speak their primary language after such an immersion; instead, they conversed only in English.

To demonstrate the differences between all three instructional approaches, intensive, accelerated and conventional, their major common features were compared (Serdyukov & Serdyukova, 2006b). A learning system can be described using such features as course duration (short vs. long); instructional process character (intensity); lesson duration; frequency of lessons (per week); structural model of learning (a conventional parallel model offering a number of courses at a time, or a sequential model when students take one class at a time); methodological approach; student motivation; learning environment; learning efficiency and the instructor. Class size is also an important factor: an intensive course works better for a class of 12-15 students, an accelerated class accommodates up to 25 students, and a conventional one – 25 or more students.

A comparative analysis of these features of three different types of instructional formats, as shown in Table 3, demonstrated that IL and AL have several common features: they are both short (compressed) in duration, have lengthy classes (up to 4-6 hours), use a sequential structural model, normally enjoy high to very high student motivation, and increase learning efficiency. As different from IL, AL uses standard learning environment and mostly traditional methodology with some innovations, and the instructor from a conventional university usually

can successfully teach accelerated courses though acknowledging the differences. IL, on the contrary, requires a particular learning environment and a highly effective, specially trained instructor.

Table 3. Comparative features of three instructional approaches

<b>Approach Feature</b>	<b>Intensive</b>	<b>Accelerated</b>	<b>Conventional</b>
<b>1. Course duration</b>	Short (4-8 wks)	Compressed (5-12 wks)	Long (15-18 wks)
<b>2. Process</b>	Intensive	Traditional	Traditional
<b>3. Session duration</b>	4-5 hrs	3-6 hrs	1-2 hrs
<b>4. Frequency</b>	4-6 per week	1-3 per week	1-2 per week
<b>5. Structural model</b>	Sequential (one at a time)	Sequential (one at a time)	Parallel (several at a time)
<b>6. Methodology</b>	Special	Mostly traditional	Traditional
<b>7. Motivation</b>	Very high	High	Varied
<b>8. Engagement</b>	Active	Varied	Varied
<b>9. Learning environment</b>	Special	Standard	Standard
<b>10. Learning efficiency</b>	Very high	High	Various degrees
<b>11. Class size</b>	12-15 students	20-25 students	25 students and more
<b>12. Instructor requirements</b>	Specially prepared	No special requirements	No special requirements

As mentioned above, many schools have been using AL for years. National University's programs, for example, utilize 1x1 course model based on a typical AL approach (Serdyukov et al., 2003, 2006b), which delivers all courses in a one-month long, one-course-at-a-time compressed format. It is worthwhile to note that conversion of the traditional semester course into an accelerated or, particularly, into intensive course necessitates modifications not only in the instructional format but also in the instructional methodology. One of the reasons is that methods, strategies and activities applied in a regular classroom may not work in the accelerated short-term or intensive course where instructional time may extend up to 5-hour long, usually evening classes, with adult students studying after a hard day on the job.

## Further Applications and Research

Though Meyer (2000) believes it is only the results that primarily matter in AL, for educators is critical to understand how the results are achieved, what methods are used and in what way, and which innovative techniques can be used to increase the efficiency of teaching and learning. AL and IL practices have a long and complicated history, yet research in their instructional methodology is scarce, which is correctly noted by Boyes et al. (2004). The reasons are several: most of AL and IL is usually undertaken by the practitioners who are tired of the often boring and ineffective practices; these approaches are still marginalized by the traditional educators and educational theorists who are too skeptical about innovative approaches to teaching and learning to be open and objective; many applications have been commercial (private colleges, schools, classes and corporate training), therefore no investigations were even envisaged; research of teaching and learning practices is certainly a very complex and costly endeavor, particularly when the brain is involved. Under these conditions very few researchers, not mentioning practitioners, can afford to conduct consistent investigation of instructional practices based on the application of innovative approaches.

It does not mean, of course, that research has not been conducted at all, as has been demonstrated above, or it should not be undertaken. Seamon (2004), for instance, conducted a thorough investigation evaluating short- and long-term differences in instructional effectiveness between intensive and semester-long courses. This research confirmed that "Students in the intensive version of the course performed significantly better than students in the semester length course on posttests of content and questions tapping higher-order learning." Wlodkowski and Kasworm (2003) produced evidence that accelerated learning programs are more effective with nontraditional learners and have similar or better learning outcomes. It is essential, nevertheless, to study the application of special instructional strategies and techniques in various accelerated and intensive courses and long-term effects of such learning.

In the growing Web-based learning, AL can be delivered via online classes, which is being done at National University, though no research has been identified showing that IL can also be implemented in an online environment. Success of online AL depends on the quality of principal factors described above: course instructional design, instructor's professionalism, students' preparedness, attitude and

motivation, flexibility of schedule, convenience of the course structure and learning process, effectiveness of the Web-based learning delivery, ease of course navigation, intensity of interactions in the discussions, expediency and clarity of feedback, availability of all the necessary learning materials and tools, and institutional support.

Blended or hybrid formats that have been becoming popular lately can be viewed as a temporary compromise between online and classroom-based formats and may be regarded as a *déjà vu* phenomenon. This trend to integrate live, face-to-face learning into web-based educational systems stems from current technical limitations of the online environment for some practical learning experiences, such as chemistry or physics labs involving experiments and manipulations that need hands-on operations. It also relates to learning activities requiring direct student interactions, such as dramatization, games and role playing which cannot be done without gathering students in one place. However, with the development of multimedia, hypermedia, computer-based simulations, telecommunications and computer-mediated communication, these limitations will eventually disappear. Some of these activities can be implemented today using synchronous iLink sessions. These blended formats, though in some ways beneficial for establishing personal, face-to-face contact and accomplishing some vital classroom activities, impose considerable restrictions on learning convenience and flexibility as they demand simultaneity, which often creates conflict of interests and interferes with students' busy schedules. Asynchronicity of learning remains one of the key success factors of web-based learning (Ryan & Serdyukov, 2005).

All these new approaches and their applications, as well as basic principles, strategies and tools of AL and IL, must be further investigated. Some directions for research were identified by Scott & Conrad (1992, 446-450). Major topics for research can also include the following:

1. Current instructional approaches and methodologies: Their theoretical foundations.
2. Accelerated and intensive learning: How do they work in the classroom and what should be improved? Pros and cons, and how can we use them in teaching our students?
3. Teaching adults: What are the best ways to enhance their learning outcomes?
4. Instructional design: How to optimally structure and plan the course, the lesson, and the whole instructional process?

5. Effective presentation of the new material: What are the most effective modalities, formats and strategies?
6. Student activities: What are the best methods and strategies for collaborative and individual work in onsite, online or blended environments?
7. Educational technology: when and how to make it work best?
8. Student learning styles and their multiple intelligences: How to use them to enhance learning?
9. Student attitudes and dispositions: How to affect them for better learning?
10. Student motivation: How to raise it?
11. Time management: How to help students to manage it more efficiently, especially in an online class, and how to increase time-efficiency of learning in general?
12. Student readiness to learn: How to improve learning productivity of busy adults?

## **Conclusion**

Accelerated learning may be a response to the currently growing demand for better education within a short time frame. Intensive learning, which is a higher level of accelerated learning, is an attempt to raise time and cost-efficiency of learning. The similarities between these two instructional approaches are numerous; however, the principal difference is clear: intensive learning is capable of providing quality learning outcomes due to utilizing all available resources, including the learner's intellectual and emotional potential, thus increasing productivity of learning. Hence methodologies of teaching and learning in these two approaches differ, as well as conditions and implementation factors. Intensive learning requires more effort on the part of both learners and instructors; it may be more costly, however it can provide greater time-efficiency which, in many cases, may be a decisive factor in choosing the program. So the demand for accelerated and intensive learning programs is different. Both approaches are demand-driven; however, they have sound theoretical foundation and considerable proof that it works supplied from numerous international practical implementations.

As much as online education is gaining ground based on accessibility, convenience, flexibility with constantly rising learning efficiency, the innovative approaches discussed in this article will also undeniably continue to grow in view of an increasing public demand for accelerated and intensive programs. Scott and Conrad support this

deduction: "Given adult and part-time student demographic trends, intensive courses probably will proliferate in the future" (ibid. 411). We can see this tendency is gaining momentum.

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# **Varieties of Immersion in Teaching Business English to University Students of Business and Economics: The Ukrainian Approach**

Oleg Tarnopolsky

## **Abstract**

The article discusses the general approach and practical experience of introducing immersion into Business English teaching to students majoring in Business and Economics at Ukrainian universities. Two principal types of immersion are analyzed: immersion through simulation of profession-oriented activities and immersion through learning professional subjects in English. Both of these types are divided into lower-level and higher-level varieties. Some data is given concerning the implementation in teaching practice of Ukrainian universities of both types and all the four varieties of immersion programs discussed in the article.

## **Key Words**

Business English teaching, immersion, immersion through simulation of profession-oriented activities, immersion through learning professional subjects in English, continuous simulation, total immersion, sheltered immersion.

## **Introduction: Two Types of Immersion**

Teaching second/foreign languages by way of immersion has become a well-established practice both in North America and Europe since the introduction of the so-called "Canadian French immersion" programs (Calvé, 1991; Rehorick & Edwards, 1994). Clark (2000) defines "immersion" as a method of teaching second/foreign languages by way of teaching one or several academic subjects in students' target language. Immersion programs have proved their efficiency in what concerns the development of target second/foreign language communication skills of secondary school students. What is less researched is the use of such programs for developing target second/foreign language communication skills of tertiary (university) students. However, there are no reasons to believe that university subjects cannot be taught in the target language if students' command of that language is sufficient for learning their professional subjects in it. This article discusses the experience of two Ukrainian universities in introducing such *immersion through learning professional subjects*

*in English*, which is considered to be *the principal type of target language immersion* for university students.

The article also discusses *another, auxiliary, type of target language immersion* that is less known in the West since it was introduced in Cold War times in the former Soviet Union. That kind of immersion was developed by Plesnevich (1976) and may be called *immersion through simulation of profession-oriented activities*. The essence of this approach is a continuous simulation of professional activities that students will do in their professional work after graduation, but carrying out those activities in the target language only (mostly English) and during foreign language classes. This auxiliary type of immersion may be a good preliminary step toward introducing the principal type of immersion since it trains students at lower levels of target language command in using it for professional purposes in sheltered foreign language classroom conditions. Thereby, students are getting psychologically, linguistically, and communicatively prepared for later (at higher levels of target language command) acquisition of professional knowledge by means of that target language in much less sheltered conditions of learning professional subjects in relevant university courses that relate to their major.

Therefore, it is reasonable to start discussing the practical experience gained in what concerns introducing immersion for teaching students at Ukrainian universities with the auxiliary type of immersion. It should be noted that the experience to be described was gained in the area of teaching Business English only to students majoring in Business and Economics.

### **Immersion through Simulation of Profession-Oriented Activities: The First Variety**

This variety of the type of immersion under consideration was developed, as it has already been pointed out, on the basis of the concept of continuous simulation in Business English teaching (Tarnopolsky, 2000). That concept later became the foundation for elaborating the coursebook *Business Projects* (Tarnopolsky, Kozhushko, et al., 2002) designed for teaching Business English to university students of Business and Economics. In the coursebook *Business Projects*, continuous simulation was made the organizing and principal learning activity for an entire course on Business English for students of Business and Economics. All other learning activities led to that one and prepared learners for it. Continuous simulation was designed as such an organization of the Business English course when learning develops as continuous modeling and enacting of business activities and communication in class. The

enactment is done in the framework of almost life-size functioning of an imaginary company “organized” and “run” by students themselves.

This is immersion through simulation of profession-oriented activities in its pure form. Playing, i.e., doing continuous simulations, students pursue the explicit goal of organizing and making succeed their imaginary company while acquiring Business English is a side effect. The experiments, tests, and tryouts that were carried out demonstrated that the side effect was much more successful than traditional and explicit learning of Business English using traditional Business English coursebooks. The students' learning motivation also was found to be considerably higher (Tarnopolsky & Kozhushko, 2002a; Tarnopolsky & Kozhushko, 2002b; Tarnopolsky & Kozhushko, 2003). Those experiments, tests, and tryouts were carried out at Dnipropetrovsk University of Economics and Law with the second year students of the Department of Economics and Business Management and the Department of Finances and Economics.

The approach through continuous simulation just discussed was designed for the beginning and intermediate levels of learning Business English and for the students who had already attained the intermediate level in their General English communication skills before they started their Business English studies. This was just the case with the students of the above-mentioned departments who participated in the experiments, tests, and tryouts aimed at checking the efficiency of the coursebook *Business Projects*, and the continuous simulation approach embodied in it. Those students had a course of General English in their first year of studies at the university that allowed them to achieve the required intermediate level in their English communication skills by the end of that year. They started their Business English studies in their second year at the university (the beginner level of Business English), and were supposed to attain the intermediate level in Business English by the end of that year. The already-mentioned experiments, tests, and tryouts convincingly proved that they really achieved such a level, and much more successfully than the students in control groups who did not enjoy the benefits of being taught through continuous simulation approach (Tarnopolsky & Kozhushko, 2003).

One feature of this approach is focusing students' language studies on what may be called *General Business English* (Tarnopolsky, 2004). Business English as the language of business communication exists in a number of varieties. For instance, the language of marketing has some differences as compared to the language of finance, but they both belong to Business English. It may be said

that each variety of Business English is distinguished from the others first of all by some specific ESP that is included into it for achieving the particular goals set in a definite area of business activities. For instance, in the field of marketing Business English (*General Business English*) used by specialists is greatly modified by the specific ESP of marketing. The same concerns the language used by people employed in finances, management, etc. All such kinds of ESP cannot be taught in detail in university courses of Business English that have to limit themselves mostly to some core business language (*General Business English*) used in whatever area of business communication. That was the reason of limiting the immersion program based on continuous simulation to students' acquisition of *General Business English* only in the framework of the program taught.

On the other hand, the success of the program in making students achieve the intermediate level in their Business English communication skills allowed to develop the next approach (the second higher-level variety of the same type of immersion) – the one used for teaching Business English at the advanced level. Here the goal set was learners' acquisition of not only *General Business English* but mostly of some particular kinds of ESP characteristic of different particular areas of business communication. Thus, the approach was aimed at making the students efficiently gain command of those advanced Business English communication skills that require the use of some specific ESP. But again, as already mentioned, the approach in question was only another variety of the same type of immersion since it was also based on a simulation of profession-oriented activities. The only change was that this time it was a more advanced and sophisticated degree of such a simulation.

### **Immersion through Simulation of Profession-Oriented Activities: The Second Variety**

This second variety of immersion through simulation of profession-oriented activities was based on the so called *total immersion* (Grant, Meeler & Misak, 2003). Total immersion presupposes teaching different academic subjects in the target language without any recourse to the students' mother tongue. It also excludes any specific focusing on language forms that may be a source of additional difficulties for students studying an academic subject in the language that is not their native one. The approach was used for organizing mini-courses on different professional subjects – but again not in standard university courses on those subjects. The mini-courses were taught in the framework of Business English

program for senior university students majoring in Business and Economics, i.e. within the course of Business English. The mini-courses on finances, marketing and management were designed just as ordinary university courses on such subjects – including lectures, seminars, practical tasks, and tests – with the difference that they were given in English only and during classes of English only. So in this case again Business English and some kinds of ESP related to particular areas of business activities were learned not explicitly but implicitly by doing something else. That doing something else was actually studying professional mini-courses, those that were included into the students' target language training, thus allowing them to acquire advanced Business English communication skills as a side effect of learning such mini-courses.

The mini-courses were introduced into Business English programs for the third year students of Dnipropetrovsk University of Economics and Law (again the Department of Economics and Business Management and the Department of Finances and Economics). By the end of their third year of studies those students were supposed to attain the advanced level in their Business English communication skills starting from the intermediate level at the beginning of the year. The students in the experimental groups (where the mini-courses were introduced) were those who in their second year of studies were learning Business English through the continuous simulation approach. And again, as testing students' Business English communication skills proved, the results were considerably higher than in comparable control groups – those learning Business English using traditional approaches and traditional coursebooks designed for the advanced level of Business English studies. It was the same with students' learning motivation which was much higher in the experimental groups (Tarnopolsky & Kozhushko, 2005). What was also proved was the fact that experimental groups students really gained command of some specific ESP (e.g., the ESP used in the area of finances) that was required for business communication on specific professional issues. It did not happen in control groups where students mostly remained within the framework of *General Business English*.

Yet, it should be stressed again that this approach is still a variety of immersion through simulation of profession-oriented activities but not real immersion through learning professional subjects in English. Students do learn professional subjects in English but they learn them within the English course as fragments of those subjects (mini-courses) and not as systemic academic courses. It may be said that in this situation we have a simulation of learning professional courses but not the genuine learning of those courses.

On the other hand, this simulation is very close to reality. There is only one final step left to be made – to pass from such “artificial” mini-courses in classes of English (the final stage of preparation for genuine immersion) to actual teaching of academic subjects in English in full-size university courses on those subjects (genuine immersion). It means passing from the auxiliary type of immersion (*immersion through simulation of profession-oriented activities*) to its principal type (*immersion through learning professional subjects in English*). How this can be organized will be discussed in the following parts of the article. But before, it seems advisable to dwell on two final points concerning immersion through simulation of profession-oriented activities.

The first of these points is the fact discovered in our long-term (five years) studies of immersion through simulation of profession-oriented activities. One of those studies (Tarnopolsky, Kozhushko & Zhevaga, 2006, 2006a) revealed that students who had been learning their Business English by means of both varieties of immersion through simulation of profession-oriented activities demonstrated much greater confidence in their Business English communication skills than those learners who had been acquiring those skills in a more traditional manner. Eighty-five percent of students from the experimental groups in the second year of study and 88 percent in the third year of study felt that they had adequately gained the absolute majority or all of the skills required for efficient professional business communication in English. The situation in control groups was quite different. Only 31% of the students in the second year and only 42% of the students in the third year felt such confidence, and that means that the majority of learners did not feel themselves adequately prepared for professional Business English communication (Tarnopolsky, Kozhushko & Zhevaga, 2006). Besides, it was found out that immersion through simulation of profession-oriented activities had had a great positive *emotional* impact both on the students and the teachers from the experimental groups. Nothing like such impact could be observed in the control groups (Tarnopolsky, Kozhushko & Zhevaga, 2006a). Therefore, it can be safely asserted that in classes of English immersion through simulation of profession-oriented activities demonstrated its overall advantage in all aspects over more traditional approaches when teaching Business English to university students of Business and Economics.

The second point that should be emphasized is a theoretical one. Immersion through simulation of profession-oriented activities can be considered as one of several ways of implementing a broader concept of second/foreign language learning – that of *experiential learning*, or learning by doing, when students implicitly learn their

target language by way of explicitly doing something else, but doing it in the target language. This general approach ensures direct links between language learning and genuine life-size communication in that language (in our case, professional communication), thereby accelerating and improving the development of relevant communication skills.

If considered from the point of view of its influence on language and communication skills acquisition, the principal type of immersion – that of learning professional subjects in English – belongs to the same category. It is also experiential learning of Business English for students and the following two parts of the article discuss how to make it feasible in Ukrainian universities at the departments specializing in Business and Economics studies.

### **Immersion through Learning Professional Subjects in English: The First Variety**

This variety of immersion through learning professional subjects in English was developed by my doctoral student Zoya Korneva (2004) for the third year students of the Department of Management and Marketing at the National Technical University of Ukraine “Kyiv Polytechnic Institute.” The variety was designed for those students who in their third year of studies at the university reached only the intermediate (not advanced) level of Business English. It is a typical situation for many Ukrainian universities since a number of students there majoring in Business and Economics do not enjoy equal opportunities for Business English studies in comparison with the students of Dnipropetrovsk University of Economics and Law discussed above (they have less classes on Business English, do not pass through the process of acquiring it via simulation of profession-oriented activities, etc.). Just for such “weaker” categories of students this variety of immersion through learning professional subjects in English was elaborated.

The approach was based on the so-called *sheltered immersion* (Freeman, 2000) that allows, among other things, to use students’ mother tongue in the process of teaching the academic subject in the target language. Sheltered immersion is used when the mother tongue can considerably facilitate learning eliminating those language difficulties that otherwise could become insurmountable obstacles to learners’ adequate comprehension of the subject matter of an academic course. Sheltered immersion is different from partial immersion (Grant, Meeler & Misak, 2003), also allowing for the use of learners’ mother tongue. But in partial immersion this use is limited to the initial stage of teaching an academic subject in

the target language. Later, the mother tongue is “pushed out” and totally replaced with the target language (the so-called *pull-out classes*).

In the sheltered immersion model developed by Korneva (2004), the professional subject to be taught by means of immersion was “Management of International Economic Activities.” Following the model developed, students listened to the lectures in the course delivered in their mother tongue (Ukrainian). But at the end of every lecture its content was summarized in English and students received handouts with glossaries of the principal English terms for the basic professional notions discussed in the lecture. Practical classes/seminars in the course were held mostly in English, and students were required to prepare and write their final course papers in English, too.

In the experimental study carried out by Korneva (2003, 2004) the learning outcomes of the students from the experimental groups (after one-semester-long sheltered immersion course) were compared to those outcomes that were achieved by students from two kinds of control groups. They were learning the same professional subject in two different ways. In the first kind of control groups students had their course on “Management of International Economic Activities” in their mother tongue only. In the other kind of control groups students were studying their course on “Management of International Economic Activities” by way of partial immersion (see above). It means that their mother tongue was allowed to be used at the initial stages of the course and was later replaced by “English only” teaching and learning.

The study (Korneva, 2003, 2004) demonstrated that, though the experimental and control groups had been equalized in all aspects (including the students’ command of English) at the beginning of the study, after one semester the advantages of experimental groups in what concerns the successful learning outcomes became indubitable. First of all, it concerned the development of Business English communication skills. There was nothing surprising in the advantage of experimental groups in that respect over those control groups where there was no immersion at all (the former had a great amount of communication practice in English which the latter had lacked). But the students from the experimental groups had the same kind of advantage over the students from those control groups where partial immersion had been introduced. Partial immersion proved to be too difficult for the students, which impeded their progress in the development of English communication skills.

The advantage of the experimental groups also was manifested in the aspect of mastering the subject taught and its content matter. The students from those groups performed considerably better at the end-of-the-term examination in "Management of International Economic Activities." The reason was that, in comparison with the control groups where there was no immersion, the students from the experimental groups had worked with a lot of additional professional materials in English in their course on the subject. The control groups that were studying in the conditions of partial immersion had the same opportunities but, as it has already been said, the language difficulties were too great for them. Obviously, those difficulties impeded not only their language progress but also were an obstacle to efficient mastery of the course subject matter, which negatively influenced the students' performance at the end-of-the-term examination.

Therefore, the study carried out by Korneva (2003, 2004) proved that immersion through learning professional subjects in English was quite a feasible proposition for students of Ukrainian universities majoring in Business and Economics. If such students were below the advanced level in their English, they needed sheltered immersion only because even partial immersion was too difficult for them. It means that there is a need for different immersion programs for students of Ukrainian universities depending on their level of English. There also must be a place for immersion of a higher degree of sophistication designed for students who are more advanced in their English. This will be discussed in the next part of the article.

### **Immersion through Learning Professional Subjects in English: The Second Variety**

This variety of immersion through learning professional subjects in English is of the highest degree of sophistication and difficulty. It may be called *immersion proper* because in such a case total immersion is introduced when an academic subject is taught in the target language only without any recourse to students' mother tongue and without any specific focusing of students' attention on target language forms used in the process of teaching (see Grant, Meeler & Misak, 2003). The principal difference from the total immersion used in the second variety of immersion through simulation of profession-oriented activities (mini-courses on professional subjects) is due to the fact that teaching is done not in classes of English but in regular classes in an academic course on a particular professional discipline. So there is not (and cannot be)

any “language sheltering” for students, which considerably increases the difficulty for them.

This difficulty makes it expedient to introduce such a variety of immersion only when students achieve the advanced level in their command of English in general and Business English in particular. The other expediency seems to be the introduction of immersion programs of this kind at the end of the third or from the fourth years of learners’ studies at the university and only after they have experienced in their university course of English both consecutive varieties of immersion through simulation of profession-oriented activities (see before). In that case, total immersion in classes on professional subjects will not come as a kind of shock to the students but as something that they have already more or less got used to (thanks to preceding professional mini-courses in classes of English) and are well-prepared for (thanks to preceding simulations in English of different kinds of professional activities, including professional learning activities).

Just this approach was followed at Dnipropetrovsk University of Economics and Law in the 2006/2007 academic year when developing and introducing into practice English immersion courses on economic disciplines for third and fourth year students of the Department of Economics and Business Management. The relevant study is still in progress, so that it is too early to discuss the final results but the preliminary data demonstrates a high success of the approach both in promoting the students’ command of English for professional communication and in their mastering the professional subjects being taught not in their mother tongue but in the target language. Therefore, it can be safely concluded that the implementation of even the most sophisticated variety of immersion is quite feasible for Ukrainian universities under the conditions discussed above.

## **Conclusion**

The general considerations and practical findings reported in this article demonstrate that immersion programs are efficient and may be introduced in Ukrainian universities for students majoring in Business and Economics. But these universities need both types of such programs and all the four varieties of them to be used depending on the specific conditions in each of those universities.

The best and most effective solution would be the consecutive introduction of three varieties of immersion programs:

1. Immersion through simulation of profession-oriented activities – the first variety: Continuous simulation of professional activities in students' classes of English for professional purposes at the beginner and intermediate levels.
2. Immersion through simulation of profession-oriented activities – the second variety: Mini-courses in English on professional subjects in students' classes of English for professional purposes at the advanced level.
3. Immersion through learning professional subjects in English – the second variety: Total immersion when an academic subject is taught in the target language only in regular university classes on that professional subject for third and fourth year students.

Even if such a consecutive introduction of different immersion approaches is impossible due to some objective reasons (see before), there is an option of introducing the first variety of immersion through learning professional subjects in English – the sheltered immersion.

It may be said that the division of immersion programs for universities suggested in this article – two basic types of such programs with each type divided into two varieties – ensures greater manoeuvrability and flexibility for universities in choosing the type or types of programs to better suit their particular needs and conditions.

It should also be noted that the findings discussed in this article should not be considered as applicable to Ukraine only. They are applicable to universities of all non-English-speaking countries where English is not used as a basic language of communication but where there is an interest in developing and introducing English immersion programs into the process of teaching/learning professional subjects included in the curricula.

These findings also may be of interest to those universities in English-speaking countries that collaborate with universities-partners in non-English-speaking countries and organize teaching some professional courses at those universities-partners.

The article did not touch upon a fundamental issue – that of preparing teachers to teach in immersion programs. This is a very difficult question because those teachers should be native (or at least quite fluent) speakers of English and at the same time specialists in some particular professional field in which they teach academic subjects in English to their students. In our studies this problem was solved naturally because all our teachers engaged in

teaching in the immersion programs had dual tertiary education – that with English as their major and also a degree in Economics. Regretfully, such a solution is not always practically feasible. But this is a subject matter to be discussed in another article.

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# **The Benefits of an Accelerated Learning Format in Teacher Education Programs**

Jan Richards

## **Abstract**

Because our student population is increasing, 50,000 additional teachers will be needed in the United States within the next 10 years. Overcrowded teacher education programs in traditional universities cannot guarantee the availability of necessary classes, however, and students desiring a teaching credential anticipate an extended time frame for credential completion. There is growing interest in the benefits of accelerated programs to meet this critical need. Researchers have found that outcomes from such compressed courses equal (or surpass) outcomes from traditional course formats. National University employs such an accelerated format and has been highly successful in training future teachers for California classrooms.

## **Key Words**

Teacher education, accelerated learning, compressed learning, program format

## **Introduction**

Teacher retention is a critical issue in education worldwide. As baby boomers retire, our U.S. school enrollment is projected to increase by one million children in the next 10 years, and 50,000 additional teachers will be needed to fill the gap (U.S. Department of Education, 1999). Because teacher education programs in traditional universities cannot guarantee the availability of necessary classes, students desiring a teaching credential experience frustration, anticipating a longer time frame for credential completion and entrance into the classroom. As a consequence, there has been growing interest in the benefits of accelerated programs to meet this need, and nontraditional students (adult learners) are entering them in large numbers (Wlodkowski & Kasworm, 2003).

These non-traditional learners are very practical. They have limited time for study and need more flexibility and convenience than do traditional students. More than 250 U.S. colleges and universities currently offer such accelerated programs, and it is projected that 25 percent or more of all adult students will be enrolled in accelerated programs within the next 10 years

(National Center for Educational Statistics, 2001). Accelerated learning is being looked at worldwide as a possible vehicle for educating more of the population in less time.

## **What Are Accelerated Courses and Programs?**

These programs are structured to take less time than conventional programs to attain a degree or credential. Accelerated courses are often taught sequentially (one at a time) rather than in the traditional parallel fashion in which several classes are taken at once. Rather than splitting one's focus between several subjects for one semester, the student focuses on one subject at a time with deeper concentration

Most traditional universities use a parallel style format, while universities that have accelerated programs such as National University use a sequential model for all programs. Greiner, Serdyukov, Tatum, Subbotin, and Serdyukova (2005) would contend that such a sequential model meets the needs of adult learners better than the traditional parallel model since it seems to reduce the number of distractions in students' lives so that they can give more focused attention to one subject. Students have shared that this "one class at a time" format allows them to focus all their attention and energy on one subject and that the learning tends to be deeper.

Accelerated learning formats require the same number of class hours as a conventional format, but these hours are compressed into fewer weeks. Accelerated courses have five common characteristics: "short duration, more frequent and lengthier lessons, compressed learning information, efficient activities, and intense learning processes" (Serdyukov & Serdyukova, 2004). Evidence suggests that such accelerated learning programs are very effective with nontraditional learners, operate at lower costs, and have outcomes that are comparable (and often superior) to traditional university formats (Wlodkowski & Kasworm, 2003).

## **Who Are These Students?**

"The typical adult student in an accelerated program is a thirty-six-year-old white woman who is married, working full time outside the home, and with more than fifteen years of work experience" (Wlodkowski, Mauldin, and Gahn, 2001; Wlodkowski and Westover, 1999). They have limited time for study and need more flexibility and convenience than do traditional students (Wlodkowski, 2003). Most nontraditional students work more than 20 hours a week and have families. They cannot do college living in a dorm! Adult

learners “tend to prefer single-concept, single-theory courses that focus heavily on the application of the concept to relevant problems” (Zemke & Zemke, 1981, p. 609). They are very efficiency-minded asking, “What is the cheapest, easiest, fastest way to learn to do that?”

## **Why Do Students Choose Accelerated Classes/Programs? What Are the Benefits?**

Time is the first important reason students choose an accelerated format. Convenience of learning is another. These are working adults who value a program that can be finished in a shorter time. They are older than traditional college students and are trying to balance their work life, home life, and school. Time is precious for these adult learners and a shorter, compressed schedule of courses is appealing. In addition, classes are scheduled far ahead so that students see each month’s course completion as a step toward their goal. According to Serdyukov, et al. (2005), the benefits of accelerated learning are as follows: they

- Enhance students’ learning and development by keeping them focused on the given subject matter and learning;
- Allow students to achieve their goals faster through condensed short-duration courses;
- Allow compression of the overall time of instructional time while increasing productivity of learning providing comparable or superior outcomes;
- Offer a flexible accommodation to the needs and conditions of working adults making learning more convenient;
- Increase accessibility, flexibility, and convenience of learning raises the quality of education, and generally boosts students’ satisfaction.

## **What Are the Criticisms of Accelerated Learning Formats? Why is Compressed Learning Controversial?**

Such compression of classes is thought by some to lead to weaker learning outcomes and that the crammed curriculum does not allow adequate time for reflection and deep learning. Critics propose that the *quality* of learning is a function of *hours* in the classroom. The longer the class, the more content will be covered. In a comprehensive review of 100 articles, however, Scott & Conrad (1991) concluded that outcomes from compressed courses equal (and sometimes surpass) outcomes from traditional course formats. In comparative courses such as law, computer science, and business administration, the outcomes showed either no significant difference

between traditional formats and compressed formats or that outcomes of compressed learning were stronger. The researchers added that “students were often motivated, excited, and inspired by intensive course experiences and that concentrated learning generated a level of satisfaction unlike that experienced in traditional-length courses” (p. 444).

In the Seamon study (2004), for example, psychology classes were compared — one a semester-long class and one an intensive format:

Students in the intensive version of the course performed significantly better than students in the semester-length course on posttests of content and questions tapping higher-order learning. The two groups did not differ significantly in their affinity for learning..., age or GPA, suggesting the superior performance was the result of the intensive course format and not any pre-existing student characteristics. (p.1, abstract)

When psychology teachers were surveyed on student preference between intensive formats or semester-length courses, they overwhelmingly rated the accelerated classes as more satisfying.

## **Quality of Accelerated Learning Courses and Accelerated Programs**

Wlodkowski (2003) addresses some of the measures of quality in higher education that have been applied to accelerated learning programs: (1) accreditation, (2) learning, (3) student attitudes, and (4) alumni attitudes.

### **Accreditation**

Regional accrediting bodies such as the Western Association of Schools and Colleges (WASC) are a public indication that a college or university has met acceptable academic standards and has the resources to provide a satisfactory higher education experience. Departments within a school (such as the School of Education) have their own accrediting bodies as well. In California, for example, teacher education programs are evaluated by the California Credentialing of Teacher Education (CCTC). National University is approved by WASC and the credential program is in good standing with CCTC.

## **Learning**

Although there remains the strong notion that learning is less effective when presented in less than the traditional amount of time, results of research do not bear that out. Conversely, researchers found that time studying did not necessarily bring more learning. When recent researchers compared the performance of younger (traditional) students with that of older students taking the same course in an accelerated format, the results indicated no difference in the levels of learning (Wlodkowski and Westover, 1999; Wlodkowski, Iturralde-Albert, and Mauldin, 2000). They found that the average performance of the older student was in fact higher than the average performance of younger students in traditional courses. Consistently, the outcomes showed either no statistically significant difference or that compressed classes were stronger.

In assessing the quality of learning, Swenson (2003) asks two important questions: "At the end of an independent lesson...courses, or program, 'do learners know they should know? Can they do what they should be able to do?'. . . There should be no differences in expectation regarding quality practices or outcomes." Learning should become the purpose of education and "formats are judged by how much learning takes place" (p. 86).

## **Student Attitudes**

Like students in traditional programs, adults in accelerated classes evaluate their learning experience as positive (Scott and Conrad, 1992). Kasworm (2001) found that in accelerated programs, students perceived their experience to be "a supportive world defined for adult learners" (p. 2) compared with their previous experience in traditional colleges during their younger days. The students perceived that the program offered them a world of structure: the program was predictable, the courses were taken one at a time, and there was a foreseeable timeline to completion. "The accelerated degree program was seen as locking them into a learning process that held them in place and that pushed them to completion" (Kasworm, 2001, p. 8).

Learning one subject at a time was an important asset of an accelerated learning experience so there was no focus overload of learned information. . . . These students valued their fellow adult learners as key personal supporters to help them learn and cope with the complexities of their lives. They became a quasi-family of caring and supportive adults faced with adult life demands. (Kasworm, 2001, p. 7)

## **Alumni Attitudes**

Because alumni have acquired experience in the workplace after completing their program in accelerated classes, their perceptions of the value of their education are valuable. Similar to the Wlodkowski and Westover (1999) study, the results of a 2005 alumni survey of satisfaction at National University (NU) indicated that graduates were very satisfied with the quality of their education. An overwhelming majority of alumni indicated that their career success is greater as a result of their National University degree and that they would recommend this program (Alumni Feature Assessment, 2005). When asked what convinced them to enroll at National University, the top three responses were (1) accelerated one month format; (2) evening course schedules; and (3) convenient/numerous learning centers.

In a university where all courses are taken in a one-course/one-month format, these alumni results indicate that students in all schools and departments, in undergraduate and graduate levels (1) were very satisfied with the format and accessibility of classes; (2) believed their education was relevant to their chosen work; and (3) viewed the academic rigor as strong.

## **Teacher Education Program**

National University “recommends more teachers for credentialing than any other single institution in California” (Factbook, 2006). The School of Education is by far the largest at National University, and the credential program is a thriving part of it. Graduates of the National University Credential program are asked to participate in an exit survey at the completion of the program that measures the quality of instruction and the relevance of classes to their experience in the classroom. Like other programs, these classes are presented in an accelerated format: one-class/one-month both online and on ground. Classes meet two evenings a week for 4 ½ hours as well as the final Saturday of the month for a total of nine classes or 45 contact hours. This “situated learning” has a practical focus that is tied to real classroom activities, observations, videos of classroom performance, etc. The Methodology courses use practical, hands-on learning experiences and demonstrations, the study of teaching strategies, and lesson plan development.

In the Teacher Education Exit Survey (2004), participants were asked to (1) rate the quality of instruction and faculty in their program; (2) rate the degree the credential program enhanced their ability to manage behavior of students and to teach students from diverse ethnic backgrounds; and (3) rate the value of each class to the development of their teaching ability. Similar to the results of the alumni survey, 83.4% of students completing

the Credential Program Exit Survey rated the quality of teaching as “very good-exceptional;” 76% of the participants rated the credential program as enhancing their ability to manage student behavior as good to exceptional (this question connects with the real daily life experience of a teacher); 90% rated the preparation to teach students from diverse ethnic backgrounds very good-exceptional; and 80% rated the entire program as good to exceptional. Student satisfaction and academic performance reported in the Teacher Education Exit Survey mirror the results and conclusions put forth in all studies of accelerated learning programs and courses described in this paper.

## **Conclusion**

The critical need to train more teachers for the classrooms of the 21<sup>st</sup> century is without dispute. Student populations are increasing worldwide, Baby Boomer teachers are approaching retirement, and teacher retention rates remain unsatisfactory. The benefits of an accelerated learning program in which students with bachelor’s degrees can complete all class work and required state tests of competence and be ready to enter the fieldwork segment of their program in *one year* needs serious consideration. If we can prepare our future teachers well in a shorter period of time and can demonstrate that these students are getting a strong education, one that readies them for today’s classroom challenges, more universities worldwide would do well to consider adding this compressed format to their traditional offerings. Both students and instructors appreciate the convenience, the shorter time frame, and the real-world emphasis accelerated programs afford. Perhaps it is time that more universities take a second look at their options in order to serve their students more fully.

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# Algorithms and Fundamental Concepts of Calculus

Igor Ya. Subbotin and N. N. Bilotskii

## Abstract

An elementary function is one of the foundational notions of Precalculus and Calculus courses. However, many Calculus textbooks do not provide students with a clear definition of the elementary function or simply avoid it completely. Many other books are saturated with errors connected with this. In the present article, the authors discuss their approach consisting of introducing the notion of an elementary function via linear algorithms. Our experience in teaching at National University, California, USA, Kiev National University of Technology (KPI), and Kiev National Pedagogic University confirms the effectiveness of this approach.

## Key Words

Elementary functions, algorithms.

## Introduction

Mathematics is the art and science of solving problems based on logic. The main expected product of a mathematical research is an algorithm. According to Wertheimer (1959), while solving a problem the student is supposed to be able to develop the overall structure:

A certain region in the field becomes crucial, is focused; but it does not become isolated. A new, deeper structural view of the situation develops, involving changes in functional meaning, the grouping, etc. of the items. Directed by what is required by the structure of a situation for a crucial region, one is led to a reasonable prediction, which like the other parts of the structure, calls for verification, direct or indirect. Two directions are involved: getting a whole consistent picture, and seeing what the structure of the whole requires for the parts. (212)

This process is supposed to be supplemented with an algorithm consisting from the main passes toward the final solution. A clear and logically completed algorithmic block scheme is a great visual support

for instruction. There is a well-established tradition to use these schemes not only to illustrate solutions or proofs, but mainly to reflect graphically some sophisticated concepts (Triola, 2004, 272). Other good examples are proves of the theorems written in the traditional form in many Geometry textbooks (see, for example, Alexander and Koeberlein, 1999, 104). More specific information regarding algorithms in the secondary school mathematics can be found in the collection of works NCTM (1998).

According to Google, there are dozens of different explanations (mistakenly called definitions in some broader, rough, and non-mathematical meaning) of the concept of algorithm. We selected here some examples, each of which is interesting in some specific sense.

1. "An explicit step-by-step procedure for producing a solution to a given problem" ([www.racteam.com/LANLRisk/Glossary.htm](http://www.racteam.com/LANLRisk/Glossary.htm)).
2. "An algorithm is a procedure or formula for solving problems" ([www.stallion.com.au/html/support/glossary.html](http://www.stallion.com.au/html/support/glossary.html)).
3. "An algorithm is a mathematical function that is used to encrypt and decrypt information" ([www.pki.vt.edu/help/glossary.html](http://www.pki.vt.edu/help/glossary.html)).
4. "A finite set of well-defined rules for the solution of a problem in a finite number of steps" ([www.sabc.co.za/manual/ibm/9agloss.htm](http://www.sabc.co.za/manual/ibm/9agloss.htm)).

The first statement is the best possible, general illumination of the notion of algorithm in a common sense meaning. The second quote underlines the equivalence between an algorithm and a formula. This is a very thoughtful idea. Understanding of the language of formulas is the effective shield against math phobia. Formulas are just short-coded notations of algorithms. The third definition is very far from the reality and, in general, is wrong. It demonstrates the unfamiliarity with such a main mathematical concept as the function is. However, it uses the word function, which is one of the key words for the current article. The last one operates with the imperative concept of finite number of steps. Actually there are many algorithms in mathematics that use infinite numbers of steps. Even the algorithm for a long division of 1 by 3 is infinite. Perhaps, the authors of this "definition" mean that the algorithm consists from a finite number of rules and directions. Finite algorithms play a central role in our consideration. More useful and precise information about the algorithm can be found in <http://en.wikipedia.org/wiki/Algorithm>.

In Mingus (1998), the following, more suitable description of the general notion of algorithm is given:

An algorithm is a computational recipe for the systematic execution of a procedure designed to solve a specific problem that maintains the following characteristics:

1. Input data along with a finite set of instructions are given.
2. A computing agent reacts to the input and instructions and carries out the steps.
3. Intermediate results are stored and used.
4. The computation is carried out in a discrete, stepwise fashion.
5. The computing agent interprets the set of instructions in such a way that computation is carried out deterministically, without resort to random methods. (34)

First, we recall that the concept of algorithm is intuitive. In general, we can describe it as “an explicit step-by-step procedure for producing a solution to a given problem”

([www.racteam.com/LANLRisk/Glossary.htm](http://www.racteam.com/LANLRisk/Glossary.htm)). In Malcev (1980), the notion of algorithm is defined using the following restrictions:

1. *The Discreteness of an Algorithm*: an algorithm is a process of the sequential constructing of a value in a discrete time such that the main initial system of values is given at the beginning; at each following moment the system of values is derived by the given rule (program) from the system of values presented at a preceding moment.

2. *The Determination of an Algorithm*: the system of values at a present (non-initial) moment is uniquely determined by the system of values at a preceding moment of time.

3. *The Elementary Character of an Algorithm Stages*: the rule (program), by which at every moment a system of values is derived from the system of values presented at a preceding moment must be simple and local.

4. *The Directedness of an Algorithm*: if the way of determining of some value from a preceding value cannot be realized, then in this case the clear direction defining the result of the algorithm needs to be given.

5. *The Array Property of an Algorithm*: the initial system of values might be chosen from a potentially infinite set.

It is well known that the algorithms are equivalent to the enumerative functions. By the famous Church's thesis (Maltsev, 1980) the class of the latter coincides with the class of recursive functions. So, the notions of an algorithm and a recursive function are equivalent. This idea is a very constructive power tool allowing us to justify the existence and, more importantly, inexistence of any possible algorithmic process. We need to admit that behind any mathematical concept there is an algorithm realizing computations or proofs. We will apply the concept of algorithm for clarification of some very basic ideas of Calculus course.

All key concepts of Calculus deal with elementary functions, such as polynomials, rational functions, exponential functions, logarithmic functions, trigonometric and inverse trigonometric functions, and so on. Well-known examples of non-elementary functions are the Dirichlet function ( $f(x) = 0$  for all rational numbers  $x$ ; and  $f(x) = 1$  for all irrational  $x$ ); the function  $f(x) = [x]$  (the whole part of a number),  $f(x) = \int \frac{e^x}{x} dx$ ,  $f(x) = \int \sin(x^2) dx$ ; and others. We cannot expect clear understanding of central Calculus theorems such as theorems of continuity, differentiability, and integrability, without detailed comprehension of the notion of elementary functions. Actually, one can say that the traditional Calculus course in general is the mathematical analysis of elementary functions. At the same time, there is a strange paradox: some Calculus textbooks do not contain even the term "elementary functions" (Smith, 1996; Fincy, 2001; Barnett, 1996); other popular textbooks and dictionaries just substitute the definition of an elementary function with some approximate narrative descriptions, or just assume that this notion is intuitively known (Borowski, 1991; Thomas, 2000; Jonston, 2001). One also cannot find a reasonable consistency in the textbooks, in trying to get a more or less rigorous definition of the elementary functions. Here is an example of a relatively good definition of the elementary function extracted from the popular Calculus textbook Larson (1994):

*An elementary function is one that can be formed as sum, product, or composition of functions from the following list: polynomial functions, rational functions, functions involving radicals, logarithmic functions, exponential functions, trigonometric functions, inverse trigonometric functions.*

Notice that there is no keyword “finite” in this definition. Also, the list of basic elementary functions, from which one can obtain all others, is questionable.

Similar definitions from different books are dealing with distinct sets of basic elementary functions and operations.

Before the appearance of the article Pugachov (1964), many textbooks and dictionaries (see, for example, the very popular dictionary Bronshtein, 1984) defined an elementary function as a function that can be expressed with a single formula. In Pugachov (1964), the author analyzed such an approach and constructed some counterexamples to such kinds of definitions. However, the definition offered in Pugachov (1964) is also far from being perfect. For instance, there are no constants in the list of basic elementary functions, which implies, in particular, that  $y = e$  is not an elementary function.

Perhaps one of the best possible definitions of the elementary function useful for the beginner can be found in Schkil (1994).

The following functions are the basic elementary functions:

1. The power function  $y = x^a$  ( $a$  is a real number);
2. The exponential function  $y = a^x$  ( $a > 0, a \neq 1$ )
3. The logarithm function  $y = \log_a x$  ( $x > 0, a > 0, a \neq 1$ );
4. The trigonometric function  $y = \sin x$ ;
5. The inverse trigonometric functions  $y = \arcsin x, y = \arctan x$ ;
6. The constant function  $y = C$ .

All other elementary functions could be generated from the list above by:

- 1) Applying the arithmetic operations of addition, subtraction, multiplication, and division to the basic elementary functions and numbers, and
- 2) Using composition of some basic elementary functions, or, in other words, constructing a composite function.

**Definition 1** (Schkil, 1994): *A function that could be formed as an analytic expression using some basic elementary functions listed above with the help of the finite amount of operations of addition, subtraction, multiplications, division, and function composition on the*

*basic elementary functions and numbers, is called an elementary function.*

However, according to Vilenkin (1978), the list of the basic elementary functions can be reduced to the following:

$$y = x, y = \frac{1}{x} (x \neq 0), y = e^x, y = \ln x (x > 0), y = \sin x, y = \arcsin x \left(-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}\right).$$

Let us briefly explain this choice. The main ideas of the classification in Vilenkin (1978) are that the class of functions from the general Calculus could be described by the following: select some main functions from this class and define the operations to be applied to these functions in order to get a function from this class (the closure property). Based on this concept, the authors proved that the above-mentioned set of basic elementary functions is sufficient for the Calculus needs. Another interesting and central question is: why do we choose the set of basic functions listed above? In Vilenkin (1978), the authors observe that the multiplicative group  $R_x$  of the field  $R$  of all real numbers is a direct sum of the group  $D$  of order two and the multiplicative group  $R_+$  of all positive real numbers. The group  $D$  defines the sign of a number and the group  $R_+$  its absolute value. One of the remarkable mathematical facts is that the groups  $R_+$  and  $Q$  (the additive group of the field  $R$ ) are isomorphic. This way we justify the existence of the functions  $y = e^x, y = \ln x (x > 0)$  from the list above. The justification for trigonometric functions is coming from the definition of the exponential function of a complex variable. It is interesting to note that this approach is also based on the homomorphism of the additive group of real numbers on the group  $T = \{e^{iy} \mid y \in R\}$ , or on the multiplicative group of all complex numbers with the module is 1. The function  $y = \arcsin x$  is included in the list as the inverse function for  $y = \sin x$ .

Using Definition 1, one can easily prove that all rational functions (including polynomials), all power functions with any real exponent, trigonometric and inverse trigonometric functions are elementary. The operations of addition and multiplication, and inverse operations of subtraction and division are chosen here as the main operations of a numerical field. The principle of selecting the above functions as the basic elementary functions can be rigorously justified using Group Theory methods. This approach definitely cannot be used for introducing elementary functions to beginners since it is based on some deep ideas of Abstract Algebra.



This construction does not allow us to find a value of  $y$  by using a linear algorithm; however, by using some auxiliary functions, it is possible to define (1) and (2) with a single formula. Let:

$$u_1(x) = \frac{1}{2} \left( 1 - \frac{|x - a_1|}{x - a_1} \right), \quad u_n(x) = \frac{1}{2} \left( 1 - \frac{|x - a_{n-1}|}{x - a_{n-1}} \right),$$

$$u_k(x) = \frac{1}{4} \left( 1 + \frac{|x - a_{k-1}|}{x - a_{k-1}} \right) \left( 1 + \frac{|x - a_k|}{x - a_k} \right), \quad k = 2, 3, \dots, n-1$$

It is easy to see that (1) could be represented by the following single formula:

$$y(x) = u_1(x)f_1(x) + u_2(x)f_2(x) + \dots + u_n(x)f_n(x).$$

Similarly for (2) we introduce the functions

$$v_1(x) = \frac{x + a_1 - |x - a_1|}{2}, \quad v_n(x) = \frac{x + a_{n-1} + |x - a_{n-1}|}{2},$$

$$v_k(x) = \frac{x + a_{k-1} + |x - a_{k-1}|}{2} - \frac{x - a_k + |x - a_k|}{2}, \quad k = 2, 3, \dots, n-1.$$

Now the function (2) can be written as the following single expression:

$$y(x) = \varphi_1(v_1(x)) + \varphi_2(v_2(x)) + \dots + \varphi_n(v_n(x)) - \varphi_1(a_1) - \varphi_2(a_2) - \dots - \varphi_{n-1}(a_{n-1}).$$

So, since the functions (1) and (2) have been given by single formulas (i.e. by linear algorithms) on each interval from the given finite set of intervals, we were able to find a single linear algorithm defining each of these functions (1) and (2) on their domains.

We were able to extend this approach on the case of infinite amount of intervals.

**Definition 3:** A function  $f(x)$  defined on  $D(f)$  is called locally elementary in  $D(f)$  if for any point  $x_0 \in D(f)$  there exists a  $\delta$ -neighborhood  $O(x_0, \delta) \subset D(f)$  of  $x_0$  such that there is a function  $\varphi(x)$  given by a single formula for which  $\varphi(x_\delta) = f(x_\delta)$  for all  $x_\delta \in O(x_0, \delta)$ .

For a locally elementary function  $f$ , its domain  $D(f)$  is an open set. In connection with this, observe that not every elementary function is a

locally elementary function. For example, the function  $y = \arcsin x$ , where  $D(y) = [-\pi/2, \pi/2]$  is an elementary function, but not is a locally elementary function in its domain. Moreover, there are some non-elementary functions, which are locally elementary in their domains. To prove this we will consider the following function given on  $(0, 1)$ :

$$(3) \quad y = \left( \begin{array}{l} x^2, 0 < x \leq \frac{1}{2}; \\ 2x^3, \frac{1}{2} \leq x \leq \frac{2}{3}; \\ \dots\dots\dots \\ nx^{n+1}, \frac{n-1}{n} \leq x \leq \frac{n}{n+1}; \\ \dots\dots\dots \end{array} \right)$$

It is obvious that the function  $y(x)$  is a locally elementary in  $D(y) = (0, 1)$ . On the other hand, in order to define all values for this function one should compute the values of  $y = x^n$  for every  $n \in \mathbb{N}$ , which means that the process of calculation is not linear. Notice that the function is continuous on  $(0, 1)$ . The following statement is true.

**Proposition 1:** *If a function  $f$  is locally elementary in the domain  $D(f)$ , then it is elementary on any  $[a, b] \subset D(f)$  where  $a < b$ .*

Indeed, since  $f$  is a locally elementary, at every point of the domain  $D(f)$  there is a neighborhood containing this point on which  $f(x)$  is defined by a single formula. The segment  $[a, b] \subset D(f)$  is covered by such intervals-neighborhoods. If the set of these interval is infinite, then by the well-known Borel's lemma there exist a finite subset of this set also covering  $[a, b]$ . This implies that the function  $f(x)$  can be represented with a single formula on  $[a, b]$ .

The following definition naturally generalizes both notions of elementary and locally elementary functions.

**Definition 4:** *A function  $f(x)$  is called locally elementary on its domain  $D(f)$  if for an arbitrary  $x_0 \in D(f)$  there exists a  $\delta$ -neighborhood  $O(x_0, \delta) \subset R$  of the point  $x_0$  such that there is a function  $\varphi(x)$  given by a single formula for which  $\varphi(x_\delta) = f(x_\delta)$  for all  $x_\delta \in D(f) \cap O(x_0, \delta)$ .*

It is not difficult to show that every basic elementary function from the list above is locally elementary on the corresponding domains. Moreover, every elementary function is also locally elementary function on its domain. In fact, if  $O(x_0, \delta)$  is a  $\delta$ -neighborhood of a point  $x_0 \in D(f)$ , then all conditions of Definition 3 are valid. Hence  $O(x_0, \delta) \subset \mathbb{R}$ ,  $D(f) \cap O(x_0, \delta) = O(x_0, \delta)$  and all conditions of Definition 4 are also satisfied. However, Definitions 3 and 4 are not equivalent. Class of functions that elementary on their domains does not coincide with the class of locally elementary in their domains functions. In particular, a function can be an elementary function, but not a locally elementary in its domain.

**Proposition 2:** (1) Any elementary function and any locally elementary in  $D(f)$  function is locally elementary on  $D(f)$ ; (2) Class of locally elementary on its domain functions includes as proper subclasses the class of all elementary functions and the class of all locally elementary in the corresponding domains functions; (3) The classes of elementary functions and locally elementary in their domains functions do not contain each other. They overlap on their proper parts.

It is well known that a finite set of arithmetic operations on continuous functions leads us to a continuous function. Since every basic elementary function is continuous in its domain, it follows that every elementary function is continuous in its domain. The same arguments prove the following:

**Proposition 3:** (1) A locally elementary in its domain function is continuous at every interior point of its domain; (2) A locally elementary on its domain function is continuous at every point of its domain (taking in account the one-sided continuity at the limit points).

Due to the stated above, the function (3) is continuous on  $(0, 1)$ . It is interesting to admit that this function has an antiderivative  $Y(x)$  on  $(0, 1)$  defined as the following:

$$(4) \quad Y = \left( \begin{array}{c} \frac{x^3}{3} + C_1, 0 < x \leq \frac{1}{2}; \\ \frac{2x^4}{4} + C_2, \frac{1}{2} \leq x \leq \frac{2}{3}; \\ \dots\dots\dots \\ \frac{nx^{n+2}}{n+2} + C_n, \frac{n-1}{n} \leq x \leq \frac{n}{n+1}; \\ \dots\dots\dots \end{array} \right),$$

$$C_{n+1} = C_n + \frac{n^{n+3}}{(n+1)^{n+2}(n+2)(n+3)} A_1 = a, a \in R, n \in \mathbb{N}.$$

It is clear that  $Y(x)$  is differentiable and non-elementary on  $(0, 1)$  but locally elementary on this interval.

In conclusion, we would like to point out that we developed many exercises based on the above-mentioned material. Practicing with them helps our students to master such important concepts as the concepts of elementary functions, composite functions, continuous functions, and a deeper understand the topological properties of the number line.

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# **Accelerated General Physics: Real Challenges and Possible Solutions**

Nataliya Serdyukova

## **Abstract**

Accelerated learning approaches require effective instructional methodology to ensure the necessary quality of the learning outcomes. Educational and psychological research determined there should be a sufficient number of repetitions of the same material in the learning process to provide for understanding and retention. Simple repetition, however, is insufficient; it takes several spaced cycles to achieve the desired result. An Iterative Instructional Model was developed to explain the process of effective learning based on spaced repetitions and implemented in teaching an accelerated General Physics unit. Theoretical foundations, research and practical implications of cyclic, iterative learning are presented.

## **Key Words**

General Physics, accelerated learning, cyclic learning, iteration, retention

## **Introduction**

Accelerated learning is a growing trend in today's adult higher education (Wlodkowsky, 2003). Working adults who need higher degrees, new specializations and continuous professional development are looking for accessible, flexible, customized, convenient and, especially, fast educational opportunities (Greiner et al., 2005). The major problem for adult learners is the limited time they can allocate for learning due to their hectic lifestyles and numerous job, family and other responsibilities (Serdyukov et al., 2003). Universities and colleges competing for students thus have to provide a variety of programs in new, short-term formats, including accelerated, compressed, short-term and intensive ones. Innovative instructional approaches, however, need more research into the nature of accelerated learning and, especially, in particular strategies and techniques that would help learners achieve desired learning outcomes in a short time. Without effective teaching models for serving adult

learners, colleges and universities may face educational quality and, consequently, enrollment problems. The development of new paradigms of learning is pursued with the most important goal in mind: teaching for long-term retention and transfer (Helpern & Hakel, 2004).

### **Accelerated Physics Course**

The accelerated learning model used at National University is distinguished from traditional educational systems by its 1x1 format: one-month-long course delivery in a one-course-at-a-time learning process. Compressing semester-long courses in the one-month format is a complicated task, especially when the courses, such as General Physics, require substantial knowledge base, specific learning skills and extensive cognitive and physical efforts (Serdyukova, 2005). Clearly, effective instructional design and non-conventional methodological, psychological, and organizational solutions are needed.

The General Physics course unit was first developed and introduced at National in 2003. It includes a theoretical SCI 104 and a practical SCI 104A General Physics Lab courses, which are offered sequentially, one after another. The need for Physics comes from teachers of Science and Physics, as well as from engineers for whom it is a prerequisite class. In five years, enrollment in these classes has grown from 10 to 50 students per year with a projected number of more than 100 students in the year 2007-2008 and a tendency to grow.

The challenges in teaching General Physics in an accelerated course were identified through surveying students in the years 2004-2007. They are as follows:

- Considerable temporal interval between students' taking this class and their previous learning (high school or college).
- Insufficient level of preparation in Physics and sciences in general as well as in math obtained at high school.
- Lack of specific skills, such as conceptualization, research, problem solving, and other cognitive skills required in a science class.
- Short, accelerated format of instruction that compresses all major parts of physics into a two one-month terms while attempting to develop theoretical knowledge and practical skills necessary for their further work.

The first three issues are, evidently, beyond the scope of current research and the instructor usually has to make specific adaptations in his or her instructional approach to students' entry competency level. The accelerated course format, however, needs special consideration. A compressed, accelerated course means shorter duration but also longer classes with shorter time intervals between them, which may affect retention of the new information. In view of these challenges, an accelerated General Physics two-course unit cannot be delivered in two months using traditional methodology and necessitates an innovative approach to course and learning process design, planning and organization, as well as more effective instructional strategies and techniques. The goal of these courses remains to provide learning outcomes comparable to the traditional semester-long course offered in the same 45-hour classes. This requirement of academic quality in this course could be met as there had been research confirming its feasibility based on comparing learning outcomes of Algebra courses taught in accelerated and traditional formats (Serdyukov, Subbotin & Serdyukova, 2003). It was expected this goal could be achieved in General Physics classes as well.

The learning outcomes of the General Physics unit (NU Catalog, 2007) were recognized as follows: In Physics students should be able to:

- Identify and define physical quantities.
- Demonstrate understanding of major laws of Physics.
- Apply the laws of mechanics, hydrostatics, kinetic theory of gases, heat and work, electromagnetism, oscillatory motion and waves, electricity and magnetism, and optics for explaining physical phenomena and solving problems.

In order to be able to do it, students will have to:

- Gain new knowledge and insight into everyday phenomena based on fundamental physical principles.
- Develop critical analytical skills to evaluate physical phenomena and their effects by developing clarity in definition, consistency in logic and the search for adequacy of evidence.
- Develop a clear understanding of scientific method and its application to the fundamental principles governing physical universe.
- Be able to use this knowledge and skill in solving Physics problems as they apply in real-life situations.

These outcomes have very pronounced practical accent and require effective methodological approaches. A concern regarding all accelerated programs, however, remains as to whether students really achieve the desired learning outcomes stated in the syllabi. Two critical issues in achieving quality learning outcomes are understanding and retention of knowledge, which are in fact major goals of learning.

### **Repetition, Iteration and Retention**

Instruction starts with an elementary acknowledgment of the fact that repeated practice or iteration is a universal method of learning. "Repetitio est mater studiorum," says the old Latin proverb. Often, in the stressful, hurried process of learning, there is little opportunity to revisit the learned material: students abandon those learning steps where they "performed poorly." If students could see errors, revisit concepts and correct their understanding of how to apply them, learning would be reinforced. One learning experience (exposure to knowledge) is not sufficient for full understanding and retention. It has to be reinforced and extended by re-use in identical or similar situations. Students should be offered the opportunity to master content and develop skills through repeated iteration (Komerath, 2001).

According to Schoenfeld, Smith and Arcavi (1993), and Aiala et al. (2004), the growth of understanding is highly non-linear with starts and stops; the student develops partial understandings, repeatedly returns to the same piece of knowledge, and periodically summarizes and ties related ideas together. This leads to the conclusion that understanding can be reached if we accept the need for multiple iterations toward a solution (Hmelo, Holton & Kolodner, 2000). The same repetition procedure applies to retention as will be shown below.

There are several major factors regarding retention, as suggested by Robertson (1970, cited in Chang, 1998):

1. Forgetting is greatest immediately following learning; thereafter, it declines to a stable level.
2. Retention increases with repetition. However, (a) Repetition distributed over several periods leads to greater retention than repetition concentrated in a single period; (b) variation in form, style, and expression during repetition, together with repetition of main points, may result in greater retention than repetition of the identical message; (c) the greater the complexity and length of the

message, the greater the amount of repetition necessary to produce retention; and (d) the greater the interference from competing messages, the greater the amount of repetition necessary to produce retention.

3. More meaningful or more vivid material is better retained than less meaningful or less vivid material.

4. The more completely material is initially learned, the greater is retention.

5. Material presented first (primacy) or last (recency) is better retained than material presented in the middle (Robertson, 1970, cited in Chang, 1998, 28-29).

Among the many instructional strategies, repetition, or rehearsal and recall remain the primary ones that can lead to effective learning outcomes. There is ample evidence that repetition profoundly affects performance. "The 'repetition effect' – the notion that an increased number of learning trials improves later recall – has been robustly demonstrated throughout many decades of work" (Chiaravalloti et al., 2003). The amount of repetition is a primary factor involved in the learning process. "The more repetition, the greater the depth of the learning and the slower the rate of decay" (Robertson et al., 1984, cited in Chang, 1998, 204). "An opportunity to review previously presented material may affect not only the quantity of what is learned but also the quality" (Dempster, 1991, 71).

This observation is also supported by the Atkinson-Shiffrin Multi-memory model, which explains that the rehearsal loop (repetition) helps transfer information into long-term memory from the short-term memory: "rehearsal serves the purpose of increasing the strength built up upon in a long-term store both by increasing the length of stay in short-term store...and by giving coding and other strategies time to operate" (Atkinson and Shiffrin, 1968). This notion is further reiterated explaining that learning process is gradual and cumulative – the more review, the better retention (Estes, 1962). Unfortunately, due to the accelerated rate of the short-term, compressed courses, this critical methodological aspect is not always taken into account though there are definitely opportunities to increase retention through repetition. These repetitions can be introduced during the same class, in the course sections or in extended work on the two-course course unit.

Massed repetitions, however, because there is not much time between them, tend to inspire a false sense of knowing or confidence...they received relatively little [mental] attention ... Spaced repetitions, on the other hand, are likely to encourage exactly the kind of constructive

mental processes, founded on effort and concentration, that teachers hope to foster. (Dempster, 1991, 73). Research demonstrates that various intervals between the study and testing retention of the same material between 30 min. to 30 days and more yield better results (Glover & Corkill, 1987; Dempster, 1991, 72-73). Distributed practice, or spaced effect has been studied in various situations. In math instruction, its role was expressed as follows: "Long-term retention is best served if assignments on a particular skill are spread out in time rather than concentrated within a short interval" (Suidam, 1985). There has been research of repetition and space effect in mathematics instruction (Kwon, et al., 2005; Siegler, 2003), but no research in Physics has been identified.

Repetition helps engage students in active, conscious processing of material. Repetitions, especially spaced repetitions, "can foster time-on-task and help students develop and sustain positive attitudes towards school and learning" (Dempster, 1991, 75). Repetition of a central theme with some variation is generally considered superior to repetition of identical messages. This finding seems to hold across a wide variety of research. In fact, Cox and Bogart suggest that "repetition of identical messages beyond some critical point may actually lead to negative response" (Robertson, 1970, cited in Chang, 1998, 30). Learners can become so used to seeing or hearing the same information that they no longer pay attention to it. This problem, known as advertising wearout, can be alleviated by varying the way in which the material is presented (Solomon, 1992, 107-108). Presenting the same information in different formats or modalities can have a more profound effect on retention than repeating it in the same form. Improvements in learning can be achieved by proper organization of learning, effective use of time in the classroom, iterative process, distribution of time between learning events, spacing effect and multimodal learning process combining textual, oral, visual and multimedial presentation of material (Quirk, 2000).

Immediate application of the learned material in some kind of practice enhances retention. Solving problems and doing labs are examples of such applications. Repetition coupled with effective techniques, such as the generation effect (Snodgrass & Kinjo, 1998) enhances retention. The generation effect is based on students' better remembering the items they have generated rather than items they have just read and memorized explains some of the activities in the Physics class that involve students in explaining Physics concepts, in continuous problem solving and in experimentations in the lab. So, both the nature of the repeating event and the number of repetitions

determine the time course of learning (Ofen-Noy, Dudai & Karni, 2003).

It is evident, therefore, that repetition remains one of the major strategies for understanding and retaining new information. Even more important than repetition itself is the time interval between repetitions. It has been proven that better retention is achieved when there is a sufficient interval between repetitions. Frequent repetitions may provide for better understanding and retention; however, the number of repetitions should be reasonably limited due to restrictions of the planned learning process. Research warns there can be a threshold after which the number of repetitions may not have a considerable impact on the retention.

Simple repetition, however, does not adequately describe the learning process based on recall. It is a two-dimensional model that takes into account only the fact of occurrence and the number of repetitions. Iteration as a higher level concept brings the necessary clarification in this process allowing to describe the learning process in its complexity.

Iteration, according to the Harper-Collins Mathematics Dictionary, is a repeated application of a mathematics procedure, where each step is applied to the output of the preceding. Merriam-Webster's Online Dictionary gives the following definition of iteration: "the action or a process of iterating or repeating: as a procedure in which repetition of a sequence of operations yields results successively closer to a desired result." Iteration, however, is different from repetition in that it is not a mere replication of the previous procedure but a recurrence at a higher level, where at each step it adds new knowledge to the previous one. Therefore, iteration as a process presupposes a gradually expanding set of information added to each preceding cycle to increase the initial knowledge and bring learning at each cycle closer to the desired outcome. This process is essentially an approximation of the current state of the learner and learning to the desired outcomes.

In teaching and learning, iteration is a repeated procedure carried out during a particular course, topic or lesson that provides knowledge presentation, activation and application through a set of interconnected iterations or cycles. Each cycle contains a model of the whole content area approximated to a given level of knowledge. Each subsequent cycle is based on the preceding one and adds to it some details thus bringing a more extended and a deeper understanding. Learning starts with the first iteration that presents the whole topic but at first superficially, without specific details, just major concepts,

relationships, and an overall structure. Every subsequent iteration adds new details to the initial presentation thus increasing its complexity and coverage, until the topic is exhausted. The final iteration offers an overview of the topic, recapitulating its principal points and placing it in the framework of the whole content area or field of study. Therefore, iteration can serve as a mechanism for knowledge construction and management, for improving retention of knowledge, and for effective skill development. The basic idea behind iterative instructional model (IIM) is that the learner should learn from previous cycles, expand knowledge and perform better at every new cycle. Learning actually takes place in a set of iterations (Serdyukov et al., 2004).

The iterative process of knowledge construction using IIM unwinds like a spiral. Its goal is gradual approximation of the current knowledge in each of the cycles to its complete representation. Each preceding cycle grows into the subsequent one, expanding the knowledge at each iteration. Each cycle represents a full model of the whole topic presented at a consecutively higher level of complexity, completeness and detail than the previous one.

IIM is applied at the presentation cycle where the content is iterated several times in different modalities (lecture, instructor demonstration, text, visuals, audio-visual or multimedia show and simulations). It is important at this cycle that the topic is presented as a whole, in its entirety, through several increasing levels of approximation. Thus, students perceive and process information a number of times in multiple formats, which improves understanding and retention. In the activation cycle where problems on a given topic of the increasing level of complexity are offered for solution, case studies are considered, games played, discussions held, IIM is particularly useful for knowledge construction and skill development. In the application cycle where students demonstrate their new knowledge and skills in dealing with various life-based situations, IIM helps to adapt new knowledge and skills to real-life situations. At each iteration, IIM is used differently, utilizing the same content in a number of cycles where the conditions of content retrieval are changing until the desired outcomes are achieved.

Iteration comes as a further development of the concept of spiral curriculum (Bruner, 1960) and spiral stages in learning (Piaget, 1963). There are basically two models of the learning process: linear, or sequential, and iterative, spiral. J. Bruner writes about a spiral curriculum: "A curriculum as it develops should revisit these basis

ideas repeatedly, building upon them until the student has grasped the full formal apparatus that goes with them." It "turns back on itself at higher levels" (Bruner, 1960, 13). Unfortunately, he does not elaborate on this idea further.

Piaget maintained that in learning there were stages that were specific and spiral – they would build new skills based on the previous skills developed in the preceding stages. Subsequent stages were not simple reproductions of the initial stages but had new goals and new actions to achieve those goals: "The learning of logical structures is based therefore on a kind of circle or spiral, which amounts to saying that structures constitute the product not only of learning but also of an internal operation of equilibration" (Piaget, 1968, 104-105).

Iterative instructional model (IIM) describes learning in the following way:

- Learning is usually taking place in cycles based on the repetition effect.
- The learning material of each course can be repeated and recalled in a number of cycles determined by the course content, goals, structure, conditions of study.
- Learning process based on iteration develops as an expanding spiral consisting of a measured number of interconnected cycles separated in the course by intervals.
- Student knowledge is gradually expanding at each cycle by adding new information to each preceding cycle thus approximating the results at each cycle to the desired outcome.
- Each cycle is based on all the previous ones and adds to them new details thus developing a deeper understanding, increasing its complexity and coverage, until the topic is exhausted.

Learning built on the IIM is an effective cumulative process (Serdyukov et al., 2004). The IIM, like spiral and other sequencing strategies (progressive differentiation, hierarchical and short-path) offers a way to develop knowledge and skills in a particular content area from the simple to the complex.

Research establishing the optimal number of iterations and intervals between repetitions has not been found; hence, it is important to determine these factors experimentally to ensure the necessary understanding and retention for a particular subject area. One major factor in ensuring retention is the nature of the instructional approach. Instructional strategies and activities that reduce the effect of

forgetting and improve long-term retention should be organized in learning cyclic course structure. This structure may consist of the following four cycles: presentation of the new material coupled with a demonstration; class analysis and discussion; group and individual applications (problem solving and/or lab experiments); and review and assessment. Each cycle should include iterations in the quantity (at least 6) sufficient to ensure understanding and retention. These iterations should be distanced in one lesson (up to 30 minutes), in the course section concentrated on the same topic (1-3 days), and in the unit (four weeks).

## **Iteration in Physics Instruction**

Integration of IIM in General Physics classes at National demonstrated that iteration can take place at various levels of the course: its parts, topics and individual units and assignments. In the accelerated course there are five general course iterations: introduction, midterm and final reviews, midterm and final exams. Each of the topics has the same cyclic structure that includes introduction, presentation, student activities, predominantly in the form of problem solving, homework (reading textbook and solving problems), and review.

## **Levels of Iteration in Physics Unit**

### I. Unit

Theoretical – Lab courses: Actually, lab repeats the theoretical course in its major parts but in a different environment and with new goals.

### II. Theoretical and Lab courses:

Introduction into the course (overview), reviews, midterm and final.

III. Topic in theoretical course: Introduction, presentation, analysis, problem solving, homework, and review. Topic in the lab course: Introduction, demonstration, lab work, calculations, homework, review.

Note: Problem solving has its own 4-5 iterations of increasing complexity.

These iterations are presented below. Recall in the learning process there are two forms of work: class and home. Each topic is developed in four iterations in the class and two at home making a total of six. Iterations in the course and in the topics are arranged by the class and home work activities as follows:

Class work

Homework

- |   |                     |
|---|---------------------|
| 1. <i>Introduction into the course (overview)</i> |                     |
| 2. Introduction into the topic                    |                     |
| 3. Detailed presentation (lecture)                |                     |
| 4. Problem solving                                |                     |
|   | 5. Textbook reading |
|   | 6. Problem solving  |
| 7. Homework review                                |                     |
| 8. <i>Midterm review</i>                          |                     |
| 9. <i>Midterm</i>                                 |                     |
| 10. <i>Final review</i>                           |                     |
| 11. <i>Final exam</i>                             |                     |

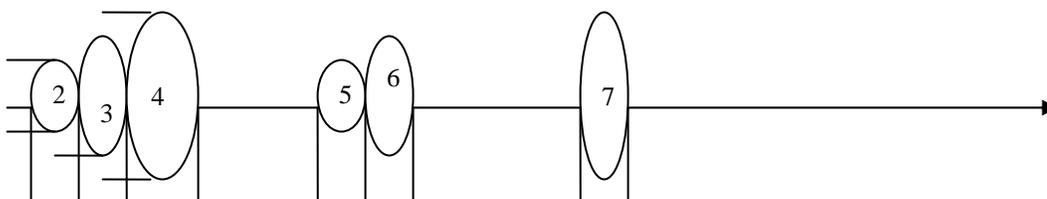


Figure 1: Iterative model of the topic in the course.

Instructional cycle of a topic thus consists of six iterations organized in three cycles, as shown above. The first three iterations (2-4) are organized in the first cycle and integrated in the initial lesson of the topic presenting various levels of topic coverage ensuring understanding of new material and primary retention; two homework iterations (5-6) that comprise the second cycle are done between two classroom cycles on the next day or two after the first one; a review (7), which makes up the third cycle is distanced from the first two by two or three days. Both second and third cycles are intended to enhance retention. All three cycles provide six iterations and ensure spaced repetition that, as was shown above must be done on the same day, on the next day and a few days later. A lab course that basically repeats the structure of the theoretical course, adds another cycle with

several iterations on each main topic. Each lab topic cycle includes the following six iterations: Introduction, demonstration, lab work, calculations, homework, and review. These iterations take place a month after the theoretical course thus adding the necessary extended repetition and recall that proved to be critical for long-term retention (Glover & Corkill, 1987; Dempster, 1991). Consecutive structure of the Physics unit where the lab course follows the theoretical course offers this opportunity for spaced extended repetition that maintains and solidifies retention.

Iteration has five parameters: a duration of the step (cycle); its dimension (amount of info tending to expand at each cycle); the number of iterations (repetitions); duration of the total learning period (fixed); and the temporal intervals between each iteration. This may be a direction for further investigation.

Accelerated theoretical General Physics classes call for a specific instructional design involving more frequent change of instructional activities to maintain student alertness and attention and increase their productivity of learning. Thus, based on iterative approach, during one 4.5-hour class students have 3-4 short 15-minute lectures followed by the 5-10 minute lecture demonstrations, and 3-4 problem-solving sessions lasting up to 30 minutes. Typically used strategies include interactive lectures, lecture demonstrations, video and inquiry, analysis and discussion of the problem-solving techniques, Q&A, and problem solving (on the board before the class and individual. Lab classes, due to their specificity, cannot provide this variety of activities and frequency of iterations. Nevertheless, lab works themselves are modified iterations of the material learned in the theoretical course, which thus provides another level of spaced repetition separated by 30 days.

## **Experimentation and Discussion**

To evaluate students' knowledge retention in Physics classes a test was given to two groups of students: one, experimental, using IIM (17 students), and the other, control, taught in a traditional way (10 students), on the topic "Electricity." The test included the following questions:

1. Write the formula of the Coulomb's Law
2. Write the formula of the Ohm's Law
3. Write the formula of the electric power

4. Explain what is electric current
5. Explain what is electric resistance
6. Calculate the effective resistance of a pocket calculator that has a 1.35 V battery and through which 0.2 mA flows

These questions were given to each of the groups before the topic and after it, before the beginning of the next topic (two days later) in both theoretical and lab classes that were separated by approximately 30 days. The results were evaluated using a 5-point scale, and an average point was determined for each question for all students in the group.

Table 1: Average grades in two classes

<b>Average grades for all tests</b>							
1 <sup>st</sup> class - experimental				2 <sup>nd</sup> class – control			
Theoretical		Lab		Theoretical		Lab	
Before	After	Before	After	Before	After	Before	After
1.1	2.1	3.7	4.5	0.6	1.8	1.8	2.3

According to Table 1, improvements have been observed after every repetition of the topic in both groups; however, significantly better outcomes were noted in the experimental group that consistently used IIM than in the control group. Each new iteration helps to raise the grade, which can be associated with improved retention.

To compare learning in the accelerated course format using an IIM and a traditional semester format, let's suppose the number of iterations in the IIM and in traditional formats is the same being determined by the course content and requirements, and equal to  $n$ . The duration of the accelerated Physics unit at National is eight weeks, and at the traditional university 17 weeks. Let's calculate the time per one iteration (interval between two iterations) denoted as  $T$  by dividing the total duration of the course measured in weeks by the number of iterations  $n$  during the same time for each format:

**Accelerated model**

**Traditional semester model**

$$T' = \frac{x \text{ weeks}}{n}$$

$$T'' = \frac{y \text{ weeks}}{n}$$

While at National University students take one course at a time, at a traditional university they normally take about four courses at a time. If we agree the number of iterations  $n$  in each course is the same, then  $T$  for NU will be  $\frac{8}{n}$ , and  $T'$  for the traditional university  $\frac{17}{n}$

$4n$

The ratio between  $T$  and  $T'$  thus will be  $\frac{T}{T'} = \frac{8 \cdot 4n}{n \cdot 17} = 1.9$

This means the time per iteration in the accelerated NU format will be 1.9 times longer than the time in the traditional semester format, which is in line with the requirements of spaced repetition mentioned above. We should also take into account negative interference on the quality of learning in each particular course from three other courses taken concurrently on the same period. This allows us to assume that the accelerated IIM provides for better conditions for retention than the traditional course.

To determine if there is a difference in learning outcomes between Physics classes using the IIM and classes that do not consistently use iteration, the final grades were compared of 35 students of three groups who took classes using IIM and 22 students of three groups who did not use IIM.

Table 2: Grades in Two Classes

Grades	Traditional	IIM
<b>A</b>	<b>29.8</b>	<b>29.2</b>
<b>B</b>	<b>39.9</b>	<b>45.8</b>
<b>C</b>	<b>18.2</b>	<b>22.9</b>
<b>D</b>	<b>0</b>	<b>2.1</b>
<b>F</b>	<b>12.1</b>	<b>0</b>

As follows from Table 2, the number of A's is practically the same in both models; however, in the accelerated courses there are more B's and C's than in the traditional courses. Overall, students in the accelerated classes earned more positive grades than in the traditional ones: 100% versus 87.9%. It is even more remarkable that no students failed the classes. These data demonstrate a notable improvement in learning outcomes of the students using iterative learning.

## Conclusion

IIM described in this article proved to be an effective instructional model helping improve student's understanding and retention of the new material by revisiting basic concepts and applications presented in the course a number of times in an increasingly more sophisticated context. Accelerated Physics classes taught on the basis of this model demonstrate a marked increase in productivity of learning and improvement of recall.

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# **Assessing Clinical Attributes for Therapists: A Tool for Gatekeepers of the MFT Profession**

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## **Abstract**

This article concerns the role of psychotherapy education programs as gatekeepers for the counseling profession. The authors report the reliability and validity of the Clinical Attributes for Therapists Scale (CATS), an instrument designed to assess the interpersonal skills of students in the Master of Arts in Counseling (MAC) program at National University. The CATS showed high reliability and validity. Additional exploration of the CATS revealed that it adds new information beyond traditional measures of academic achievement (e.g., grades). The CATS can be used to make decisions about the advancement, remediation, or dismissal of students in psychotherapist training programs.

## **Key Words**

Clinical attributes, psychotherapy education, counseling profession, interpersonal skills, assessing clinical skills, professional gatekeepers

## **Introduction**

One of the most challenging aspects of educational programs that prepare students for careers that require professional licensure, such as clinical psychology, medicine, nursing, and law, is screening those students for personality traits that may interfere in their ability to practice their chosen profession (Johnson & Campbell, 2002). Determining the quality of students' ability to acquire theoretical knowledge is done by evaluating academic work; however, assessing the students' capacity for the application of knowledge and the use of techniques requires a different type of evaluation. This is particularly true in any psychotherapist training program as the therapeutic relationship is the vehicle through which all services are delivered. Therefore, educational institutions must assess the ability of their students to establish and maintain a beneficial therapeutic relationship as an integral part of the requirement of the program.

In our experience, as Marriage and Family Therapist (MFT) educators, most students who have personality issues that may result in harm to clients demonstrate problematic behavior in the classroom before they begin to see actual clients. Two examples demonstrate this observation. The first was a student who was in a class taught on group psychotherapy. In that class students were required to co-facilitate a role-play group session with other students playing the clients. The student in question had talked at length about his experience in the field but did a poor job co-facilitating in class. He received many suggestions for improvement during the feedback section both from peers and from the instructor. In the next class session he revealed in the group that he had been so upset with his performance as a co-facilitator that he had gone home and scratched his arms and hit himself in the head. He displayed the scratch marks for all to see. He was unable to understand that his inappropriate reaction to feedback could interfere with his ability to work with clients because clients will often have negative reactions to therapists' interventions and therapists must be able to take negative feedback without personalizing it. The student under discussion was ultimately removed from the program primarily because the faculty were committed to protecting potential clients from harm.

Another example is a student who was in a practicum class. In the first class session the instructor assessed that the student's level of anxiety was so great that she could not hear accurately what was being said. The professor had to repeat information more than a dozen times for the student and she still did not hear it correctly. The other students were clearly impatient and the student did not appear to notice the non-verbal cues of others. The teacher finally had to tell her she would talk to her privately. The full-time faculty member in charge of the program believed this student was currently unfit for the profession based on her level of anxiety and inability to process information. All of her previous instructors were contacted and they verified they had observed a similar pattern but none of them had reported the student for assessment. In this case, the student was counseled into a different program, but if she had insisted on staying in the MFT program, it would have been very difficult to remove her due to the lack of documented evidence. This is an example of how essential it is for all faculty to report and record concerns about personality traits that may prevent students from working effectively with clients.

The discussion of fitness and character issues in psychotherapists began in the published literature in 1945 and has continued to the current day (Thorne, 2000). Johnson & Campbell (2002) suggest that

“if certain qualities of character and specific indicators of personal stability are prerequisite to effective practice in psychology, the challenge for our profession is to develop valid and reliable ways to screen candidates in those domains” (p. 50). The literature has reported consistently that at least some students attracted to psychology as a profession have personal limitations such as serious emotional or characterological problems. A 1995 survey of Chairs of Departments of Psychology revealed that 34 percent believed that their program had enrolled students with enough psychological problems to be considered impaired (Procidano, Busch-Rossangel, Reznikoff, & Geisinger, 1995). Eight percent reported having students who were guilty of ethical conduct that could raise concerns about fitness for the profession. Similarly, Johnson and Campbell (2002) found that only 51 percent of psychotherapy-related degree programs had written policies regarding evaluation of fitness for the profession.

The reasons why training institutions or their faculty members may not utilize standardized instruments and procedures for evaluating, remediating, and dismissing students deemed ill-suited for the counseling profession are complex and poorly understood. Most institutions have some sort of screening process as part of their admissions procedures (Johnson & Campbell, 2002). Yet, as other authors have pointed out, it is unrealistic to assume that such procedures could possibly identify all potentially problematic students (Knoff & Prout, 1985; Kerl, Garcia, McCullough, & Maxwell, 2002; Nagpal & Ritchie, 2002). A few studies have emerged in recent years that have attempted to identify faculty and institutional concerns pertaining to the dismissal of students unfit for the profession. Pressures for student retention, concerns regarding poor student evaluations, anxiety about continued employment, and apprehensions about possible student initiated lawsuits against the institution or supervising faculty have been expressed (Frame & Stevens-Smith, 1995; Baldo, Softas-Nall & Shaw, 1997; Gaubatz & Vera, 2002).

Another contributing factor may be the scarcity of evaluative instruments with sound psychometric properties. We found only three such published instruments: (a) the Personal Characteristics Review Form (PCRF, Frame & Stevens-Smith, 1995); (b) The Basic Skills Evaluation Device (BSED, Nelson & Johnson, 1999); and (c) The Professional Performance Fitness Evaluation (PPFE, Lumadue & Duffey, 1999). Only one of these instruments, the BSED, has been empirically studied (Nelson & Johnson, 1999), but that scale was developed specifically for trainees working directly with clients and is not well

suited for evaluating students' classroom behavior as predictive of clinical skills.

It is the authors' opinion that screening for interpersonal skills for the counseling profession is an integral part of any degree-granting institution (Parker, Tatum, Shook, & Alexander, 2003). The present study investigates a screening instrument for classroom use developed by the faculty of the Master of Arts in Counseling (MAC) program at National University. The instrument, known as the Clinical Attributes for Therapist Scale (CATS), was designed to evaluate the interpersonal skills of counseling students by operationally defining and assessing attributes commonly accepted by the profession; attributes such as empathy, positive regard, and communication skills. The present article reports on an analysis of the CATS, and shows reliability and validity data collected over a six-month period with more than 300 students. In addition, the authors discuss how the CATS supplies different information than more traditional assessments of academic progress (e.g., grades). Establishing the reliability, validity, and utility of the CATS may begin to fulfill the critical need for a psychometrically sound instrument for the preclinical evaluation of the students' psychological fitness for the counseling profession.

## **Method**

### *Participants*

The participants were 340 students (approximately 90 percent female) enrolled in the MAC program in the Department of Psychology at National University. The student data were collected between October 2002 and March 2003.

### *Materials*

The primary instrument used in this study was the CATS (a copy of the instrument and information on its development is available from the authors). The CATS is a 20-item questionnaire completed by every instructor for every class in the MAC program. Some of the items (e.g., restates content of communication accurately, states interpretation of non-verbal communication accurately) were assessed separately from the perspectives of peers, instructors, and role-play client sessions. Instructors were asked to rate each student in the class on all 20 CATS items on a 5-point scale ranging from 1 (Inadequate), 2 (Below Average), 3 (Average), 4 (Above Average), to

5 (Superior). A score of 0 indicated a skill or behavior not observed in that class. This category was included because some of the didactic/lecture classes may not present the opportunity to assess all of the items on the CATS in every course.

### *Procedure*

National University has an instructional format in which a 4.5 quarter unit class is completed in four weeks. The CATS is distributed to all instructors teaching during a particular month. Instructors were taught how to use the CATS by the full- or part-time faculty at their regional location prior to being assigned to any counseling courses. Students who receive two or more scores of 2 (Below Average) or one or more scores of 1 (Inadequate) were evaluated for the need for intervention.

### *Results*

The results are organized into two main sections. First we examine the psychometric properties of the CATS. In particular, we examine (a) whether the items on the CATS can be reduced to a smaller set of factors, (b) the reliability of the CATS, and (c) evidence for the validity of the CATS. The second section investigates several empirical relationships between the CATS and other variables. Specifically, we describe the relationships between the CATS and (a) number of courses taken by students, (b) class size, (c) grades, (d) location at which coursework was taken, and (e) the type of coursework taken by the students.

## **Psychometric Properties of the CATS**

***Factor analysis.*** Factor analysis is a statistical technique that allows the researcher to find underlying relationships among a set of items, questions, or measures. The CATS has 20 items, but a factor analysis revealed that these 20 items can be condensed down to two general factors. The first factor included items that related to the demonstration of clinical skills (e.g., maintains caring, non-judgmental and appropriate language; maintains appropriate eye contact). The second factor included the remaining items, which related to classroom behaviors (e.g., responds to feedback in class in a constructive manner, participates actively and constructively in class discussions and exercises).

**Reliability analysis.** Reliability concerns the consistency and stability of a measurement tool such as the CATS. Three types of reliability analyses were performed on the CATS: internal consistency, temporal stability, and inter-rater agreement. All three analyses demonstrated that the skills and behaviors measured by the CATS were interrelated and stable across time, and that the raters were in general agreement about the attributes being rated.

**Validity of CATS.** Whereas reliability analyses show the consistency and stability of the CATS, validity analyses try to demonstrate that the CATS measures what it purports to measure (i.e., it measures skills and behaviors that are critical to the professional MFT). Validity can be assessed in three ways in this context. The first assessment of validity is *content* validity. Content validity refers to the specific content of the CATS and whether this content is rationally related to the properties or characteristics being evaluated. In the present context, content validity refers to whether the items on the CATS (the content) are relevant to the assessment of a student's fitness as an MFT. Typically, content validity is determined by expert judgment regarding the content of the test. With regard to the CATS, faculty members in the MFT program (the experts) reviewed the items and determined that the content did measure relevant aspects of fitness (Parker, et al., 2003). Moreover, the content of the CATS is similar to the content of other instruments that measure professional performance or basic counseling skills (e.g., Frame & Stevens-Smith, 1995; Kerl, et al., 2002; Nagpal & Ritchie, 2002; Nelson & Johnson, 1999).

The second assessment of validity is *construct validity*. The results of the factor analysis described above can be interpreted as supporting the construct validity of the CATS. The two factors identified in the factor analysis indicate that the items formed two distinct constructs (i.e., clinical skill and classroom behavior). A more complete construct validation would include evidence that these distinct constructs are related to other, similar constructs. This more complete validation will be performed in future studies.

A third assessment of validity centers on *predictive validity* (i.e., showing that the scores on the CATS predict success in the counseling program). The primary measure of success in the MFT program is Grade Point Average (GPA). Both of the factors identified above were correlated with GPA; Factor 1 (clinical skill) was significantly correlated with GPA ( $r = .23, p < .01$ ), and Factor 2 (classroom behavior) was also significantly correlated with GPA ( $r = .24, p < .01$ ). Both correlations suggest that students who receive high ratings by their

instructors on clinical skills and classroom behaviors tend to do better in their course performance in the counseling program.

## **Descriptive Statistics and Empirical Relationships for Critical Variables**

***Means, standard deviations, and correlations.*** At the time the CATS was administered for each student, we recorded (a) the number of courses completed by each student, (b) the size of the class the student was taking, (c) the student's grade point average, (d) an average score for the student's rated clinical skill (Factor 1), (e) and an average score for the student's classroom behavior (Factor 2). Table 1 shows the means and standard deviations for these variables, and the bivariate correlations between all variables.

There are a number of things to note about the mean values and correlations for these variables. In particular, it is interesting that the average value for Factor 1 (clinical skill) is lower than the average value for Factor 2 (classroom behavior). This difference was statistically significant,  $t(1124) = -8.30, p < .001$ , and this indicates that, on average, students are rated lower on their clinical skills than on the quality of their classroom behavior. This may imply that students in the counseling program are better prepared academically than clinically, or that it is just more difficult to assess clinical skills compared to classroom behaviors.

A second thing to note is that as students take more classes in the program, GPA significantly increases ( $r = .164, p < .01$ ), but ratings on clinical skill and classroom behaviors do not significantly change.

Finally, it is interesting to note that as class size increased, the attribute ratings (both clinical skill and classroom behavior) significantly declined ( $r = -.227$  and  $-.141$  respectively,  $p < .01$ ), but GPA was unaffected ( $r = .027, p > .05$ ). These latter two findings suggest that CATS and GPA are measuring different attributes and qualities of the students.

***Location effects.*** The data were analyzed by location to determine whether there were differences in the effects of the CATS at different sites across the state. Table 2 shows the means, standard deviations, and the sample sizes for Factor 1 (clinical skill) ratings across the eight different locations in which the counseling program was offered in the state of California. A one-way analysis of variance revealed that there

were location differences,  $F(7, 896) = 34.57, p < .001$ . Inspection of Table 2 indicates that the lowest average ratings were given in Redding (3.16) and the highest average ratings were given in Stockton (4.14).

Table 3 shows the means, standard deviations, and the sample sizes for Factor 2 (classroom behaviors) ratings across the eight different locations. Again, a one-way analysis of variance revealed that there were location differences,  $F(7, 943) = 36.98, p < .001$ . Inspection of Table 3 indicates, again, that the lowest ratings were given in Redding (3.24) and the highest ratings were given in Stockton (4.44).

Lastly, Table 4 shows the means, standard deviations, and the sample sizes for GPA across the eight different locations. A one-way analysis of variance revealed no significant location differences,  $F(7, 291) = 1.28, p > .05$ .

Comparing all three tables, it is interesting that, although different locations tend to rate clinical skills and classroom behaviors differently, all locations are very consistent in the class grades issued. This finding suggests that clinical skills and class behavior are not just substitutes for grades; they measure something different and add new information to the assessment of counseling students.

**Course type effects.** One final analysis involved the comparisons of courses that are theoretical in nature with courses that are more experiential and practically oriented. Of the 18 courses in the counseling program, six stress the theoretical dimensions of counseling, two are almost purely experiential, and ten contain a mix of theory and practical/experiential components (e.g., assessment, treatment planning, diagnosis, group process). Table 5 shows the differences in the course type for GPA, clinical skills (Factor 1), and classroom behaviors (Factor 2). The results showed that the type of course (theory, experiential, or mixed) produced significant differences for the Factor 2 (classroom behavior) ratings, but not for Factor 1 or GPA. A statistical comparison of the means (using a Bonferroni adjustment for Type 1 errors) showed that only the theory and experiential classes differed ( $p < .05$ ) with respect to Factor 2 (ratings were significantly higher for the experiential classes than for the pure theory classes).

**Summary of empirical relationships.** Several interesting observations can be made. First, it is interesting that the instructors rated students lower on their clinical skills than their classroom

behaviors, and that as students take more courses in the program their GPA increases but the CATS ratings of clinical skill and classroom behaviors do not change. In addition, increased class size was significantly associated with a decline in ratings for skills and behaviors, but not for GPA. These relationships suggest that the CATS assessment provides different information than GPA.

Where a student took classes and the type of classes taken were related to the CATS ratings but not GPA. Where a student took his or her classes had a significant effect on the CATS ratings of clinical skill and classroom behavior, but GPA did not differ across locations. The type of class (experiential, theoretical, or a mixture of both) had no effect on GPA or ratings of clinical skill, but did alter the ratings of classroom behaviors (students in the classes with an experiential component got higher ratings than students in the theory-only classes). The point that stands out with regard to location and course type (as well as with class size and number of courses) is that the CATS and GPA seem to be measuring different attributes and qualities of the students because the same variables (class size, number of courses, location, and course type) have differential effects on these two measures.

## **Discussion**

An often neglected aspect of MFT training is the evaluation of the student's psychological fitness for the profession (Johnson & Campbell, 2002). In an earlier report (Parker, et al., 2003) we described the development of an instrument, the CATS, designed to help evaluate MFT students' interpersonal skills in the classroom. The present study reports the results of an assessment of the reliability and validity of the CATS for more than 300 students during a six-month period. This assessment is important because, although there have been attempts in the past to develop a standardized tool for evaluating student fitness (e.g., Frame & Stevens-Smith, 1995; Kerl, et al., 2002; Nagpal & Ritchie, 2002; Nelson & Johnson, 1999), there has not been any systematic attempt to establish the psychometric properties of these different instruments and scales. The current study not only found good evidence for the reliability and validity of the CATS, but also discovered some useful empirical relationships between the CATS and other critical educational variables.

Rather than attempt to summarize all the complex empirical findings in the study, we will instead discuss one major underlying theme that

emerged from the data. It is clear that the CATS is not just another way to assess the students' academic progress. The CATS is apparently measuring something quite different than grades (the traditional measure of academic achievement). Although the CATS and GPA were correlated (see Table 1), they were affected in different ways by other variables. For example, the number of courses a student took improved GPA but had no effect on ratings of clinical skill or classroom behaviors (see Table 1). On the other hand, class size was negatively related to the CATS ratings, but was unrelated to GPA (again, see Table 1). Also, the CATS ratings were associated with the location at which a student took the MFT classes, but GPA did not change across different locations (see Tables 2-4). Finally, the type of courses taken by the students (theory, experiential, or mixed) had no effect on GPA but did influence certain elements of the CATS (see Table 5). It appears that the CATS is "adding value" to the assessment of the MFT students and should be used in conjunction with traditional grades.

In general, we believe that the CATS is a psychometrically sound instrument and we advocate its use by other institutions. It is an easy scale to administer (there are only 20 items and the instructor only has to rate each student once at the end of the class). There are limitations to the CATS, of course, but future research and improvements should correct most of these problems. The strength to this approach is that it provides tangible, objective evidence for the fitness of students during their MFT training. The CATS can therefore be used to assess whether students should be allowed to progress in their training, or whether remedial steps should be taken to help students who reveal problems that limit their fitness for the profession. In the worst-case scenario, the CATS can also be used as one vital piece of information to dismiss students from a program before they do harm to themselves or others.

### **Directions for Future Research**

A potential next step in assessing the CATS would be to compare the scores assigned by faculty to those assigned by students' clinical supervisors on the clinical skills items in the instrument. This would add another measure of validity and strengthen the results. Additionally if other institutions adopted the CATS and measured it in traditional learning formats other variables such as age, taking one class at a time for one month, and each instructor having a longer

period of time to assess the student could be studied and might add to the reliability and validity results.

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## APPENDIX

Table 1. Means, Standard Deviations, and Pearson correlations for Critical Variables in the Study.

	Mean	SD				
			Courses	Class Size	GPA	Factor 1
Courses	7.01	5.07				
Class Size	18.62	6.94	-.038			
GPA	3.35	.40	.164*	.027		
Factor 1 (Clinical Skill)	3.60	.70	-.028	-.227*	.230*	
Factor 2 (Classroom Behavior)	3.72	.79	.025	-.141*	.241*	.760*

\* Correlation is significant at the 0.01 level (2-tailed).

Table 2. Means, Standard Deviations, and Sample Sizes for Clinical Skill Ratings (Factor 1) Across Eight Locations in California.

Location	Mean	Standard Deviation	N
San Diego	3.24	.39	132
Carlsbad	3.79	.67	100
Costa Mesa	4.03	.64	97
Los Angeles	3.67	.74	153
Fresno	3.42	.45	105
Stockton	4.14	.53	71
Sacramento	3.72	.78	114
Redding	3.16	.53	132
<b>Total</b>	3.60	.70	904

Table 3. Means, Standard Deviations, and Sample Sizes for Classroom Behavior Ratings (Factor 2) Across Eight Locations in California.

Location	Mean	Standard Deviation	N
San Diego	3.38	.49	152
Carlsbad	3.88	.73	101
Costa Mesa	4.19	.73	97
Los Angeles	3.92	.91	181
Fresno	3.44	.45	104
Stockton	4.44	.72	71
Sacramento	3.72	.73	114
Redding	3.24	.55	131
<b>Total</b>	3.72	.79	951

Table 4. Means, Standard Deviations, and Sample Sizes for Grade Point Averages (GPA) Across Eight Locations in California.

Location	Mean	Standard Deviation	N
San Diego	3.34	.42	33
Carlsbad	3.32	.35	36
Costa Mesa	3.50	.26	32
Los Angeles	3.37	.40	59
Fresno	3.25	.57	32
Stockton	3.43	.21	27
Sacramento	3.29	.50	46
Redding	3.31	.28	34
<b>Total</b>	3.35	.40	299

Table 5. Means, Standard Deviations, Sample Sizes, and Significance Levels for GPA, Clinical Skills (Factor 1), and Classroom Behaviors (Factor 2) across Different Types of Courses.

	Course Type	N	Mean	Std. Dev.	Sig. of F
Grade Point Average (GPA)	Experiential	17	3.55	.18	NS
	Theory	192	3.36	.44	
	Mixed	145	3.41	.33	
Factor 1 (Clinical Skill)	Experiential	17	3.95	.44	NS
	Theory	192	3.63	.73	
	Mixed	145	3.62	.70	
Factor 2 (Classroom Behavior)	Experiential	17	4.20	.51	$p < .05$
	Theory	192	3.65	.67	
	Mixed	145	3.77	.78	

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# Using WeBWork in an Online Course Environment

Angelo Segalla and Shandy Hauk

## Abstract

WeBWork is a free, open source, Web-based, interactive mathematics homework system used to individualize and automate grading of mathematics homework assignments. Previous and ongoing research indicates that students who use WeBWork stay on task longer than students who use traditional paper and pencil methods and often score higher on pre-test and post-test experiments. In this report we connect the use of WeBWork to an online teaching-learning environment and address some of the benefits and issues students and instructors will have when using WeBWork. We include some “do and don’t” suggestions especially for instructors to help make the program more user-friendly for themselves and for their students.

**Key Words:** Web-based homework, WeBWork, homework

## Introduction

Since the introduction of rudimentary “drill and practice” teaching machines designed to have students learn the basic facts of a subject (Pressey, 1926), we have seen a long procession of more and more mechanically and electronically sophisticated “machines” enter the teaching-learning setting. Research on the effectiveness of such apparatus is mixed for use in the traditional classroom; although WeBWork, one of the modern descendants of Pressey’s machine, has been shown to be an efficient tool for homework when used as an integral part of a mathematics course in a classroom setting, we extrapolate its use here to the e-learning environment of online courses. With no pretense of doing justice to the short but rich history of machine-assisted learning systems, we mention in passing that with the invention of the computer, Pressey’s “machine” soon developed into an electronically sophisticated instructional tool, often in the form of “computer assisted instruction.” With the appearance of the internet, “e-learning” took its place in the teaching-learning communities of schools, academe, and industry. Almost all new college students in the United States have used a personal computer by age 18 and approximately half of entering first-year students have used the internet; the other half will be introduced to the internet when

they get to college (Pew, 2002). In this paper, we address some of the issues faced by college mathematics instructors who are, or will be, teaching an online mathematics course and: (a) have decided to use WeBWork for managing the homework assignments as well as (b) are new to the web-based WeBWork interface. Thus, here we concentrate mostly on how to incorporate WeBWork into a mathematics course and illustrate whenever appropriate some, but certainly not all, of the features of this sophisticated descendant of Pressey's machine. We conclude this introduction by illustrating, in Figure 1, the most salient feature of WeBWork: the program can interpret student responses written in mathematical notation.

Find the partial derivatives of the function

$$f(x, y) = \frac{8x + 9y}{-1x - 3y}$$

$f_x(x, y) =$	<input type="text" value="-5y/(x+2y)^2"/>
$f_y(x, y) =$	<input type="text" value="5x/(x+2y)^2"/>

**Note:** *You can earn partial credit on this problem.*

[Preview Answers](#)

[Submit Answers](#)

You have attempted this problem 0 times.

You have unlimited attempts remaining.

[Email instructor](#)

Figure 1(a): A typical WeBWork question and student answer

Entered	Answer Preview	Result
$(-15*y)/[(x+3*y)^2]$	$\frac{-15y}{(x+3y)^2}$	correct
$(15*x)/[(x+3*y)^2]$	$\frac{15x}{(x+3y)^2}$	correct

All of the above answers are correct.

(1 pt)

Find the partial derivatives of the function

$$f(x, y) = \frac{8x + 9y}{-1x - 3y}$$

$f_x(x, y) =$	$-15y/(x+3y)^2$
$f_y(x, y) =$	$15x/(x+3y)^2$

Figure 1(b): WeBWork response to student's entry

### How Important is Homework?

Many studies have already established the importance of homework, especially for the advanced cognitive development expected in high school and college mathematics (Cooper, 1989; Cooper, Lindsay, Nye, & Greathouse, 1998; Warton, 2001). Homework is an activity related to motivation, mastery of material, and to achievement (Keith & Cool, 1992). It is also clear from the research that homework is a necessary but not sufficient prerequisite for satisfactory achievement on exams (see, for example, Peters, Kethley & Bullington, 2002; Porter & Riley, 1996). However, the role of homework in student achievement is only partly understood and research continues on the topic.

Within the liberal arts tradition at U.S. colleges, the primary purpose of homework in college mathematics is to support the development of knowledge of facts, connections, procedures, and reasoning for later use in more advanced mathematics or in applications to life (e.g., finance). The method for achieving this goal has traditionally been through paper and pencil homework practice with facts and concepts. Exercise sets in most college mathematics textbooks offer drill practice with facts followed by practice with applications, and a brief interaction with abstract concepts. Many texts end an exercise set with mildly non-routine problems aimed at encouraging students to deeper reflection on concepts and their relationships. For a variety of reasons, from pressure to "cover" a proscribed collection of chapters in

such textbooks to the personal epistemologies of students and instructors, the usual practice in college mathematics teaching is to assign problems mostly from the first two categories (drill and application) and few from the third (concepts). Though there are efforts to rewrite college mathematics textbooks along the lines of the reform of calculus in the United States (e.g., Connally, Hughes-Hallett, Gleason, Chiefetz, Flath, Lock, et al., 2004; Kime & Clark, 2001), our discussion here is directed to those working in traditional as well as reform settings, with the latter including the new trend of online courses.

### **About WeBWork**

WeBWork is an efficient, free, open source, Web-based, interactive mathematics homework system used to automate the instructional tasks of assigning, presenting, correcting, and recording mathematics homework of the drill and application types. That is, WeBWork is for closed-ended mathematics problems that have solutions that can be expressed in a finite number of ways using standard mathematics notation. Research at colleges and secondary schools suggests that WeBWork is an effective learning tool when integrated explicitly and consistently as part of a mathematics course. The mathematics achievement (as measured by written exams) among students who use WeBWork for homework assignments is as good as, and often better than, achievement among students in the same courses who completed traditional paper-and-pencil homework assignments. WeBWork is not a tutorial program; it grades items and records students' scores. Those items can be structured by the instructor as homework, quizzes, tests, worksheets, or other activity. The program also keeps track of students' solution attempts so the instructor can keep apprised of student efforts. Simply put, WeBWork is an electronic homework helper that allows the instructor to concentrate less on the labor-intensive task of checking students' homework and more on stimulating instructional planning and course activities.

WeBWork is currently used in more than 100 universities and community colleges with an estimated 80,000 students. Unlike some other (commercial) programs that have a homework component as part of the larger system, WeBWork was developed explicitly and solely for accepting answers in mathematical notation. Yet, its versatility is such that it is also being heavily used in physics and other science classes, and the program could easily be adapted to other subjects.

In WeBWorK the student first prints out a copy of the assignment, then works on the assignment as in the traditional pencil-and-paper method. Once items are completed, the student enters the answers in WeBWorK. The program gives the student an immediate response on each problem stating if the answer is correct or not. If the answer is not correct the student is allowed another try, and another; there is no limit on the number of tries unless the instructor limits the number of tries as one might, in the case of a quiz. WeBWorK keeps track of how many solution attempts a student submitted, the number of correct answers, and the number of tries it took a student to get to the answer submitted.

Some instructors at colleges using WeBWorK report that the program motivates students to do more homework than they would ordinarily do in the traditional paper-and-pencil format. The University of Rochester, for example, reports that more than 90% of their students complete WeBWorK assignments.

### **How Students Use WeBWorK**

WeBWorK is simple to use for the student. Students go to the course WeBWorK URL, log in with username and password, choose the problem set that has been assigned and begin to do homework. The problems are unique to each student, with built-in parameters that are randomized by WeBWorK using the student's id number as the randomization seed. If the student does not complete the assignment in one sitting, the student can log out and restart at exactly the same place at next log in: the problem-set's randomized parameters do not change from session to session.

Students can work in groups on the same assignment because WeBWorK gives each students the "same" problem but with different parameters. One student will be asked to solve the quadratic equation  $2x^2 - 15x - 8 = 0$ , another will get  $2x^2 - 3x - 5 = 0$ .

### **How to Use WeBWorK as an Instructor**

One of the first things an instructor new to WeBWorK should do is get some practice using WeBWorK as a student (more on this below in Suggestion 2). An instructor logs on to WeBWorK with a number of homework management privileges. We do not delve into these in any

specific manner here since this paper is intended only as a collection of sign posts on how to use WeBWork, not a training program. A detailed online “how-to” source for first-time and repeat users of WeBWork is available through the Web site <http://bosna.natsci.csulb.edu:8888/webwork2/>. Many universities using WeBWork offer professional development WeBWork workshops. Frequently, instructors who attend the workshops, especially those who are going to use WeBWork for the first time, will get some technical telephone support.

Through the WeBWork interface an instructor can perform a host of tasks ranging from setting due dates to changing passwords to limiting the number of tries a student gets on each problem, to creating, coding, and adding new problems to the database. However, the first-time user of WeBWork is well-served by the existing national problem library: it contains thousands of problems to choose from for courses from beginning algebra to differential equations.

Among the “do and don’t” suggestions below we also offer a number of references where instructors new to WeBWork can learn more about the program. Among the technicalities that we do not get into here but that are well-addressed in the references provided here, are how to:

- Create a problem set
- Select and add problems to a set
- Edit an existing problem set
- Copy a problem set from another instructor’s class
- Assign a problem set by making it visible to students
- Set up scoring parameters for a problem set
- Send email to students
- View student(s) progress
- Act as a student
- Change set data for an individual student
- Change a password
- Remove or change student status
- Write new problems or edit existing problems

### **Suggestions for Using WeBWork**

Based on research results and experience using WeBWork, we offer the following set of suggestions to instructors who will use WeBWork for the first time.

**Suggestion 1:** *Depend on your local WeBWork administrator for technical support.*

There are several levels of authorization and responsibility in the WeBWork system. The most authoritative is the national “WeBWork Team,” a handful of mathematics and computer experts around the country, mostly university mathematics professors, who created and regularly improve the program. The national WeBWork Team is the gatekeeper of the program at the national level (as of this writing, version 2.3.2 is out).

Locally, your university WeBWork administrator is the gatekeeper of the WeBWork hardware and software, and has the authority to make changes, answer technical questions, and fix “bugs.” The research on human interactions around learning technology supports the following suggestion: If you are using WeBWork through an agreement with another institution, find out who the local WeBWork expert is and open a clear channel of communication with that person. Be sure to read some of the reference information about WeBWork before you begin this communication. The WeBWork administrator will need a spreadsheet of your class members and id numbers, but some additional information is in order: how and why you plan to use WeBWork, how many students are involved, course numbers, dates, etc. This paves the way for an efficient and smooth working relationship. Also, be sure to negotiate a back-up method for contacting your local WeBWork administrator in case the primary method fails. For example, if the primary contact method is email and the server goes down, have a contact phone number for the local WeBWork administrator!

At the third level, as an instructor you have control of your WeBWork class(es) and have a wide enough range of authorization to make changes — technical and not-technical — to the WeBWork part of your own course. In “Instructor Mode” one does not have to be a coding expert to keep the administrative part of homework assignments current and correct. Nonetheless, help is available for just this sort of thing through the Web sites given below. Choose the level of WeBWork expertise that is most comfortable for you in making WeBWork an integral part of the course.

**Suggestion 2:** *Plan to spend at least three hours on the steep side of the learning curve to get familiar with the program before the semester begins.*

There are several ways to do this. Some are more appropriate for full-time faculty whose departments may have funds to allow them to attend live training sessions. Other ways are more accessible to adjunct faculty who may face more challenges in getting the time or professional development funds for attending workshops. As with mathematics learning, after the initial investment of energy to come up the steep side of the logistic curve, regular continued exploration about WeBWork will improve your instructional success in using it. We list several ways to tackle the steep part of the learning curve and to continue learning here, starting with the most accessible.

2.1. *The interactive WeBWork users group* at <http://65.206.22.46/moodle/> is a must for both experienced and novice WeBWork instructors. On the left side of the screen you will see the message: "If you are new to WeBWork start here." Click that link and you have begun your steep climb. Typical questions for beginners you can get answers to at this site are how to: (a) set up your course; (b) add or drop students; (c) build a problem set; (d) modify due dates; (e) change passwords; (f) post messages for the entire class; and (g) send emails to the entire class or an individual student, including how to generate a form email that sends a different email to each student containing that students' grades.

2.2. *Explore the many WeBWork installations at other universities.* The national WeBWork Team hosts a site with links to many other university WeBWork information sites: [http://math.webwork.rochester.edu/docs/sites/courses/links\\_to\\_courses.html](http://math.webwork.rochester.edu/docs/sites/courses/links_to_courses.html). Some, not all, have excellent instructions on how to use WeBWork as a student and as an instructor.

2.3. *Download the PowerPoint program "WeBWork Workshop"* from <http://bosna.natsci.csulb.edu:8888/webwork2/>. This is an easy-to-follow presentation of the basics about how to use WeBWork as an instructor.

2.4. *Before you allow students to use the program ask your local WeBWork administrator to set up a practice course* that will allow you to explore both "as student" and as "the instructor." You probably will spend very little time in student mode because WeBWork is easy for students to use. To get an appreciation for the flexibility WeBWork offers students, visit <https://webwork.dartmouth.edu/> and click on "Demo Course." You will spend more time in instructor mode, of course, because

WeBWork has so many features. Explore and change things to see what happens. You will not damage the WeBWork program globally from a practice class. So explore away. The instructor (and students) use copies of both the program files and problem sets. The original files are safely stored on the cavernous servers of the "WeBWork team" and cannot be modified by changes you make locally.

2.5. *Attend a WeBWork training workshop.* These are usually offered at the national and often at some of the regional MAA conferences. For more details, see <http://www.maa.org/webwork/>.

**Suggestion 3:** *As important to preparing yourself to use WeBWork is to prepare your students.*

We found a great deal of positive influence on student use and persistence with WeBWork when we provided an introductory half-hour of WeBWork activities for students to complete in a computer lab. The activity included a few minutes of hands-on practice logging into and moving around a WeBWork practice assignment followed by four problems for students to complete. In an online course environment, we suggest a tutorial, such as a PowerPoint Web presentation that provides students with (1) the correct URL, (2) the log on process (username and password), and (3) once in the program, a "Problem Set 0" that involves students in using the basic functionality of WeBWork to print a problem set, preview answers in mathematical form, submit answers, and review their work. Many of the WeBWork installations around the country have these tutorials available to their students.

**Suggestion 4:** *Cultivate a view of cautious optimism about WeBWork.*

Research on WeBWork suggests that student achievement in courses that use WeBWork is highly correlated to a supportive but cautious attitude toward WeBWork on the part of the instructor (see, for example, Hauk & Segalla, 2005). In fact, much research has indicated that an attitude at either extreme (e.g., hate to best-thing-since-sliced-bread) can interfere with optimal use of any instructional tool (Mumtaz, 2000). Simply put: on a zero to ten scale, with zero for loathe and ten for awestruck, an instructor attitude between four and eight will yield the best results in terms of student willingness to work with WeBWork. For example, through doing problems in "student-mode" an instructor can build an awareness of the foibles of WeBWork and can capitalize on the shortcomings of the interface to generate

online discussion of the nature of mathematical representation and communication. Similarly, familiarity with the types of drill and procedural items in the Problem Library opens the way for online discussions or student-team-prepared presentations about complex applications or conceptual foundations. These types of engagement with mathematics (representing, communicating, problem-solving, connecting, reasoning) are key aspects of deep understanding of mathematics (National Council of Teachers of Mathematics, 2000). WeBWork items can start student activity in these areas and follow-up assignments can extend and deepen their learning (e.g., see Suggestions 12 and 13, below).

**Suggestion 5:** *Anticipate and be ready for student concerns about WeBWork itself.*

You will experience challenges and small confusions yourself as you familiarize yourself with the student view of WeBWork. Also, you will learn more about the initial challenges at the sites we recommended in Suggestion 2. A typical student puzzlement likely to find its way into your email is: "But I did the problem right and it told me the answer was incorrect." Although it may be true that the student has uncovered a glitch in the program — unlikely but possible — it is more likely that this is a syntax issue. For example, if the student submits  $x+5/x$  but the answer is  $(x+5)/x$ , WeBWork will indeed say it is incorrect. An effective suggestion to the student is: "Before you submit your answer, use the 'Preview Answer' button to check that what you entered in the answer window — in calculator notation — matches what you mean to say." As in any online learning environment, additional student questions to anticipate include:

- I forgot my password, how do I find out what it is?
- Why can't I see the correct answer like in the textbook?
- Can you extend my due date for Set 5?
- How can I see my grades so far?

**Suggestion 6:** *Have students print out a hard copy of their (individual) assignment.*

Trying to do mathematics in front of the computer screen is not conducive to concentrating on a problem. The "live" though silent monitor screen, which may slip into screensaver mode, can imbue a sense of impatience that may cause some anxiety for students. It is also tempting to use the computer for other purposes as a break from working on a problem, (e.g., "surfing the net"). We have found that

the most complete interaction with the mathematics comes when students print out and work the problems on paper, as they would any other mathematics assignment, and use WeBWork only as the source and as the instant grader of their work.

**Suggestion 7:** *Work the problems first.*

Ideally, the instructor has worked out each problem chosen for a problem set before assigning it to the students. We say ideally because our experience has been that three in ten instructors make it a habit to do this. The payoff for them is that they can (1) anticipate mathematical and syntactical errors, and (2) it enables them to post hints for each problem in the "Set Info" window.

**Suggestion 8:** *Periodic meetings, virtual or face-to-face, with other faculty members using WeBWork can be very helpful.*

As noted above, instructors can join the national discussion among WeBWork users. Depending on the use of WeBWork at your institution, consider joining or creating a local faculty wiki or "Discussion Board." If available, a faculty (and student!) users manual can answer a lot of questions before they get to the instructor (e.g., a wiki Web site that both students and faculty contribute to locally). The manual might be a short and to the point read-only document. Whatever mechanism is used, include a section with answers to Frequently Asked Questions (FAQ).

**Suggestion 9:** *Set course policies about communication to facilitate student autonomy.*

Online instruction is a bit of a misnomer in that teaching in an online environment often involves other, "offline," methods of communication. There are several ways for students and instructors to communicate through and around WeBWork.

9.1. *Web:* Based on your experiences starting to work with WeBWork and on your familiarity with the students at your institution, create a page of links to WeBWork resources you think your students will find useful — then you can respond to many questions about logistical issues by pointing them to the Web page with the answer (instead of typing up the answer) in the reply email you send.

9.2. *Email:* While doing their homework, students will take advantage of the "Email Instructor" feature, as they should. Even though as

an online course instructor you will be on the net more so than instructors teaching traditional classes, it is a good idea to set some email priority rules to keep the number of emails manageable. For example, you might let students know in your posted course policies that when you receive email questions the first thing you ask yourself is: Is the answer to this question already available to a diligent student? Encourage students to exert at least five minutes' effort to answer their own question through the three most likely resources: the textbook; emailing, calling, or text messaging a classmate; the WeBWork help page you set up (see Suggestion 9.1 above). Additionally, in the syllabus or course policies, you can mention that you might send a very simple email in response to questions that are answered by these resources. Anything from "Read Section X.Y of the text and try again" to "My suggestion is to spend 30 minutes on this on your own by first reading Section X.Y, then working the examples through on paper for yourself. If, after you have completed that and have come back to your WeBWork assignment, you still have a question, please email me again with the details of your question."

- 9.3. *Telephone/messaging:* Telephone and text messaging policies can follow similar rules to those for email, above.
- 9.4. *Online discussion:* Have a WeBWork-dedicated thread as a "Discussion Forum" where asynchronous electronic conferencing allows students to post and answer messages. Our experience indicates that students may benefit from immediate communication by messaging or calling each other with small issues while research certainly suggests that such peer-to-peer reliance can be very good for student learning. However, ask students to post a summary of the problem and how they resolved it (e.g., with the help of a peer) on the Discussion Forum as an aid to students who may have the same or similar issue in the future.
- 9.5. *"Set Info:"* If you can anticipate some questions, place some general hints for that assignment using the "Set Info" part of WeBWork– it will appear on the right hand side of the screen (see Figure 2).

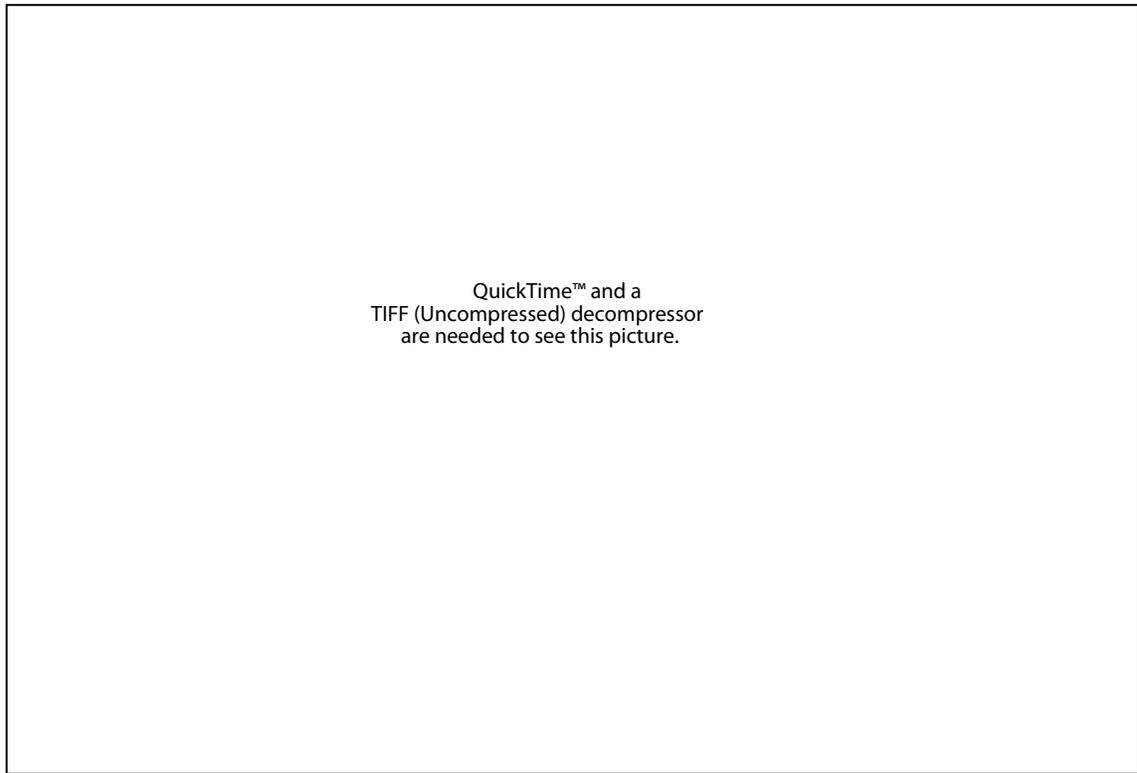


Figure 2: Set Info Screen

**Suggestion 10:** *Prepare for reluctance to learn new technology.*

Some people generally resist change. Be aware that students may not be as enthusiastic as the instructor is with the way the course is delivered and, worse, that their homework assignment is evaluated by a machine! Many students who feel forced to take an online course may have some (justified) reluctance to engage in the delivery method. Recognize this and deal with it in appropriate ways. Insight into the challenges of the first-timer experience as online instructor can be found in Conrad's (2004) article. Though many potential remedies are available in books and articles, two books we have found particularly useful along these lines are among the large collection by Palloff and Pratt (2003, 2005).

**Suggestion 11:** *Set up grading to encourage WeBWork completion.*

Studies show that WeBWork keeps students on task longer. In one study, this translated into the fact that low-performing students using WeBWork achieved a higher total gain in (post-test minus pre-test) scores than low-performing students using traditional paper-and-pencil

homework (Segalla, 2006.) Consider this fact when setting up your grading scale. Perhaps making homework count as heavily as, say quizzes or an exam, will support students to stay on task longer.

**Suggestion 12:** *Explore ways to use WeBWork to identify, explain, and correct conceptual errors.*

WeBWork is flexible, but it is not an artificial intelligence program that can pinpoint where a particular student or group of students made a conceptual error. One way to capitalize on the information WeBWork gathers on student effort is to first examine the WeBWork spreadsheet to see how many students in the class missed (or retried a great deal) a problem containing a particular concept. Prepare a subset of WeBWork problems that scaffold up to the big idea, perhaps as a follow-up activity or quiz. You might also recommend some tutorials and Web sites to students through the "Set Info" feature.

**Suggestion 13:** *Motivate course discussion through challenging WeBWork items.*

The instructor receives student performance information dynamically in the form of a spreadsheet and can easily see how students performed individually and as a class. As noted above in Suggestion 12, the instructor can identify homework problems that may need to be discussed as a class. A problem that shows a large number of tries and has a considerable number of wrong responses is one to consider for an enhanced presentation or "Discussion Board" activity. Perhaps even extend the deadline for completion of that particular item in WeBWork to allow time for online interaction around the problem.

**Suggestion 14:** *Be familiar with "the buttons."*

There are several important "buttons" in WeBWork available to the student to communicate with the instructor or to check their work before they submit it for a grade. Depending on the version of WeBWork you are using, these buttons may change name and location on the screen, but wherever they are, the "Help," "Feedback," "Print a hard copy," and "Preview" buttons are important to the successful use of WeBWork by the students. Spend some time on encouraging your students in their use. The flipside is that the instructor needs to take the time and trouble to tailor these helpful buttons to their local needs. Also, though "Set Info" is not a button, it merits the instructor's close attention and use.

## Conclusion

Given that homework is an important part of the teaching-learning process in mathematics and given that human nature is what it is, the typical college student does not spend enough time doing, checking, and reflecting on homework to learn the subject well. WeBWorK is not an ideal solution to the pedagogical disconnect between the instructor's efforts to have students master the material sufficiently well and the typical student's approach to homework, but it is a real and sensible partial solution. Until something better comes along, we highly recommend WeBWorK for mathematics homework for traditional and online courses.

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# **Adding Voice/Visual Interaction To Online Classes**

Donald Schwartz and Consolacion Fajardo

## **Abstract**

This paper discusses the addition of live voice/visual interaction to asynchronous online learning environment, utilizing voice over internet protocol (VoIP) technology. Reference is made to theories for successful online learning: andragogy, intentional learning/self-regulated learning, and engagement theory. It compares the learning activities in a traditional classroom with those in an online learning environment that offers both synchronous and asynchronous interactions. It analyzes the results of a 2006 survey at National University, a non-traditional university, as to why students enroll in online classes and their perception of the use of the voice/visual technology as an enhancement of their online learning experience.

## **Key Words**

VoIP, synchronous, asynchronous

## **Background Information**

The Sloan (2006) report showed that about 80% of students taking online courses are at the undergraduate level. The bulk of online students are adult or "non-traditional" learners, and more than 70% of those surveyed said that online education reaches students not served by face-to-face programs (Elaine & Seaman, 2006).

## **Theoretical Construct**

Andragogy, Self-regulated Learning , and, Engagement Theory are three different but related theories that are relevant to the question of what characteristics, qualities, and attributes contribute to adult learners' success in online learning.

## **Andragogy**

Andragogy is the art and science of helping adults learn (Lee, 1998). It focuses on the characteristics of adult learners and a set of assumptions for most effectively teaching adults: self-concept, experience, readiness to learn, orientation to learning, and motivation. The essence of the theory is that the adult learners need to be self-motivated and to be active participants in their own learning (Knowles, 1970).

## **Intentional Learning/Self-regulated Learning**

While not termed andragogy, the recommendations of the Accounting Education Change Commission (AECC, 1990) were based on the andragogical paradigm. AECC maintained that educators must prepare graduates to become accounting professionals by equipping students with lifelong learning skills. Intentional learning is the focus of the AECC monograph and is defined as learning with self-directed intent and choice of how and what to learn.

Smith (2001) describes lifelong learning as either self-directed learning or self-regulated learning. Self-directed learning is the term often used in the study of adult education outside a formal educational setting, while self-regulated learning focuses on students in a formal educational setting. Smith's study focused on the review of research on self-regulated learning.

Smith (2001) provided a self-regulated learning model that includes what she calls self-regulatory attributes and self-regulatory processes. Self-regulatory attributes include self-efficacy, self-awareness, and resourcefulness. Self-regulatory processes consist of attributions, goal setting, and self-monitoring. At the core of this model is self-motivation. Smith posited that self-regulatory attributes and self-regulatory processes influence the strength of the learner's self-motivation.

## **Engagement Theory**

Kearsley (2000) cited another learning theory called Engagement Theory, which may be viewed as another version of the andragogical paradigm. The Engagement Theory posits that the learner must be

actively engaged in a meaningful task to achieve effective learning. The Engagement Theory states that all learning must have three important characteristics: (1) collaboration or the interaction among students, teachers, and subject-matter experts via e-mail, discussion forums, and conferencing; (2) problem-based, which means that all student activities involve completing assignments or projects rather than taking tests or exams; and (3) authenticity where all course materials and activities are realistic and directly related to the student's interests.

### **Statement of the Problem**

In a totally asynchronous online environment, there are no live class sessions in which instruction and live interaction take place. The principal means of student/instructor interaction is through threaded discussions in which instructors periodically post discussion questions, and students generally have a few days to post responses to the instructor and to the responses of their classmates. However, threaded discussions do not provide the means by which an instructor can orally explain principles and processes, or illustrate concepts with visuals such as a whiteboard, spreadsheet, PowerPoint presentations and the like. Nor do they enable instructors to get instant feedback from students to gauge their level of comprehension. Nor in asynchronous threaded discussions can students interject questions, debate controversial issues, or otherwise learn from a live interchange of ideas.

### **Purpose of the Study**

The purpose of this study is to describe a new, emerging dimension of teaching/learning strategy to accounting online courses in the form of synchronous (live) class sessions using voice over internet protocol (VoIP) technology that we call voice/visual learning environment to increase interactivity and improve the learning experience of the students in the virtual classroom. It will also include a discussion of the benefits and limitations of the strategy.

## **Methodology**

This study includes a review of literature on the underlying theories that contribute to students' success in online learning. It includes an analysis of the 2006 survey at National University regarding the reasons why students enroll in online classes, and whether the use of synchronous chat sessions using audio/video technology rather than text-messaging enhanced their learning experience.

## **Discussions**

### *Traditional Teaching/Learning*

In a traditional classroom setting, the teacher delivers the course content to the students in a face-to-face environment where the instructor and the students are physically together (Knowles et al., 2005). Classroom activities require students to actively participate rather than just passively listen to the teacher's lectures to generate productive interaction between students and instructor, and among the students in the class. However, the traditional classroom setting requires that the students and the instructor be together physically, which for many students, especially working adults, is in conflict with job commitments and personal schedules. This has paved the way for online course delivery through the use of internet-based technologies.

### *Online teaching/Learning*

Online learning is a form of distance education. It refers to an instructional delivery in which the learners are geographically separated from the teacher and from each other, and learning activities take place through the use of internet and intranet technologies. Online learning is growing rapidly. The Sloan Consortium Study (2006) reported that overall online enrollment in the U.S.A. increased from 1.98 in 2003, to 2.35 million in 2004, and to 3.2 million in 2005 (a 36% increase from the prior year). Online learning utilizes a combination of audio, video, color, graphics and animation to stimulate students' interest. In most online courses, instructors and students do not interact simultaneously. Asynchronous communication takes place through what is often called threaded discussion, in which students respond to messages posted on a forum or Web site at times that are convenient to them. In synchronous communication often referred to as chat sessions, students and

instructor meet in a virtual classroom at a scheduled time, usually for an hour or two.

In a qualitative study to determine students' positive and negative experiences in hybrid class (a combination of face-to-face and online), El Mansour & Mupinga (2007) interviewed 12 students in a hybrid classes and 34 students in a purely online class. The results of the interviews indicated that in the online class, convenience, flexibility, and the instructor's availability were positive experiences, while technology problems and a sense of being lost in cyberspace were negatives indicated by the students.

In another study, Durrington et al. (2006) described how to establish an interactive online learning environment and provide strategies for increasing student interactivity. One strategy is problem-based learning in a synchronous chat room environment in which the exchange of ideas is encouraged and each member of the class participates in developing solutions to the problem. Durrington found that students demonstrate more positive attitudes and higher levels of performance when classes are highly interactive.

### *Asynchronous Threaded Discussion*

In a totally asynchronous online environment, there are no live class sessions in which instruction and live interaction take place. As stated earlier, the principal means of student/instructor interaction is through threaded discussions in which instructors periodically post discussion questions, and students generally have a few days to post responses to the instructor and to the responses of their classmates. Such asynchronous interaction is particularly effective for questions that call for reflection and critical thinking. But it does not allow an instructor to orally explain accounting principles and processes, or to use visuals such as a whiteboard, spreadsheet, PowerPoint presentations and the like. Nor does it allow instructors to get instant feedback from students to gauge their level of comprehension, nor for students to interject questions, debate controversial issues, or otherwise learn from a live interchange of ideas.

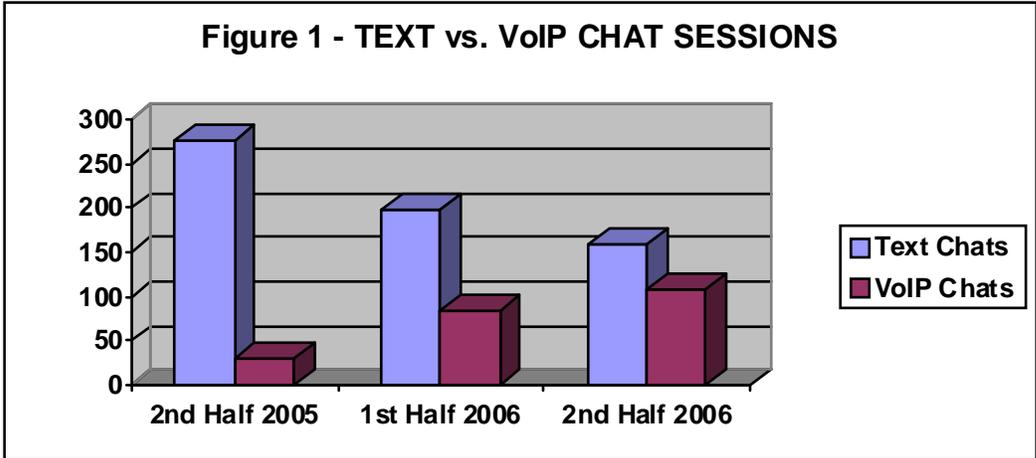
Most online communication is text-based with interpretation of conceptual understanding contingent on the students' ability to express their ideas through typewritten messages. Assessing the quality of these messages is difficult and instructors often look at

volume as an indicator of participation, rather than at cognitive presence or critical thinking.

Dooley & Wickersham (2007) used content analysis based on the critical thinking indicators by Newman, Webb & Cochrane (1995) to measure the level of critical thinking in threaded discussion with smaller groups compared to the whole class discussion. Twenty eight (28) online graduate students were the subject of the study. The authors concluded that discussion forums with fewer individuals have the potential to provide an environment for learners to have equal opportunity to voice their opinions and thoughts and demonstrate their understanding to their peers and instructor.

### *Synchronous Voice/Visual Chat Sessions*

To overcome the limitations of what is essentially a two-dimensional text-based learning environment, some universities are adding a third dimension to their online courses in the form of synchronous (live) class sessions that make use of voice over internet protocol (VoIP) technology, to provide what is here called a voice/visual learning environment. National University, a private, non-profit and non-traditional university of higher learning, started offering online classes since 1999 in the School of Business and Management that included accounting course EXE 682, a combination of financial and managerial accounting in the MBA program. The use of VoIP technology for voice/visual chat sessions started with a single online course in July 2005. In the second half of 2005, 10% of the online classes used VOIP. In the first half of 2006, 30% used VoIP, and the second half of 2006, the percentage doubled to 60% (National University, 2007). While instructors are encouraged to use VoIP technology to provide students with a voice/visual learning environment, the use of VoIP is not mandatory, and some faculty members still prefer the text-based chat sessions, perhaps because they are more comfortable with that environment.



Though the system accommodates Web cams, they are not used, at least for the time being, because of bandwidth constraints that would seriously degrade audio quality, especially for those students with dial-up internet connection. The technology does, however, permit a function called application sharing in which instructors can display on their computer screen virtually any software application, and have the students view the instructor's screen rather than their own, while listening to the instructor's oral presentation. In a similar manner, students can present their papers or projects to their classmates. As shown in Table 1, this voice/visual environment permits the use of a wide variety of teaching/learning activities that come close to matching those of a traditional classroom. In a typical voice/visual learning environment, both the instructor and the students have headsets with microphones, the cost of which is about \$25 to \$30. There is no charge for the software.



This portion of the screen for application sharing of visuals such as spreadsheets, Powerpoint slides, websites, etc.

	January Actual	February Projected
	4,000	5,000
	\$40,000	\$50,000
	24,000	?
	21,000	?
Total Costs	45,000	?

This portion of the screen for "hand raising", speaker's photo, names of participants, and text messaging.

Table 1 – Comparison of teaching/learning Activities: Traditional versus Online

Learning Activity	Traditional Classroom	Online	
		Asynchronous only	Asynchronous + Live Voice/Visual
Key concepts are orally explained by Instructor using visual aids to illustrate	Instructor orally explains key concepts, using whiteboard, handouts, spreadsheets, PowerPoint, and other visual aids	No oral communication in asynchronous courses  Students download and view visual aids independently	Instructor orally explains key concepts, and uses whiteboard, handouts, PowerPoint, and other visual aids via application sharing
Instructor builds solutions to numeric problems	Instructor builds solutions to numeric problems on the whiteboard	Whiteboard not available in asynchronous classes	Instructor builds solutions to numeric problems on a whiteboard or spreadsheet
Discussion questions	Oral discussion: Assigned discussion questions are discussed orally in class	Threaded discussion: Students post responses during a prescribed period.	Both asynchronous threaded discussion and synchronous oral discussion are used
Case discussion	Case issues are discussed orally in class	No live class discussion in asynchronous classes	Case issues are discussed orally in class
Spontaneous interaction	Instructor intersperses oral explanation with Socratic questions	No live interaction in asynchronous courses	Instructor intersperses oral explanation with Socratic questions
Sharing of real-life experiences	Instructors and students can tell personal “war stories” of relevant real-life experiences	Oral story-telling not available	Instructors and students can tell personal “war stories” of relevant real-life experiences
In-class group	Depending upon	In-class group	Groups go into

work	available classroom space, students can work together in small groups	work not available	separate virtual classrooms for a specified period of time, then return to the class
Team assignments and study groups	Students meet in person if located reasonably close	Students might meet via telephone or email	Students meet in separate virtual meeting rooms using voice/visual communication
Student oral presentation	Students orally present their project, generally using PowerPoint to illustrate	Oral presentations not available	Students orally present their project, generally using PowerPoint to illustrate
Software demonstration	Instructor demonstrates software tools such as electronic research methods, spreadsheet, database, tax return, and the like	Live demonstration not available	Instructor demonstrates software tools such as electronic research, spreadsheet, database, tax return, and the like
Guest speakers	Guest speakers can be invited to come to class	Live sessions not used	Guest speakers can be invited to speak to students from their home or office
Recording of class	Classes are generally not video-recorded	Online website accessible during the period of the course	Both online website and downloadable recording of live sessions are accessible

### *Limitations of the Live Class Sessions*

The downside to live class sessions is less flexibility. Students do not have the option of attending live class sessions at times of their own

choosing, although they can play back a video recording of the sessions they miss.

Another constraining factor inherent in the current level of internet-based technology is the delay of a few seconds between the time the words are spoken and the time the internet delivers them to the listeners. This requires the instructor to manually switch “the floor” from one speaker to another by mouse clicks on participants’ names, which slows the pace of the interaction. Also, if a student has a low-speed internet connection, the speaker’s voice sometimes breaks up, or speeds up; this makes the speaker sound – as one survey respondent put it – like a Munchkin. And there are other glitches, such as students occasionally losing their internet connection and having to log back on.

### **National University 2006 Survey of Online Learners**

In 2006, a survey was taken of non-traditional students who were taking online courses at the National University. Many of the 866 respondents had full-time jobs, or were caring for small children at home, or both. About 25% of the respondents indicated as the reason why they were taking courses online rather than on-campus, “I am not able to attend evening classes on campus because of my work or personal schedule.” Another 25% answered, “The courses were offered on-campus and I could have attended them, but I prefer the flexibility of doing schoolwork at times that are convenient for me.” The students in the first group would probably be unable to attend live class sessions at a scheduled time. The students in the second group, even though able to attend live class sessions, would probably prefer not to. But 50% of the respondents gave reasons, such as travel distance to the campus that would not permit them to attend scheduled sessions. Approximately 50% of the respondents actually did attend online courses that offered live voice/visual class sessions (National University, 2007).

Despite the issues with the current internet technology, more than 80% of the survey respondents who had experienced live voice/visual class sessions favored having them in their online courses. For those students, the benefits of live class sessions outweigh both the reduced flexibility and the technology issues, which issues are likely to be resolved as technology improves.

## Conclusion

Engaging the students in various synchronous as well as asynchronous activities provides more opportunity for students to be actively engaged in the learning process and facilitates their successful completion of online classes. The various theories mentioned in this study point to the fact that successful online learners are adult students who are self-motivated (Knowles, 1970), confident in themselves, and have a strong drive and determination to succeed (Smith, 2001). Students demonstrate more positive attitudes and higher level of performance when online classes are highly interactive (El Mansour et al., 2007). Active learning, as opposed to passive learning, has become a key concept in the online classroom.

As more universities incorporate voice/visual class sessions into their online courses, students who, because of location or commitments at work or at home, are unable to attend on-campus classes, will have available in their online courses a learning environment that is comparable to the traditional face-to-face classroom experience.

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# **A Web-based Intelligent Tutorial System**

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## **Abstract**

Appropriate use of computer technology in the learning process has been lacking and many Web-based and standalone tutorial systems in today's marketplace do not provide material that teaches students in an enjoyable and effective way. This paper proposes a Web-based Intelligent Tutorial System that will present material in an intuitive, interactive, and innovative manner while focusing on ways to integrate qualitative and quantitative methods throughout the learning experience. In this system, the lessons are guided by the actual skill set of the student taking the course. The system evaluates the student's state of knowledge through examination and, depending on the specific percentage and level of questions they answer correctly, it will guide them through a lesson plan tailored to their learning needs. The students take these exams at regular intervals and the lesson plan is adjusted in accordance to their learning at each specific level. The emphasis in this proposal is Algebra, as it provides the basis for higher learning in any field of study.

## **Key Words**

Intelligent tutorial systems, computer-assisted learning, mathematics teaching, Web-based learning

## **Introduction**

The application of computers to learning and teaching has evolved from simple text to audio and visual communications. Computer Assisted Instruction (CAI) and Computer Based Training (CBT) began in the early 1960s and evolved into Intelligent Computer Aided Instruction (ICAI) and Intelligent Tutorial Systems (ITS) (e.g. Barr and Fiegenbaum, 1982; Beck, Stern and Haugsjaa, 1996). With the introduction and expansion of the Internet, additional components dealing with the human-computer interface were added to the ITS and new terms, such as Web intelligence and Intelligent Learning Environments (ILEs), were developed (e.g. Mavirkis and Maciocia, 2003).

One of the most important application areas for an ITS is mathematics. U.S. students are behind in mathematics skills, when compared to those of Asia

and Europe, and the National Research Council and the U.S. Department of Education conducted a study (Bransford, Brown, and Cocking, 1999) to evaluate teaching and learning and the use of technology. The committee recognized that the proper use of computer technology helps the learning process. A number of technology-based tutorial systems are now available in the market for K12 students. However, most tutorial systems in the marketplace do not provide an innovative tutorial course that teaches students in an enjoyable and effective manner. Learning is a complex process and use of technology may not always promote learning. "Inappropriate uses of technology can hinder learning--for example, if students spend most of their time picking fonts and colors for multimedia reports instead of planning, writing, and revising their ideas" (Bransford, et al. 1999). Developing a tutorial system that incorporates the user's learning goals contextually and uses technology appropriately to meet these goals in an innovative learning environment is a challenging task. Most systems provide tutorials that have links to text-based pages that make learning slow and tedious. Even the tutorials with some visual interfaces seem dry and congested with more material than what should be presented to the student, or the interface is not intuitive. An end user can be overwhelmed and lose interest in such a format. There are not many tutorial systems in the market that teach math effectively and many use a general knowledge approach with no well-defined boundaries. It is necessary to define the elements of a good tutorial system to address this problem.

## **Computer Learning and Education**

What makes a good tutorial system? Some experts say that learning should occur in context, be active, social, and reflective (Pennsylvania State University, 2003-2007). The three learning styles are visual, auditory, and kinesthetic and computer-based courses should utilize all three styles. Most of the information is visual and auditory, but it can also be kinesthetic, as the user interacts with the system via the keyboard and mouse. The kinesthetic interaction determines how the student gets involved with the material as they move from the passive modes, see and hear, to the active modes, touch and react. The four basic teaching styles are formal authority, demonstrator or personal model, facilitator, and delegator. The first style has the teacher dictating what students learn with no concern about creating a relationship between the teacher and students. The second style has the teacher as a coach guiding the students and creating a relationship between them, but it is still instructor-centered. The third style is student-centered and the teacher facilitates the material and activities, but the learning becomes part of the student responsibility as they collaborate with each other. The last style is strictly student-based, as the instructor delegates the

responsibility of learning to the students. They work on projects in groups or independently and the teacher assumes the role of a consultant. In order for Web-learning to be active, social, and reflective, it should use the last two teaching styles and emphasize the kinesthetic approach of learning, where the student becomes involved and active.

The proposed system instructs and helps students to master basic algebra skills geared toward Advance Placement (AP) courses and provides an enjoyable, interesting and easy way to learn the material. The system makes the students responsible for their learning and, because it is Web-based, the student must be self-motivated to start and finish the course on their own. Thus, Web-based learning systems should mainly use the third and fourth teaching styles to be successful. One of the most important goals for the proposed system is to provide students with a tutorial that will enable them to develop appropriate math skills. The system will concentrate on an ontology authenticated by a subject matter expert that corresponds to the important skill sets needed for a full mastery of an algebra course. The system makes the learning experience interesting through a well-designed intelligent user interface that provides an enjoyable experience through interactive game-like and entertaining lessons. An interactive system is a key in the success of the student and the course is not solely text-based and motivates and maintains student attention through active participation in the learning process, as described in the design section of this paper. This project will develop a system specifically for Algebra, as it is a fundamental skill set that students must master to move forward in many areas.

The course is Web-based since the Internet is what many students are actively involved in with a significant portion of their daily lives. Familiarity with myspace.com, MSN, Yahoo, AIM messenger, youtube.com, and Napster are commonplace and on the rise. Experts say that students using Algebra with computer materials are better problem solvers (Matras, 1988). Also, Edwards (1995) cites that a revolution in secondary education in the United States is underway. Classes taught over the Internet will soon be remaking today's high schools. Education on demand 24 hours a day, seven days a week, is now a "virtual reality." Individualized schooling and instruction will be available whenever and wherever a person chooses. Following this premise, the tutorial is designed to be available online for any student to use. One more component of the system is the use of Artificial Intelligence (AI). According to Viadero (2007), students who use intelligent learning systems make learning gains that translate, roughly, into the equivalent of as much as one letter grade. He further states that since the 1970s, the National Science Foundation, the Pentagon, and the U.S. Department of Education have opened their wallets to seed research and development of intelligent tutorial systems. The proposed Web-based Intelligent Tutorial

System uses AI methods to determine the skill sets of students and guide them through the courses at the appropriate levels until they master the fundamentals.

## Survey of Current Systems

It is apparent that many systems emphasize the contextual approach more than the active, social, and reflective components of learning. Some products analyzed for this project are application-based systems, such as Encore High School Advantage 2004, Encore Math Advantage 2007, and Weekly Reader Mastering High School & SAT Math (2008). Also a number of Web-based tutorials, such as Free Math Help (freemathhelp.com) and The Math Page (themathpage.com), are evaluated for their characteristics.. A matrix of the systems and their capabilities is included in Table 1.

Table 1. Comparison of Computer-Based Tutorial Systems

Only Algebra courses were considered.								
	Interactive Lesson	Video Lesson	Interactive Quiz or Exercise	Game	Access through Internet	Software Disc	Adaptive Study Plan	Administrator Function
AP Mastery Online	○	○	○	○	○		○	○
Coolmath.com			○		○			
Encore High School Advantage 2004		○	○	○		○		
Encore Math Advantage 2007		○	○	○		○		
FreeMathHelp.com		○			○			
Purplemath.com			○		○			
TheMathPage.com					○			
Weekly Reader Mastering High School & SAT Math (2008)	○	○				○		

Most of these systems' lessons are text-based and, although some have interesting graphics, navigation is still not optimal. Joshua (1996) cites that graphics and sound have progressively supplanted the written word as a general conveyor of information; however, not even graphics and sound assists in learning if not done correctly.

## Algebra Course Ontology

The ontology that is utilized for the Algebra course is shown in Table 2.

Table 2. Ontological Structure for Algebra

1. Integer Exponents
1.1 Definition of Exponents
1.2 The Product Rule for Exponents
1.3 Zero as an exponent
1.4 Quotient Rule for Exponents
1.5 Negative Exponents
1.6 Power Rule for Exponents
1.7 Products to Powers Rule for Exponents
1.8 Quotients to Powers Rule for Exponents
1.9 Simplifying an Exponential Expression
2. Scientific Notation
2.1 Writing a Number in Scientific Notation
2.2 Write a Scientific Number in Standard Form
3. Radicals
3.1 Basic Rules
3.2 A Product of Two Radicals With the Same Index Number
3.3 A Quotient of Two Radicals With the Same Index Number
3.4 Adding and Subtracting Radical Expressions
3.5 Rationalizing the Denominator With One Term
3.6 Rationalizing the Denominator With Two Terms
4. Rational Exponents
4.1 Rational Exponents and Roots
5. Polynomials
5.1 Definitions
5.2 Types of Polynomials
5.3 Adding and Subtracting Polynomials
5.4 Multiplying Polynomials
5.5 Binomial Squared
5.6 Product of the Sum and Difference of Two Terms
5.7 Binomial Cubed
6. Factoring Polynomials
6.1 Factoring a Polynomial
6.2 Factoring Trinomials of the Form
6.3 Prime Polynomials
6.4 Factoring a Perfect Square Trinomial

6.5	Factoring a Difference of Two Squares
6.6	Factoring a Sum of Two Cubes
6.7	Factoring a Difference of Two Cubes
7.	Simplifying Rational Expressions
7.1	Definitions
7.2	Simplifying a Rational Expression
8.	Multiplying and Dividing Rational Expressions
8.1	Multiplying Rational Expressions
8.2	Dividing Rational Expressions
9.	Adding and Subtracting Rational Expressions
9.1	Adding or Subtracting Rational Expressions with Common Denominators
9.2	Adding and Subtracting Rational Expressions without a Common Denominator
10.	Complex Rational Expressions
10.1	Definitions
10.2	Methods of Simplifying a Complex Fraction
11.	Complex Numbers
11.1	Definitions
11.2	Addition and Subtraction of Complex Numbers
11.3	Multiplying Complex Numbers
11.4	Dividing Complex Numbers
11.5	Square Root of a Negative Number

The flowchart for the proposed Web-Based AP Algebra System is shown in Figure 1.

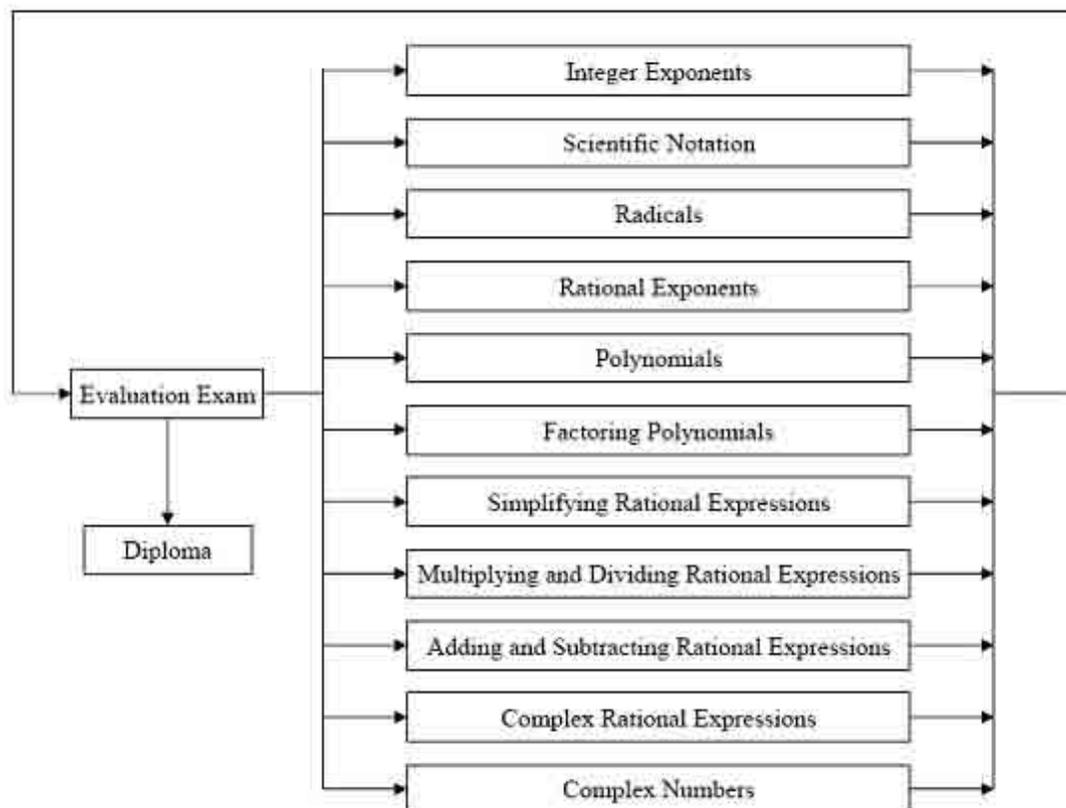


Figure 1. Proposed Web-Based AP Mastery Design

The system design consists of Web-based technology comprised of XHTML components, ASP.NET 2.0, C#.NET 2.0, Adobe Flash and ActionScript 2.0, and a Microsoft SQL 2005 database where the knowledge base resides. The prospective students access the AP Mastery Online Web site where they are presented with a splash screen and then directed to the site's main welcome page. From the menu they can get information for course descriptions, a brief history of the project in an about page, a support page and how to contact project's administrators, and a login page. In the login page, the students are asked to create an account and then enter their credentials. Once logged in, they are redirected to the restricted area where they can access courses they have permission to take. The course main menu includes: Lessons, Video, Examples, Games, Quiz, and Mastery Exam pages. On the main page, the students are asked to take an entrance exam for the system to determine at what level they should start in their respective course.

The lessons are mainly composed in Adobe Flash and they are interactive. The videos are also embedded in Flash technology and they provide short how-to instructions. Students also can look at step-by-step examples of how to solve word problems and interact with Flash-designed games that enhance their skills at problem solving. There is also a quiz section that is not tracked in the database but serves as a practice session. There is a Master Exam page that the student can take when they want to move to new lessons. The system determines the lesson flow, as described in the following paragraphs.

### **Logistics and Intelligent Components**

The intelligent component logistics to determine student’s skill levels by the system are given below, along with a UML Diagram describing the actors and interactions. The main flow of the program is shown in Table 3.

Table 3. Program Flow

• The student takes entrance exam
• The system analyzes entrance exam and determines student level
• Student takes curriculum according to the level determined by the system
• Student takes evaluation exam
• System determines new level for the student
• Student takes new curriculum
• Student takes new evaluation exam
• System determines new level
• Process repeats until student reaches top level
• If student passes top level then diploma is printed

An additional function allows administrators to add questions for exams to the knowledge base.

Figure 2 shows the Unified Modeling Language (UML) diagram where the main actors of the system are the instructor, the student, the system administrator and the database, which contains the knowledge base.

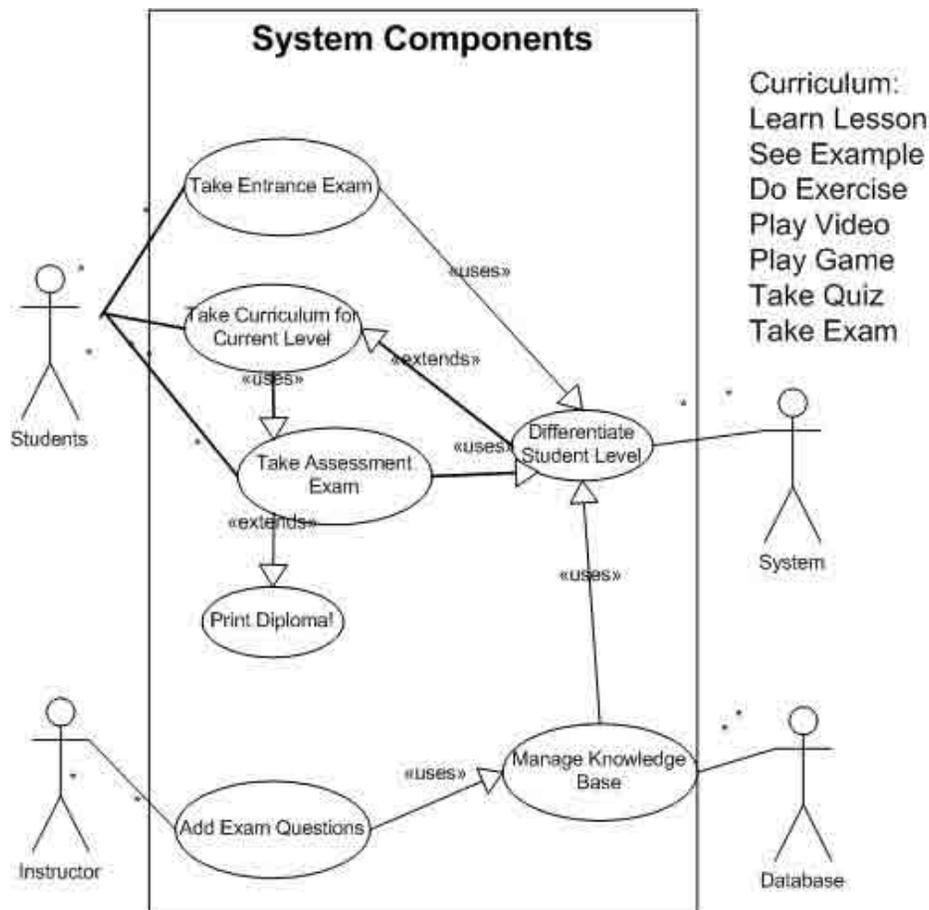


Figure 2. UML Diagram

When the students take the entrance exam, they are presented with a pool of 55 questions. These questions are taken from the knowledge base and represent five questions from each lesson in the course (a total of 11 lessons for the Algebra course). According to the percentage of questions the students get right from each lesson set, the system determines where the students should start. For example, if the students get five questions right for lessons one and five for lesson two, but then only four in lesson three and none thereafter, the student is started at lesson three. The percentage for question answered correctly for each lesson is averaged and then a total average for all lessons is determined taking into consideration the average per each lesson. Out of this formula the system determines where the student should be. The student progress is stored in the database and used as reference for future calculations as the student retakes the exam to advance lessons. Getting the students to take the exams would prove as a challenge. How does the system engage the students to take the exams, and encourage them to want and keep going with their lessons? This is

where the innovation in the course is provided. During each lesson, the student is presented the material via an assortment of media and graphic interfaces designed to engage the students in the course. The students get a Flash presentation designed with 3-D graphic animations for the topics. Now and then the system will pop up a video or game for the student to play and diversify the teaching strategy. Also, if the system determines that the student has been inactive for a lengthy amount of time (say 15 minutes), it will pop up snippets of Algebra-related jokes or some small puzzle to solve. Keep in mind that the student also can go to the video, game or quiz, and take the mastery exam on their own from the menu bar. Most of the questions will emphasize problem solving and the games will have to do with solving a mathematical problem. We try to emphasize interaction and make the learning enjoyable by providing assorted learning techniques. A sequence diagram for the system is shown here in Figure 3.

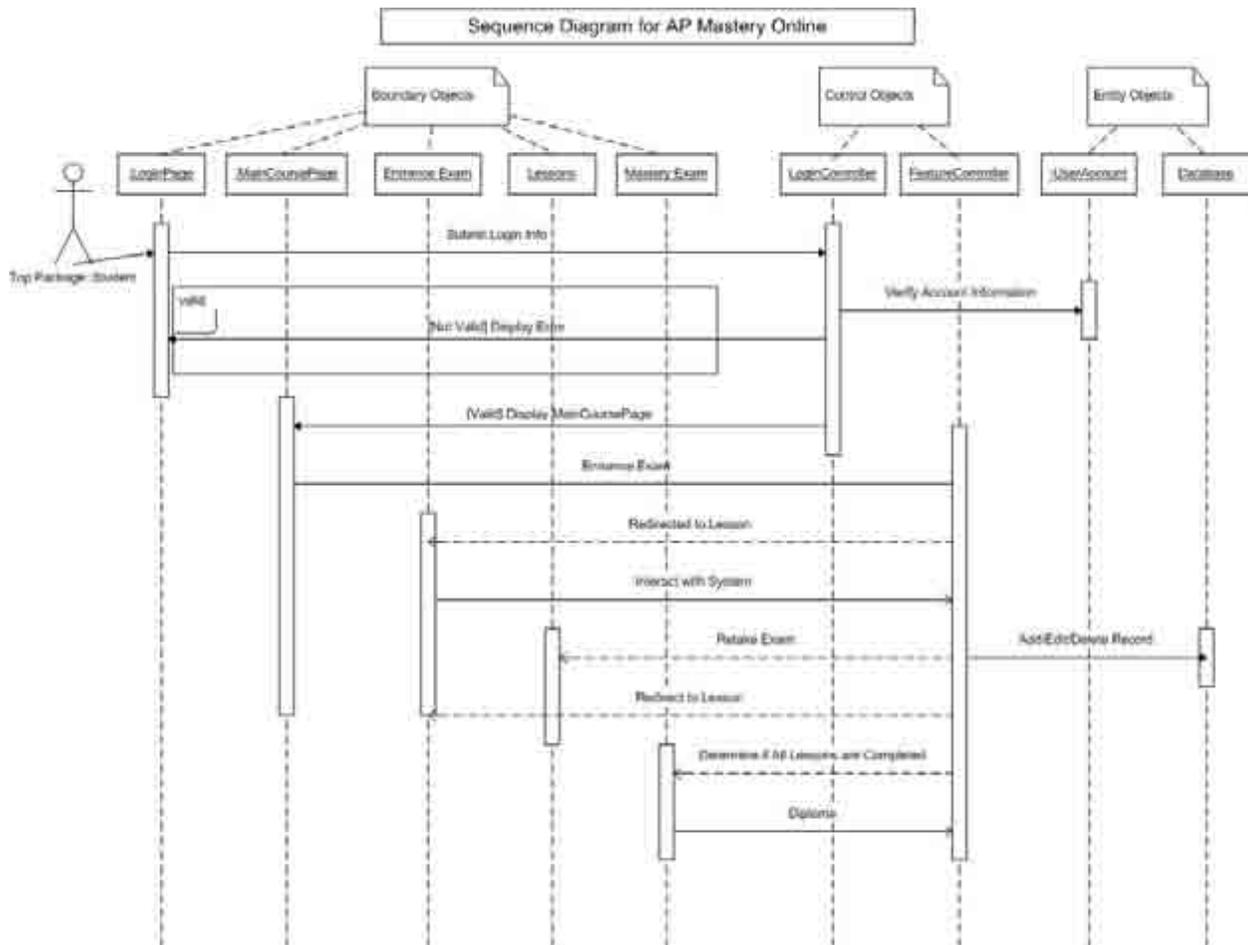


Figure 3. Sequence Diagram

## **AP Mastery Online Architecture**

The system architecture is comprised of Microsoft Internet Information Services (IIS) 6.0 as the front end and Microsoft SQL 2005 server for the backend. Students are required to have an Internet connection to access the courses with any browser that supports the Flash plug-in. The system will use session and profile states to keep information the user enters, and that needs to be posted to the active database. The site provides links where needed plug-ins can easily be downloaded and installed. Since the students do not install the system in their own computers, a Web and Database server is needed to host the Web application and its components. The recommended equipment is a datacenter class server running with dual Xeon processors and having at least 2 GB of buffered memory. Hard drive space needed is at least 5 GB for the operating system partition and at least 20 GB for the data partition. The machines should run Microsoft 2003 Server Operation system.

The database prototype consists of seven tables: Scores, Users, Ontology, Exercises, Answers, Examples, and Steps. The primary keys that will keep the Entity-relationship Diagram (ERD) structure integrity are: ExampleID, ExampleStepID, SubjectID, ExerciseID, ExerciseAnswersID, ScoreID, and UserID. The ERD is shown in Figure 4.

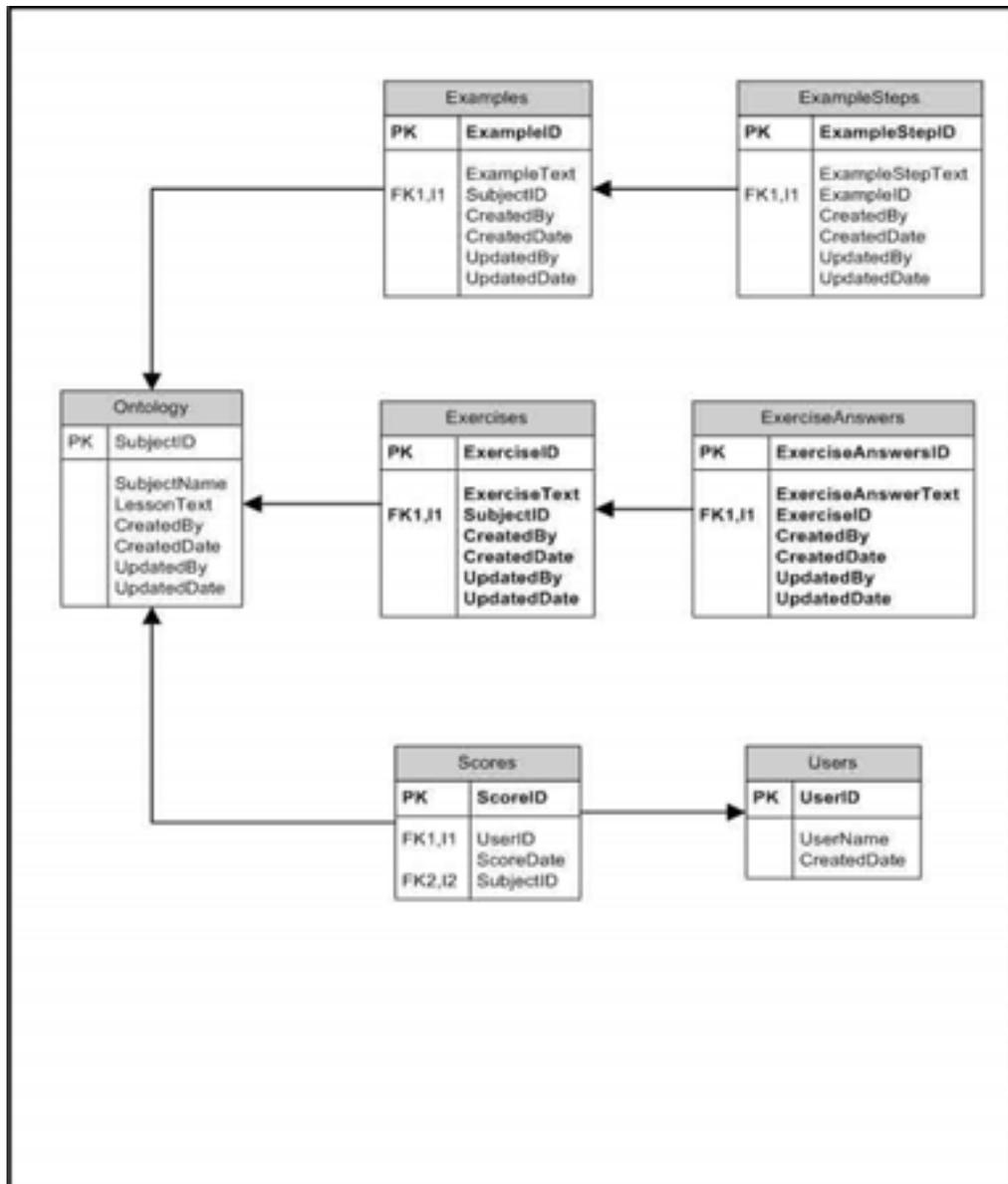


Figure 4. Database Components

## Conclusion and Recommendation

Education in science and mathematics in the United States has been declining significantly. According to the Business Roundtable Newsroom (2007), the problem-solving skills of high school age students was the largest percentage for low performers of any developed country due to declining interest by Americans in science, math, and engineering. The AP Mastery Online tutorial has that statistic in perspective and strives to make these subjects fun and attractive for students. For further design of the

course, a more robust intelligent system might be implemented, as well as the use of voice interaction.

This paper proposed the improvement of online learning via different teaching styles and a variety of technologies, and hopefully the improvement of students' interest in the sciences in the future. If teachers can design tutorials that are entertaining and captivating, learning can be seen as a game or entertainment instead of something uncomfortable to have to do for prospective students. Finally, as an article in *Ethnic NewsWatch* (2007) states, technology has changed almost every form of communication, including the communication between student and teacher. Online teaching and the learning processes are an appropriate communication application for improvement.

URL: The prototype of this system can be viewed at:  
<http://nucri.nu.edu/wits.html>

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# **Strengthening Teaching Communities through Online Professional Development**

Robyn A. Hill

## **Abstract**

A growing trend in higher education is the use of part-time adjunct faculty to teach significant portions of a university's curriculum. While full-time faculty members remain in relatively close contact, thus forming a stable professional community, most part-time faculty are not closely associated with their departments, which leads to a number of problems. These include: inadequate understanding and interpretation of instructional documents and course requirements; considerable differences in teaching methodologies; lack of clarity regarding teacher interactions and functions, especially for adult learners and within online environments; problems with adjunct retention; and reduced student learning outcomes. In order to integrate part-time instructors more fully into the university community, instill a greater sense of commitment, and maintain consistency and rigor of teaching and learning, institutions of higher learning need to create effective, integral and continuous opportunities for professional growth. This paper describes a professional development model designed to achieve these goals, as well as the results of its pilot implementation at National University in March 2007.

## **Introduction**

A student at the university where I teach recently expressed her frustration with an online class. After having had several excellent instructors, the inexperience of the current one was glaringly obvious. I asked her to do me a favor and document her concerns. A few weeks later, she handed me a folder with printouts of the syllabus and discussions, as well as several pages of handwritten notes. Among her observations were the following:

- The syllabus contained erroneous information, including incorrect testing dates and times, references to non-existent lectures, and confusing, contradictory course requirements.
- The instructor did not log into the class until the second week of the four-week course.

- The instructor did not provide any lectures, PowerPoint presentations, Web links, or other didactic materials.
- The instructor did not participate at all in several of the discussions and his postings in the others were of a very general nature that the student described as "vague." In other words, they did not impart important information about the course content; provide clarification; support, guide, manage, model, inspire, or otherwise advance the conversation.
- The instructor often took several days to respond to inquiries and was not available at all on weekends.
- The instructor did not post any grades until the beginning of the third week of the four-week course and did not provide any substantial feedback on the assignments.

Needless to say, the students in this class did not benefit from the expertise of this instructor in terms of his content knowledge because any learning that occurred resulted from reading the textbooks and student-to-student interaction in the discussions, rather than from informative instructor postings and timely, constructive feedback on assignments. Though it is unclear whether this particular instructor would have been more effective in a face-to-face classroom, at the very least, he was unable to make an effective transition to an online teaching environment. This example serves to highlight the profound necessity for institutions of higher learning to provide effective, integral, and continuous opportunities for professional development to all faculty members (Yang & Cornelius, 2005; Serdyukov & Hill, 2005). Not only do such opportunities improve the quality and consistency of the delivery of a university's course offerings, but they also serve to strengthen teaching communities and promote closer professional collaboration between all instructors (Serdyukov & Tarnopolsky, 2000; Wenger, McDermott, & Snyder, 2002).

Though many institutions of higher learning still employ a large contingent of full-time faculty members, the advent of more distributed systems, multiple campuses, and Web-based education, as well as cost-cutting and efficiency concerns, have all led to greater use of part-time faculty (Singleton, 2004). Certainly the professionalism and academic credentials of the majority of these adjuncts are high. Nevertheless, due to the fact that their backgrounds may be limited to teaching in conventional, classroom-based colleges with a younger student population, many adjuncts may be ill-prepared for the challenges of the changing face of higher education, especially with regard to adult learners and the rapidly growing popularity of distance education. Furthermore, if these instructors are not fully integrated

into the professorial community of a given university, discrepancies in the way they interpret and implement course syllabi and evaluation criteria may lead to lower standards for academic rigor or, conversely, requirements that are too demanding; both of which eventually may result in poorer student learning outcomes (Serdyukov, 2001).

Whereas full-time faculty members often share a common vision and academic culture, continuous professional development and support for all faculty members would provide a foundation for increased collegial collaboration and a mechanism by which all instructors could be kept current on modifications to the curriculum, changes in school policies, and innovations in teaching methodologies (Kabakci & Odabasi, 2004). For reasons of quality control, consistency, integrity, and accreditation, it is incumbent upon institutions of higher learning to support all instructors and nurture a professional learning community (Gold, 2001; Heaton, Pauley, & Childress, 2002; Deubel, 2003). Such a mechanism would also allow all instructors to receive support for teaching, such as expert advice from supervisors and peers; answers to questions about policies, procedures, and expectations; and access to updated instructional materials. Ideally, there would also be plentiful opportunities for interaction to exchange opinions, suggestions, and findings in a way that would foster collaboration within a learning community. This notion is supported by De Vries and Kommers (2004) who note that “the big issue for an individual is not how to become a professional, but rather how to stay one and how to develop further as a professional...they need to reflect-in action...and be supported by social networks of fellow professionals” (p. 116).

National University is an example of an institution of higher learning with a distributed system that serves a predominantly working adult student population. Its Teacher Education Department employs approximately 50 full-time faculty members and more than 800 part-time adjuncts across a system that encompasses 34 learning centers in California, Hawaii, and Nevada, as well as an extensive array of online programs. Adjunct instructors normally teach between six and 12 accelerated, intensive one-month long courses per year both online and onsite, depending on their qualifications, quality of work (evaluated primarily through student evaluations), and physical proximity to one or more of the aforementioned learning centers.

Due to the unique accelerated, one-month course format and specific adult student population at National University, all instructors, full-time and part-time, must possess an effective skill set that allows

them to teach and support working adults who are often juggling employment, families, and schoolwork in their pursuit of a degree or credential. Those who teach online also require both the technological and pedagogical (or andragogical) expertise to teach and mentor these students in a virtual environment (Schoenfield-Tacher & Persichette, 2000). In order to develop and maintain these important skill sets, faculty members must mentor and support each other. Whereas full-time faculty members often work together in their departments; collaborate on projects, research, and course development; maintain continuous communication; and attend numerous meetings that bring them all together; the majority of adjunct instructors do not generally communicate and collaborate with full-time faculty members on a regular basis. Thus, problems of isolation and lack of quality control persist. DeVries and Kommers (2004) argue that "involvement and participation create a sense of responsibility and ownership and, hence, greater commitment to the community" (p. 19). Therefore, at National University, and similar institutions of higher learning, it is imperative that continuous professional development be a priority, both for the sake of the adjunct instructors, as well as the learning outcomes of the students that they serve, and the success of the university's programs.

Although it may be feasible to arrange for face-to-face meetings with all adjuncts and full-time faculty members at institutions with a central campus, this is logistically more difficult and costly to arrange at institutions with a more distributed system. Localized meetings at specific campuses or learning centers are certainly beneficial, but may not allow for the type of broad-based communication among whole groups of instructors teaching the same courses or within the same programs, for example, that would significantly improve quality and consistency in course delivery, evaluation criteria, and student outcomes.

Therefore, there is a need to establish a continuous online professional development community based on integrated resources, practicality, and personalization (De Vries & Kommers, 2004). This paper will describe a course-specific model for teacher professional development that we have been developing and implementing since 2003 (Serdyukov & Hill, 2005) with the express purpose of accomplishing the following goals:

*Update instructors on curricular and policy changes*

Lack of communication can be a problem in any field, especially in higher education where such issues as program prerequisites, requirements, state standards, course content, accreditation concerns, appeals procedures, and other curricular and policy changes may critically affect both instructors and students. A central location for communication regarding administrative changes is an efficient way to keep everyone in the community well informed, especially if it provides opportunities for two-way communication and timely responses and feedback (Al-Ashkar, 2002).

### *Maintain instructors' methodological competency*

For schools such as National University that target primarily working adult learners, an important factor for the instructors' success in the classroom is the application of principles of andragogy to teaching (Ryan & Serdyukov, 2003). For example, instructors must understand that adult learning is based on the andragogical assumption that adults tend to be self-directed learners who are shaped by the accumulation of authentic personal experience. Knowles (1991) reminds us that adults are goal-oriented learners whose motivation tends to be intrinsic; and whose life experiences should be viewed and utilized as a unique resource within a learning community. Instructors must be able to strike a balance between providing an explicit framework of study and allowing adult learners to pursue knowledge within those boundaries. Brookfield (1985) further emphasizes that collaborative learning is a key aspect of andragogy where both facilitators and learners become part of an educational process that is both active and reflective, and where the traditional hierarchy among facilitators and learners is more democratic.

Moreover, instructors must be well prepared for the challenges of teaching their specific content in both online and onsite environments. In addition, the specificity of the course format at National University (an accelerated, one-month long course format) requires a special approach to teaching and learning (Greiner, Serdyukov, Subbotin, & Serdyukova, 2004). Delivery of the course content within this type of compressed framework demands very efficient planning, organization, and management of the instructional process, information presentation and processing, and skill development (Serdyukov & Serdyukova, 2006). Thus, the online seminar format helps to maintain the consistency and rigor of student learning outcomes by providing instructors with materials, resources, and explicit, specialized expertise to teach their courses more effectively, both online and onsite.

*Preserve a universal level of requirements, standards and quality of learning outcomes, stressing common ground as opposed to strict uniformity*

Though instructors certainly bring diversity to their classrooms in terms of the delivery of content, it is essential that all instructors within the same institution demonstrate commonalities with regard to specific course requirements, teaching methodologies, and assessment criteria. Not only does the establishment of such common ground preserve accreditation status, it also allows students to make easy transitions between instructors and classes, especially within an accelerated, one-course-per-month format (Hill & Serdyukov, 2005). Through the online seminar format, full-time faculty members can explicitly express and clarify their expectations within an interactive and collegial atmosphere.

Not only do the full-time faculty members have the opportunity to discuss the course syllabus, assignments and rubrics, and other course materials that might be open to interpretation, and thereby help to improve the consistency of course delivery, but they may also clarify other types of professional expectations. Examples include: modeling professional correspondence and announcements, required student contact hours, frequency and quality of participation in class discussions, response times for student inquiries, timing and quality of feedback on assignments, procedures for handling problems that may escalate (such as plagiarism or academic dishonesty), and keeping records.

*Promote collaboration and create an online professional community to overcome the physical distance among instructors and between instructors and the college community in order to achieve the best learning outcomes.*

By creating an online community that fosters a professional culture, adjunct instructors are much more likely to maintain and renew their commitment to the university, thus increasing adjunct retention rates and negating the necessity to constantly renew the pool of available qualified instructors (Serdyukov & Hill, 2005). In the case of National University, the majority of the instructors in the Teacher Education Department are active practitioners with tremendous experience and expertise. The ability to tap those resources in a systematic and

continuous fashion serves to benefit and enhance the entire university community for purposes of outreach, research, curriculum development, programmatic improvements, and better learning outcomes for the students.

*Increase student retention rates by improving the quality and effectiveness of the instructors' ability to teach in both online and onsite settings, while simultaneously improving student evaluations of both the course and the instructors.*

Maintaining high student enrollment numbers is essential to the financial stability of all institutions of higher learning. One of the most effective ways to prevent attrition is to offer students excellent programs tailored to their needs and taught by knowledgeable, effective, responsive instructors. Likewise, one of the most effective ways to increase enrollment is to build a solid reputation through word of mouth. When students are pleased with instructor effectiveness and their self-assessment of their learning in a particular course or program, they are more likely to recommend the university to friends, relatives, and co-workers (Kabakci & Odabasi, 2004).

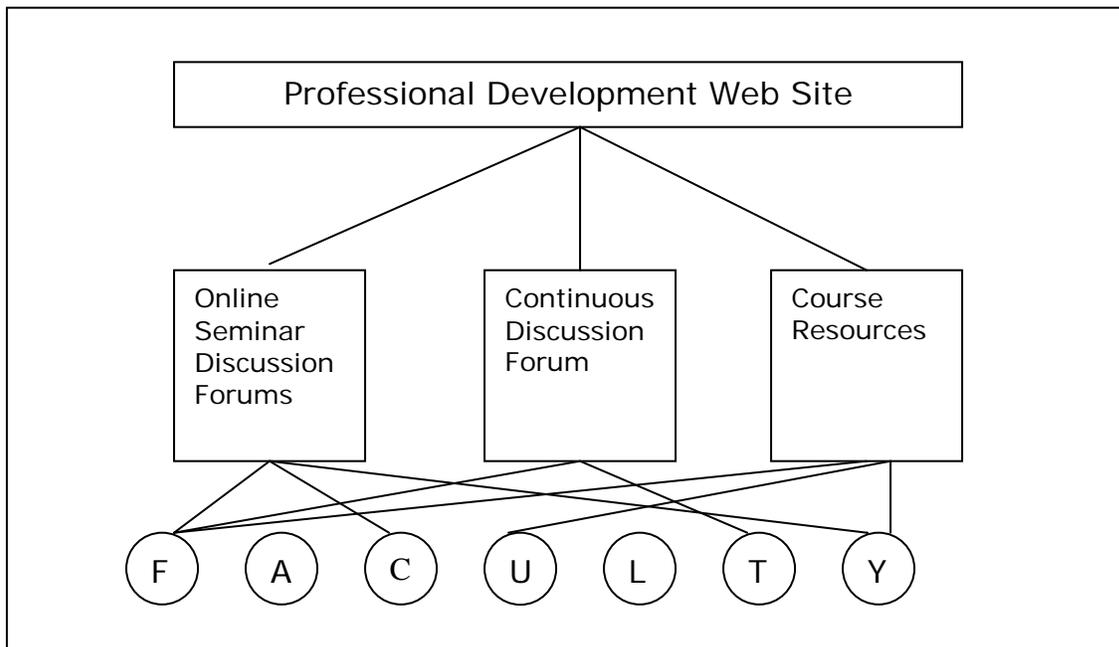


Fig. 1. The model of online professional development

Fig. 1 represents a model for an online professional development seminar that is course specific and designed to be conducted at least two times a year for a week, in order to address the most important

issues concerning instruction and university policies. In the case of this model developed at National University, the seminar Web site is actually an eCollege™ course shell that has been designated for this purpose. Every adjunct faculty member teaching a particular course (or courses) that is the focus of the seminar is given access to the Web site and is required to participate according to the expectations specified by the full-time faculty members who are in charge of the curricular development and maintenance of the course (or courses), also known as Lead Faculty. One of the benefits of using the same format for the seminars as the online courses is to familiarize inexperienced online instructors with the basics of course navigation and discussion board participation.

The *Online Seminar Discussion Forums* section consists of several asynchronous threaded discussions that are facilitated by one or more of the Lead Faculty members. Topics for these focused discussions may include: university policies, curricular changes and developments, teaching adult learners, online instructional methodologies, onsite classroom strategies and activities, or other issues specifically related to the course content or assignments. As opposed to chats, the asynchronous nature of the discussions provides more consistent opportunities for participation, for revisiting previous postings, deeper levels of reflection, access to a broader spectrum of ideas, more concrete connections to theory and practice, and more ways for the facilitators to model higher order responses and offer clarification (Gray, 2002; Kirk & Orr, 2003; Serdyukov & Hill, 2004).

A second type of forum for *Continuous Discussion*, which is also in the form of an asynchronous threaded discussion, is intended to support adjunct faculty members by providing a way for them to interact on a continuous basis with full-time faculty members who monitor the forums, as well as with experienced adjunct faculty members who moderate the forums each month. This more informal setting may also address topics similar to those listed for the online seminars, as well as a specific problem solving, and sharing and discussing educational research.

Overall, both of these types of forums allow for greater interaction between full-time faculty and the adjuncts who teach the courses that they steward, as well as increased interaction among adjuncts who teach the same courses. Again, the choice of an asynchronous format is intentional, allowing participants the opportunity to reflect and respond at the time and place of greatest convenience for them, thus

further increasing the frequency and quality of their participation (Serdyukov & Hill, 2004).

The *Course Resources* component is a permanent storehouse of information, including the most updated course syllabi; outlines; schedules; recommended literature sources and Web links; topic digests; instructors' tips, guidelines and advice; instructor-created materials; templates; sample assignments, announcements, and correspondence; frequently used university forms (i.e. grade change); as well as PowerPoint presentations, video clips, and other multimedia resources.

Between 2003 and 2005, this model was implemented on a limited basis for faculty members involved in teaching Methodology for Second Language Development courses. Though the reaction by participants was highly favorable, changes in university administration and course platform providers necessitated a brief hiatus until the spring of 2007, when the model was again implemented, this time as a pilot for the National University School of Education. Fifty-four participants, consisting of two lead faculty facilitators, five administrative observers, and 47 full-time and adjunct instructors reviewed and critiqued a variety of course materials and interacted in the online seminar discussion forums over a nine-day period. An examination of the course statistics showed that participants spent an average of one hour and fourteen minutes a day in the seminar, while the two lead faculty facilitators averaged 6 hours and 35 minutes per day. The latter statistic demonstrates not only the level of commitment necessary to conduct an effective seminar, but also highlights the number of opportunities that the seminar offered the full-time faculty members to answer questions, and offer advice, clarification, and support.

The effectiveness of the seminar in meeting the needs of both full-time and adjunct faculty; building a deeper level of collaboration and commitment; and fostering practical improvements in teaching methods and overall course delivery for both online and onsite classes is evidenced by the following comments from the seminar feedback survey:

"With the exception of talking with a friend who was already teaching at National when I came on board in 1999, this is the first time that I have been able to sit down and 'talk' with other faculty members in the Teacher Education Department. It has been extremely beneficial to learn new methods, listen to concerns (which are also my concerns)

and read how others have dealt with them. The level of concern and *expertise* reflected by the threaded discussions is impressive. I am extremely pleased that I was able to take part."

"I was most appreciative of those who spoke to the onsite courses. I have added many new methods to my repertoire from taking this seminar. It was also good to read that my concerns were their concerns regarding attendance, punctuality, level of excellence, etc. It was good to have some of my techniques for dealing with these issues validated by others. When you are a core adjunct, you do not have the opportunity to be on campus that much nor to talk to other instructors as we 'core adjunct folk' come from all over."

"The information provided covered topics that I would have not thought to ask as a new instructor. I also gained valuable insight into practices that I have used in the past onsite but how to change them so that they can also be utilized online."

"This really was one of the best online workshops I have attended. It was just outstanding. Please do it once or twice a year, if possible. It really inspired me."

An online professional development model that focuses on interaction between full-time and adjunct faculty in order to foment an increased sense of community, collaboration, and commitment; and course and program level consistency and efficiency may ultimately lead to increased adjunct and student retention, as well as improvement in student learning outcomes. The next step is to put this model into practice on a larger scale and to conduct a long-term examination of student outcomes, which can be measured in the form of grades, as well as student self-evaluations of learning that are recorded as part of their course evaluations, and compare those results for faculty members who were actively involved in the seminar and those who were not. Significant benefits, however, can only be achieved when professional development seminars like this one are established on a continuous basis. Happily, this model shows that fostering a professional culture through ongoing communication and collaboration is possible, even within an institution characterized by distance, distribution, and diversity.

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# How Effective is Hybrid Online Instruction for School Administrator Preparation?

Clifford E. Tyler and Robert Kibby

## Abstract

There has been a growing number of online and hybrid courses offered leading to student dreams and goals of earning degrees and credentials to be licensed teachers and administrators. Online instruction and hybrid (blended) online/on-ground instruction have become major alternatives to the traditional approach of on-ground instruction for teacher and school administrator-training and preparation. According to the Sloan Consortium, 2.33 million American students were taking at least one online course in 2004, up from 1.6 million in 2002. This convenient and flexible alternative instruction has become enormously popular with students living in remote locations or traffic-congested urban areas, both of whom find it difficult to travel to on-site classes.

Many colleges and universities offer online instruction that garners, on the part of some experts, critical questions as to the validity and quality of this approach. Some of the questions that will be addressed as a part of this study will be: 1) Does online instruction adequately prepare teachers and school administrators to be as effective on the job as the traditional on-ground instruction? 2) Does this instructional alternative offer equivalent academic rigor and standards as on-ground instruction? 3) What should be the role of instructors in regards to online instruction? 4) Are universities able to assess quality teacher and school administrator candidates as effectively and accurately as student personal contact and assessment? Although there is much literature addressing these questions, this paper will examine these questions from both a literature and an on-job experience.

## Key Words

Hybrid, blended online/onground instruction, changing faculty role, online interaction and response

## **Background**

Concerns about online instruction have not diminished over the past decade. Critics are suspicious of online education because courses are often offered by divisions of extended studies or continuing education, and taught by adjunct faculty or instructors without doctoral degrees. Others suggest that online courses lower the quality academic standards, diminish interaction with students and changes in interpersonal relations, while others say that academic honesty is compromised.

To face the challenge of online-instruction critics, universities are making major efforts to provide quality faculty training. Efforts also are being made to design an effective online learning environment.

This study will address the changing role of instructors teaching online courses, the challenges they face in promoting instructor-to-student and student-to-student interaction, and the new skills needed to effectively operate this technology. Finally who needs to be responsible for providing the online instructors with the quality training and support necessary to produce outstanding candidates? The discussion also will compare the quality of online instruction with on-ground instruction for high academic standards and learning results. Included in this discussion will be a comparison of the advantages and disadvantages of online instruction and steps that universities can take to address assessment and quality. Most importantly, there will be discussion comparing how well prepared are school administrators for major leadership roles and challenges by taking online courses versus on-ground courses.

## **Introduction**

“You mean I can complete my school administrative credential and Master’s Degree requirements online, without traveling to an academic center?” This is a typical question asked by students who are excited about a major revolutionary change in higher education instruction. There has been the growing number of online and hybrid courses offered leading to student dreams and goals of earning degrees and credentials to be licensed teachers and administrators.

Online instruction and hybrid (blended) online/on-ground instruction have become major alternatives to the traditional approach of on-ground instruction for teacher and school administrator-training and

preparation. Statistics pointing to a precise number of users is difficult to compile (Hoban, 2002). According to the Sloan Consortium, 2.33 million American students were taking at least one online course in 2004, up from 1.6 million in 2002. This convenient and flexible alternative instruction has become enormously popular with students living in remote locations or traffic-congested urban areas, both of whom find it difficult to travel to on-site classes (Yang & Cornelius, 2004).

Many colleges and universities offer online instruction that garners, on the part of some experts, critical questions as to the validity and quality of this approach. National University, headquartered in San Diego, California, with learning centers throughout the entire state, has offered online classes to graduate students in the School of Businesses in 1996, and later in the School of Education since 2000. Many other universities in California now offer an extensive online program.

Currently, online courses constitute approximately one-third of the 650 students enrolled in the Educational Administration Credential and Master's Degree program. Online courses have been offered on the Blackboard software platform, and are one month in duration. During that month, each course is generally divided into nine units, or two units per week plus the final exam. Throughout those units, lectures supported by selected appropriate bibliographic sources, including relevant journals, books, and the latest research on Web pages for instant student access are interfaced throughout each unit. Students are assessed by responding to the instructor and to other students through two or three threaded discussion questions that determine understanding of the lectures and assigned readings. The results of the threaded discussions offer interesting exchanges of ideas and experiences between the instructor and students, and between the students.

Although not practiced in Educational Administration, other National University academic schools also have scheduled chat rooms, where all enrolled students and the instructor meet at a designated time for more spontaneous discussions on the course content. Just this academic year, a limited number of trained instructors used I-Linc software as an alternative to online chat room and on-ground instruction. Although the current version is not user friendly, nor group interactive, it does show potential for more instructor-to-student interaction than Blackboard online instruction, and serves to combine

small on-ground classes that are not economically justifiable to offer in isolation at small Learning Centers.

*Does online instruction adequately prepare teachers and school administrators to be as effective on the job as the traditional on-ground instruction?* There appears to be little or no research available confirming online instruction does an equivalent or better job in preparing teachers and administrators for success and job effectiveness as on-ground instruction. Research surveys are limited to student perceptions of the quality of on-ground versus online instruction. With these perceptions, many students feel that their technology, writing, speaking and research skills have improved. However, many students' critical thinking, problem solving and decision skills were best enhanced for on-ground classes, along with better applying what they have learned with diverse populations and situations (Hoban, Neu & Castle, 2002).

Student perceptions were comprehensively surveyed on attitudes such as satisfaction of online instruction, preference of online learning or on-ground learning (and vice versa), satisfaction with quality of online instruction writing skills, satisfaction with lectures and threaded discussions, etc. Surveyed students were generally satisfied with all of these online components, and planned to take additional online courses. However, some students expressed missing the human on-ground contact with online classes. (Hoban, Neu & Castle, 2002; Hew, Liu & Martinez, 2004).

*Does online instructional alternative offer equivalent academic rigor and standards as on-ground instruction?* The survey results revealed mixed results with on-ground instruction offering more academic rigor, while other groups felt the rigor was comparable for both (Hoban, Neu & Castle, 2002). Other interesting results were influenced by the quality of the instructor, and how much personal attention the instructor provided each student, i.e. threaded discussion responses, prompt e-mail responses, recognition of quality contributions, etc.

National University also offers a hybrid (blended) program for Educational Administrative Students in California. This blended/hybrid program consists of 51% or five of the nine courses offered online, while the remaining four courses, including the Fieldwork or Intern Seminar, are offered on-ground at an off-site (cohort) location. The obvious advantage of the blended/hybrid program is that there is ample opportunity for student's assessment and evaluation on-ground, while students still enjoy much of the

advantages of online courses. Another advantage is that the on-ground courses can be offered at or near many of the students' work locations utilizing some resident instructors, and minimize student drives to scheduled on-ground courses at the nearest (frequently not so near) National University Academic Center.

## **Role of Instructors**

*What should be the role of instructors in regards to online instruction?* Since the online environment is different from on-ground instruction, research continuously confirms that the instructors' most important role is to motivate students. This means moving from being an intellect on-stage performer to a learning catalyst online. This is accomplished through an asynchronous virtual community between students and their instructors, rather than synchronous face to face in on-ground instruction (Yang & Cornelious, 2004). Although some (usually full-time) skillful instructors will have an innate ability to motivate students online, most will need adequate training to make it happen.

Frequency of interaction and prompt responses to all students is another key to successful online instruction. Studies have shown that the single greatest factor affecting student satisfaction in distance education course is the amount of interaction that occurs between teacher and students. This happens from the instructor's careful planning of collaborative course activities (Kirby & Elizabeth, 1999). This study is confirmed by some instructors making some fatal mistakes by not introducing themselves online at the beginning of the course, or immediately before the course begins. Others do not respond to individual student threaded discussion responses (instead respond to a group of student responses), or delay their response for two or three days.

Students also have the responsibility of transitioning from a passive on-ground learner to a more active online participant and learner. The question that students should ask themselves is, "Am I ready for an online learning environment?" Good online students should be ready to share their professional experiences, know how to participate online, synthesize ideas, show a sense of humor online, and work collaboratively with the instructor and other students (Yang & Cornelious, 2004).

*Are universities able to assess quality teacher and school administrator candidates online as effectively and accurately as student personal contact and assessment?* Students at National University can meet almost all their state license and Master's Degree requirements through online classes. Students are assessed and evaluated similarly to traditional on-ground instruction, i.e. midterm and final exams, research papers and projects, and from the quality of their threaded discussions and/or chat room discussions. The only exception where students are not evaluated for online course is administrator fieldwork or intern classes, which are strictly on-ground. In these programs, students apply the acquired knowledge and skills from their online (or on-ground courses) in their field work projects and activities.

At National University, educational administration students usually take a Fieldwork class, which requires them to complete 22 activities in a variety of 11 categories, in collaboration with their site supervisor (mentor) and university supervisor. Both assess and evaluate the quality of the student activities to determine fitness and competency to be a school administrator. Students who are already sitting administrators enroll in an Intern Seminar, which is also a monthly collaboration between the mentor and the university supervisor. The University believes that the combination of the online classes and fieldwork/intern seminars provides equivalent summative evaluation of school administration candidates.

## **Challenges of Online Instruction**

Several major concerns about online instruction have not diminished over the past decade. First of all, critics are suspicious of online education because courses are often offered by divisions of extended studies or continuing education, and taught by adjunct faculty or instructors without doctoral degrees. A number of universities utilize adjunct instructors, many without doctoral degrees, and others without adequate training, experience or skills to be effective online instructors with students. Few of these adjunct instructors have written the online course curriculum, which minimizes their course ownership (Yang & Cornelious, 2004).

Closely related to the background of many of the instructors is the offering of many online classes through extended studies or continuing education, which have considerably lower academic standards and rigor than those connected with academic schools. Much of this criticism can be countered by having online courses connected with

academic schools that demand academic standards and rigor existing in any on-ground class.

A second major concern is the lack of regular, face-to-face interaction between the students and the professor, as well as interaction between the students. The lack of personal interaction makes it more difficult for the professor to pace or meet specific needs of students (Arrant, Coleman & Daniel, 2002). The lack of interaction of students makes bonding and networking more difficult, which is important for the professional success of students. These problems have been observed with National University instructors, who fail to maintain consistent and regular contact with students, and follow up with prompt threaded discussion and e-mail responses as previously discussed. Online students have complained that few follow-up contacts and networking result with their fellow online students after classes.

A third major problem for online courses continues to be the student potential of academic honesty. Although there is some new promising technology to minimize this issue, research supports the difficulty instructors have in making a determination that student assessment and evaluation measures, i.e. midterm and final exams, research papers, and threaded discussion, are truly the work of the students. Safeguards to minimize this problem are the availability of Web pages to monitor plagiarism, and a lock on student access to the midterm and final exams online. However there are no safeguards for threaded discussion and student-prepared assignments or research projects.

A final problem is the challenge of technology of online courses. Both instructors and students have occasional difficulty with the online course software, such as Blackboard and e-College, i.e. logging on to access the course, final exams, and/or depositing the assignments for the instructor. Student or faculty technical support is not always available particularly when most needed, or there are excessive time delays in technical help providing the needed support.

## **Recommendations**

Several recommendations are appropriate to design an effective online learning environment. First of all, university administrators should plan, motivate, promote and support the online learning environment to ensure quality online instruction in six major areas: hands-on curriculum, staff training and technical support, student services,

training and technical support, copyright of intellectual property, and academic honesty assurance.

Secondly, university administrators should not force unwilling faculty members to teach online, but rather provide them financial incentives to do so. Furthermore, administrators should have a process of identifying quality faculty members to teach online, and coordinating quality training to willing faculty members. This training should include understanding their new roles as motivators for online instruction, providing them software training that hosts online courses, technical training and mentor support. Faculty training, done by knowledgeable faculty members, also should include an identification process for qualified adjunct professors, and provide them easy access to training. Training should be on-going to assure quality enhancement of instruction, providing them skills to motivate students, and to help them understand their role change as an online instructor. Faculty members should be involved in developing and writing quality online courses to assure their buy in and support for online instruction.

Quality student training should also be available to help them access and navigate their online courses, as well as providing them technical support 24 hours a day, seven days per week. If the I-Linc Program continues to be pursued for chat room and modified online instruction, the software will need improvement for more user friendliness for both faculty and students. There also should be adequate training for both parties to access for increasing their confidence level.

Technology research should be continued to assure academic honesty, quality and rigor for online courses. Advance technology also is necessary for more accurate online student assessment and evaluation. In the newer e-College online course software, students are locked into completing a test with opportunity for accessing any outside sources, i.e. internet, notes etc. from the computer (Hew, Liu & Martinez, 2004). However, technology lacks the capability to assure that student threaded discussion responses are contributions truly from those students. Also lacking is assurance that student assignments, i.e. reports, research papers, etc. are really the contributions from the students. However, this challenge is also similar for on-ground instruction.

## Conclusion

Research strongly supports an increased use of online instruction by institutes of higher education. There appears to be little difference in online versus on-ground instruction for preparation of school administrators, particularly in a blended (hybrid) course instruction. Research supports online course convenience for both instructor and student access, and its rigor and quality is on the increase. The major challenges continue to be: adequate training for both instructors and students for online instruction to be a quality learning environment for an exchange of ideas and acquisition of knowledge; and effective assessment and evaluation of students to assure their quality and rigor of the graduate program. Despite these challenges, online classes hold much promise in delivering effective and quality instruction to millions of graduate students.

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# **Developing a Systematic Approach to Program Review**

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## **Abstract**

This research study focuses on the development of a systematic evaluation process for a program review of the Master of Arts in Teaching (MAT) Program at National University. The purpose of the program review is to improve the overall program quality while ensuring the consistency and congruity of individual courses within the program, which will ultimately lead to increased student learning. The authors created the evaluation process by integrating current research from the fields of curriculum development, instructional design and evaluation, and systems thinking (Dick, Carey & Carey, 2005; Reiser, R. & Dempsey, J. V., 2006; Morrison, G., Ross, S. & Kemp, J., 2003; Mehrotra, D. 2002; Senge, P. 1990). A MAT Faculty Review Committee consisting of course leads and a department co-chair conducted an analysis of existing MAT program core courses utilizing multiple criteria. Each MAT core course was systematically reviewed to determine its degree of alignment to MAT Program Goals and the National Board Certification Core Propositions. Alignment goals for consistency and congruency within the courses included: course descriptions, course texts, and learning outcomes. Misalignments between courses and revisions needed for improvement are identified and suggestions for future research are discussed.

## **Key Words**

Program review, program improvement, systematic evaluation, quality

## **Introduction**

The purpose of this study is to document the creation and development of a comprehensive systematic program review process that was conducted by a team of six faculty members from the Teacher Education Department (TED) in the School of Education (SOE) at National University during the summer and fall of 2007. The Master of Arts in Teaching (MAT) Program is currently offered through TED and is designed for credentialed teachers and practicing educators who are seeking to enhance their teaching skills and expand their knowledge in specific educational areas.

The MAT program consists of six core courses:

1. EDT 612-Meaningful Learning through Technology (offered through the Department of Educational Technology)
2. MAT 641-Cultural Democracy: Contemporary Local and Global Issues
3. MAT 642-Program Design: Curriculum Theory, Design, and Assessment
4. MAT 643-Models of Teaching: Theories, Applications, and Practice
5. MAT 644-Foundations and Principles of Curriculum
6. MAT 640-Applications of Research for the Art of Teaching

In its fifth year, the MAT Program is faced with extensive internal and external program reviews and evaluation requirements from sources including the internal National University Assessment Committee's Five Year Review and an upcoming review from the Western Association of Schools and Colleges (WASC) scheduled for February 2008. Collective program review requirements focus on an intensive program self-study that includes a comprehensive analysis of the MAT program goals, expected student learning outcomes and evaluation criteria, as well as an examination of program alignment to national and state teaching standards. The required program reviews also include a thorough examination of current course offerings and curriculum content.

Given the need to generate appropriate program evaluation documents that would effectively capture the data required for program reviews in a systematic, efficient, and non-duplicative manner, a group of six faculty members volunteered to develop an evaluation system and review process that would be applied to the MAT Program core courses. It was with that goal in mind that the committee worked to produce a comprehensive process.

## **Literature Review**

From an overall program standpoint, current research supports a systematic approach to program design, development and evaluation, and an ongoing feedback process in which all components of the program are regularly reviewed, updated, and evaluated based on their continuous interrelationship with each other (Dick, Carey & Carey, 2005; Mehrotra, 2002; Senge, 1990). The primary reason for conducting program evaluation is to make data-driven and well-

informed decisions regarding program effectiveness and individual course quality which, in turn, leads to improved instruction and increased student learning. As Menix (2007) states, "the primary purpose of program evaluation is to judge the merit or worth of the total program being evaluated, as well as the individual elements of that program" (pp. 543-544).

The systematic review processes used in this study were adapted from instructional systems models presented by current researchers in the field of curriculum design (Reiser & Dempsey, 2006; Morrison, Ross & Kemp, 2003). Current research in curriculum planning and development regularly underscores the vital importance of "program coherence," the degree to which the courses within a program of studies relate to each other. As noted by Darling-Hammond and John Bransford (2005), "Teacher preparation programs need to consider issues of connected knowledge at the level of individual course design and congruence at the level of the design of entire programs of study" (p. 88). In a recent study of exemplary teacher education programs, Darling-Hammond (2006) points out that the strongest teacher training programs were the ones that offered coherent programs based on a strong, shared vision of teaching, a close-knit faculty, and consistent goals across the courses. According to Henson (2001), one general flaw in curricula is the failure to connect or relate the components to each other.

Ornstein and Hunkins (2004) also support the importance of program congruence and continuity in curriculum planning in which there are multiple opportunities for students to learn, practice and reinforce important concepts within the curriculum. Bransford, Brown & Cocking (1999) note that "learning is enhanced when learners encounter mutually reinforcing ideas and skills across learning experiences, particularly when these are grounded in strategically chosen content and conveyed through effective pedagogies" (p. 257). Shulman and Schulman (2004) refer to this need for repeating and reinforcing concepts to build a deepening understanding of how program elements relate to each other. Program evaluation criteria suggested by Parkay and Hass (2000) include continuity, flexibility, and balance of curricular elements as well as standards developed by professional organizations.

The concept of systematic program evaluation that connects with continuous ongoing learning is supported in the works of Senge (1990) and Mehrotra (2002). According to Senge, "Without a systemic orientation there is no motivation to look at how the disciplines

interrelate" (p. 12). In his discussion of Total Quality Management (TQM), Mehrotra notes that the systemic review approach to ongoing evaluation and improvement is based on teamwork and collaboration. Utilizing TQM principles in creating the review and evaluation process provided solidification of leadership, teamwork, collaboration, and problem-solving skills.

While there is wide support for the overall concept of systematic approaches to developing and evaluating curriculum, a search of the literature on program evaluations that have been conducted by individual schools results in a dearth of research on the topic. Kezar (1999) states that "One of the most notable trends is that systemic or comprehensive evaluation is not widespread in the literature, the research, or programs in practice" (p. 3). The lack of research in this area is attributed to the publication process itself. Kezar hypothesizes that since most journals prefer original research or new ideas, the evaluation of current programs is often overlooked.

## **Methodology for Part I**

This study is divided into two parts. In the first part, the team analyzed the individual courses in the MAT program. The second part resulted in the development of a comprehensive Curriculum Map. The final evaluation integrated data from both parts into a coherent whole.

The first step in the review process was to identify program evaluation criteria from a recognized source. An examination of standard program review requirements and criteria, specifically for graduate schools of education, indicated that documented alignment with national and statewide standards is of primary importance (National Research Council, 2001). The five Core Propositions from the National Board of Professional Teaching Standards and the 10 MAT Program Goals were selected as primary criteria and applied to each of the MAT core courses.

## **Review Process Criteria**

Information in Figure 1 shows the steps in the process used to conduct the overall program review. Figure 2 lists the criteria used to analyze the individual course data for part 1 of the study.

Figure 1: Process Used for Systematic Review of the MAT Program

A. (Part 1) - Alignment of each course with national and state teaching standards to include:
1. MAT Program Goals
2. National Board Certification (NBC) Core Propositions
B. (Part 2) Alignment Across and Within the MAT program – Curriculum Map
Analysis of congruence, consistency and balance of individual courses within the Program as reflected by:
1. Course description
2. Text(s)
3. Student Learning Outcomes

Figure 2: Summary Chart of the MAT Goals and NBC Core Propositions

<b>MAT Goal 1:</b> Reflect on teaching practice
<b>MAT Goal 2:</b> Build professional relationships/networks
<b>MAT Goal 3:</b> Build learning communities within schools/classroom
<b>MAT Goal 4:</b> Analyze cross-cultural educational issues
<b>MAT Goal 5:</b> Identify, describe, and apply theories of curriculum as they relate to State-approved standards
<b>MAT Goal 6:</b> Implement standards-based assessment in the classroom, school and district
<b>MAT Goal 7:</b> Use technology for research and teaching
<b>MAT Goal 8:</b> Apply multiple teaching models and assessment strategies
<b>MAT Goal 9:</b> Implement, assess, and evaluate standards-based curriculum
<b>MAT Goal 10:</b> Conduct action research in teaching
<b>NBC Core Proposition 1:</b> Teachers are committed to students and learning.
<b>NBC Core Proposition 2:</b> Teachers know the subjects they teach and how to teach those subjects to students.
<b>NBC Core Proposition 3:</b> Teachers are responsible for managing and monitoring student learning.
<b>NBC Core Proposition 4:</b> Teachers think systematically about their practice and learn from experience.
<b>NBC Core Proposition 5:</b> Teachers are members of learning communities.

## **MAT Program Goals and NBC Standards Data Analysis**

Members of the MAT Review Committee, who also serve as core course leads, collected and analyzed data pertaining to the MAT Program goals and NBC Core Propositions. Each committee member completed an analysis matrix to identify where the course goals were either primary (P), secondary (S), or non applicable (NA) to each of the criteria. A numerical value of 2 was assigned to the Program Goals and Core Propositions that were designated as primary (P). A numerical value of 1 was assigned to those that were covered as a secondary (S), and 0 was assigned for not applicable (NA). Scores were then converted to percentages to avoid mathematical distortion. A comparison of percentage scores indicated which of the courses were successfully fulfilling MAT Program goals and NBC standards and those in need of revision. This process resulted in the cross-analysis charts presented in Tables 1 and 2.

Table 1: Cross Analysis of MAT Core Course Goals and Evaluation Criteria

<b>CRITERIA/STANDARDS</b>	<b>EDT 612</b>	<b>MAT 640</b>	<b>MAT 641</b>	<b>MAT 642</b>	<b>MAT 643</b>	<b>MAT 644</b>
<b>MAT Goal 1:</b> Reflect on teaching practice	S-1	P-2	P-2	P-2	P-2	P-2
<b>MAT Goal 2:</b> Build professional relationships/networks	P-2	S-1*	S-1	S-1	P-2	S-1
<b>MAT Goal 3:</b> Build learning communities within schools/classroom	P-2	S-1*	S-1	P-2	P-2	P-2
<b>MAT Goal 4:</b> Analyze cross-cultural educational issues	S-1	S-1*	P-2	S-1	S-1	S-1
<b>MAT Goal 5:</b> Identify, describe, and apply theories of curriculum as they relate to State-approved standards	S-1	S-1*	S-1	P-2	P-2	P-2
<b>MAT Goal 6:</b> Implement standards-based assessment in the classroom, school and district	S-1	S-1	S-1	P-2	P-2	S-1
<b>MAT Goal 7:</b> Use technology for research and teaching	P-2	P-2	S-1	S-1	S-1	S-1
<b>MAT Goal 8:</b> Apply multiple teaching models and assessment strategies	S-1	S-1*	S-1	P-2	P-2	P-2
<b>MAT Goal 9:</b> Implement, assess, and evaluate standards-based curriculum	P-2	S-1*	S-1	P-2	P-2	P-2
<b>MAT Goal 10:</b> Apply and conduct research in teaching	P-2	P-2	S-1	S-1	S-1	S-1
<b>Total</b>	<b>15 (75%)</b>	<b>13 (65%)</b>	<b>12 (60%)</b>	<b>16 (80%)</b>	<b>17 (85%)</b>	<b>15 (75%)</b>

Primary (P) or secondary (S) indicates whether standards are primary or secondary

\* Indicates that each criteria/standard has the potential to be primary depending on topics selected by student for this capstone course.

Table 2: Cross Analysis of MAT Core Course Goals and NBC Propositions

<b>NBC Core Proposition 1:</b> Teachers are committed to students and learning.	S-1	P-2	P-2	P-2	P-2	P-2
<b>NBC Core Proposition 2:</b> Teachers know the subjects they teach and how to teach those subjects to students.	S-1	S-1*	S-1	P-2	P-2	P-2
<b>NBC Core Proposition 3:</b> Teachers are responsible for managing and monitoring student learning.	S-1	S-1*	S-1	S-1	P-2	S-1
<b>NBC Core Proposition 4:</b> Teachers think systematically about their practice and learn from experience.	P-2	P-2	P-2	P-2	P-2	P-2
<b>NBC Core Proposition 5:</b> Teachers are members of learning communities.	P-2	P-2	S-1	P-2	P-2	P-2
<b>Total</b>	<b>7 (70%)</b>	<b>8 (80%)</b>	<b>7 (70%)</b>	<b>9 (90%)</b>	<b>10 (100%)</b>	<b>9 (90%)</b>

Primary (P) or secondary (S) indicates whether standards are primary or secondary

\* Indicates that each criteria/standard has the potential to be primary depending on topics selected by student for this capstone course.

The data from the two cross-analysis charts in Tables 1 and 2 provided information concerning the degree of alignment of each course to the MAT Program goals and to the five NBC Propositions. Table 2 provides a visual summary of the data followed by a narrative discussion of the results.

Table 3: Summary of Data from Core Course Reviews

<b>MAT Courses</b>	<b>MAT Program Goals</b>	<b>NBC Core Propositions</b>
612	75%	70%
640	65%	80%
641	60%	70%
642	80%	90%
643	85%	100%
644	75%	90%

Table 2 results indicate that MAT 643 addressed 85% of the MAT Program Goals while MAT 642 addressed 80% of the MAT Program Goals. MAT 644 and EDT 612 were next with a 75% alignment each. MAT 640 scored 60% on alignment with program goals. For the NBC Core Propositions MAT 643 addressed 100% of the standards, while MAT 642 and 644 met 90%. EDT 612 and MAT 641 met 70% of the criteria.

## **Discussion of Findings**

The review process identified a number of gaps that need to be addressed in the MAT Program Action Plan for 2008. These need areas will be submitted with the 2007-2008 Program Review documents for the internal Five Year Program Review. While there is strong intent to ensure alignment to the MAT Program goals and NBC Core Propositions for all MAT core courses, special attention will be devoted to strengthening the courses listed below.

### **EDT 612**

While EDT 612 is housed outside of the Teacher Education Department, the following recommendations will be shared with the Educational Technology Department. Increase EDT612, Meaningful Learning through Technology, alignment with NBC Core Propositions

by expanding the focus on teaching and learning in this introductory technology course, which is taught through the School of Media and Communications. The course description needs to be revised in order to reflect a more concise summary of the course.

### **MAT 640**

Review and revise MAT640, Applications of Research for the Art of Teaching, content to reflect closer alignment with MAT Program goals and NBC Core Propositions. MAT 640 received three primary scores for the MAT Program Goals and the NBC Core Propositions in the evaluation process. Suggestions include converting this capstone research course into an e-portfolio course that presents student-generated evidence of course alignment with, and fulfillment of, both the MAT Program goals and NBC Core propositions. Another option for MAT640, which is currently under consideration, is to align this capstone course more closely with the areas of specialization so that applied research would build and strengthen an established knowledge base.

### **MAT 641**

Data indicates the need for an extensive revision of MAT641, Cultural Democracy: Contemporary Local and Global Issues. The course is currently aligned to only two of the MAT Program Goals and two of the NBC Core Propositions. To ensure increased attention to the application of multiculturalism and global awareness in our diverse classrooms, the course will receive additional review with feedback and input from instructors and students.

### **Methodology for Part II**

In order to conduct the second part of the systematic program review that focused on overall program continuity and the congruency of individual courses within the MAT Program, committee members developed an extensive curriculum map of the six MAT core courses used to determine areas of strength and the need for the overall program changes.

The Curriculum Map, located in Appendix A, was based on Instructional Systems Design models suggested by Dick, Carey and Carey (2005).

The map lists each of the courses and includes the following elements: course description, required text and student learning outcomes. Each element of the Curriculum Map was analyzed by the MAT Review Committee as well as by other faculty members involved in the MAT Program. Course descriptions were examined for continuity and uniformity of purpose. In addition, the required text(s) for each of the courses were compared to course learning outcomes for rigor, level of complexity, and relationship. Expected student learning outcomes also were examined, focusing particular attention on their relationship and alignment with program goals.

Creating a large-scale visual representation of the existing syllabi and catalog information regarding the MAT core courses produced results that indicated serious inconsistencies in the MAT Program curriculum and underscored areas of concern identified during the first part of the study. The purpose of the Curriculum Map was to analyze the overall continuity, coherence, and relationship of the core courses as a whole, as well as the congruence and consistency of the individual courses within the program.

## **Findings for Part II**

### *Curriculum Mapping*

The initial comparison of course descriptions revealed gaps in both program continuity and individual course consistency. When looked at, side by side, the individual course descriptions did not present a unified program approach. Also, the individual course descriptions varied substantially in length and format.

### *Course Descriptions*

The primary criteria used to evaluate the course descriptions were length, subject matter, academic level and the degree of balance between theory and application in the courses. This approach resulted in the following analysis:

1. EDT 612, Meaningful Learning Through Technology, has a lengthy course description that focuses primarily on technology. In terms of alignment with other MAT core courses, it lacks the emphasis on classroom application required by NBC Core Propositions.

2. MAT 641, *Cultural Democracy*, focuses on theoretical perspectives and seems to lack a clear focus on classroom application, which is reflected by the low scores on alignment with NBC Core Propositions.
3. MAT 642, *Curriculum Design and Program Development* and MAT 644, *Foundations of Curriculum*, are consistent and exhibit a balance between theory and application. They are similar in length and format.
4. MAT 643, *Models of Teaching*, has a brief description that centers on application and needs more balance by emphasizing the theoretical side of teaching and learning.
5. MAT 640, *Applications of Research for the Art of Teaching*, the capstone research course is concise and does accurately represent the content of the course.

### *Textbook Analysis*

A review of the texts currently required in each of the MAT core courses helped to identify needed changes and additional textbooks that would strengthen alignment with standards and support the balance between theory and application as recommended by Darling-Hammond (2006). Suggested changes and/or additions include: (a) add the APA Manual to the EDT 612 as a recommendation; (b) replacement of at least one text (if not both) for MAT 641 that addresses the focal points of the No Child Left Behind legislation and focuses on diversity, multiculturalism and the globalization of curriculum; (c) addition of a supplementary text or supplemental readings to MAT 643 that presents a more theoretical approach to teaching and learning theory; (d) addition of a supplementary text or supplemental readings to MAT 644 that balances Ornstein's philosophical and theoretical approach by emphasizing classroom application; and (e) substitution of new text for MAT 640 that provides a more flexible and practitioner-oriented approach to the development of student-generated research documents.

### **Student Learning Outcomes Alignment**

MAT Program goals are repeatedly reflected in the student learning outcomes for the individual core courses. However, the alignment of individual course student learning outcomes with MAT Program goals needs to be increased, particularly MAT 641, MAT 640, and in EDT 612. Analysis of data indicated a need to revise the core course student learning outcomes in order to align them more closely with

MAT Program goals. Areas of suggested improvement include the following:

1. Increase the opportunity for reflection on teaching practices in EDT 612, MAT 641, and MAT 640.
2. Increase emphasis on cross cultural issues and global perspectives in the core courses that deal primarily with classroom applications of teaching and learning, MAT 642, MAT 643, and MAT 644.
3. Expand the required use of technology into all core courses.
4. Include a research component in all of the core courses.
5. Make sure that Course Requirements align with learning outcomes.

An examination of Course Requirements for the MAT core courses indicated that a variety of requirements and assessment measures are currently being used in all of the core courses, with the exception of MAT 640, which focuses on the development and submission of a three-chapter research document and an in-class presentation. However, given the need to update and increase the alignment of student learning outcomes with MAT Program goals and NBC Core Propositions, there will need to be some adjustments in all of the course assignments, activities and assessment measures. This is particularly true for MAT 641, which is in the process of major revision.

## **Conclusions**

As a result of this study, the MAT Review Committee produced a systematic process for reviewing and evaluating core courses within and across the Masters of Arts in Teaching program at National University based on current research in the fields of curriculum development, instructional design and evaluation, and systems thinking.

The data that was collected from each phase of the process was reviewed and analyzed to provide recommendations for revisions to bring each course into closer alignment with the MAT Program Goals and NBC Core Propositions. The resulting gap analysis and detailed course matrix will be used by the Department of Teacher Education to prepare the Action Plan for 2008.

A brief summary of these findings will be included in documents submitted as part of the five-year Review of the Master of Arts in

Teaching Program to the internal National University Assessment Committee in fall 2007. The findings also will be included in the upcoming review from the Western Association of Schools and Colleges (WASC) scheduled for February 2008.

Each of the MAT faculty leads will use the data gathered in this study to revise their course and increase the alignment to the established criteria. Upon completion of this process, the committee will again review the courses to determine the new alignment. The next step in this program-wide analysis will be the review of each of the areas of specialization within the MAT Program. The long-term goals of this analysis are to: (a) Bring all courses into alignment with the established criteria for the program and for the specializations and; (b) Provide continuity and congruence in all courses offered through the program, thereby improving instruction and increasing student learning.

## **Recommendations**

The research conducted in this study will be helpful to those searching for information on conducting a systematic program review. As Kazar (1999) suggests, there is a need for more studies that contribute to the knowledge resources in this area. The process of systematic program review employs a step-by-step approach that can be adapted by other institutions to evaluate educational programs or groups of related courses in any discipline.

The authors recommend that institutions use the systematic process outlined in this research to align courses and to measure congruency and continuity, essential elements in the quest for connecting knowledge for learners. The process begins with the determination of evaluation criteria based on program and professional standards. The application of this criterion in a systematic manner produces data that then drives the revision and subsequent improvement of courses within and across a program. The ongoing use of this process results in continuous ongoing program improvement. The authors also recommend that institutions conducting a similar review include as many faculty participants as possible and follow the TQM approach to program review that emphasizes cooperation and collaboration as suggested by Mehrotra (2002).

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## APPENDIX

**Curriculum Map to Determine Course Consistency and continuity for MAT Core Courses**

	<b>EDT 612</b>	<b>MAT 640</b>	<b>MAT 641</b>	<b>MAT 642</b>	<b>MAT 643</b>	<b>MAT 644</b>
<b>Course Syllabus</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Course Description</b>	Created as an introductory course for the educational uses of technology in the classroom, this course is designed to provide educators with the skills needed to integrate technology into the classroom, develop research skills for use throughout the program, and align technology-based learning activities with State Standards. Course content includes designing a Web Quest for interactive	The purpose of this course is to provide classroom educators with the knowledge and skills required to understand, design, and write a research document that is relevant to their lives as professional educators	This course will examine how individuals in institutional roles operationalize culturally democratic policies and practices, including how formal and informal political forces influence culturally democratic programs and culturally relevant curriculum development and implementation. The course will emphasize successes in systemic multicultural competency development and will examine the observable and hidden evidence of organizational transformation.	This course will examine the underlying principles that have shaped outcome based learning, content based standards, accountability and the need for educational reform. The course will emphasize evaluation of school programs, student assessment and program design using appropriate review criteria	This course explores how a variety of teaching models and learning theories are applied in the instructional contexts. Specific application of some models and theories will be discussed in this course and presented in student-designed curriculum projects.	This course surveys the field of curriculum with specific emphasis on foundations, principles, and issues for public educators in California's linguistically and culturally diverse society. The course identifies various approaches to curriculum and the development, design, implementation, and evaluation of curriculum. Application of curriculum approaches will be provided through student-designed analyses of curriculum.

	<p>learning environments, writing an abbreviated literature review, and developing a model for the integration of technology in the classroom. Additional course materials focus on gaining knowledge of the International Society for Technology in Education (ISTE) Technology Standards and teaching students the responsibilities that come with Internet access.</p>					
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	<b>EDT 612</b>	<b>MAT 640</b>	<b>MAT 641</b>	<b>MAT 642</b>	<b>MAT 643</b>	<b>MAT 644</b>
<b>Course Text(s)</b>	Lockard, J., and Abrams, P.D. Computers for Twenty-First Century Educators. (6th ed.) Boston: Allyn and Bacon, 2004.	Mertens, D.M. (2005). Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches (2nd ed.). Thousand Oaks, CA: Sage Publications  American Psychological Association. (2001). Publication manual of the American Psychological Association (5th ed.). Washington, DC: American Psychological Association	Freire, P. (2000). <u>Pedagogy of the oppressed</u> . New York: Continuum.  Mandela, N. (1995). <u>Long walk to freedom</u> . Boston: Little, Brown, & Co.	Darling-Hammond, L. (1997). The right to learn: A blueprint for creating schools that work. San Francisco. Jossey-Bass Education Series.  Reeves, D. B. (2004). Making standards work: (3 <sup>rd</sup> ed.). Englewood. CO: Advanced Learning Press.	Joyce, B., Weil, M., & Calhoun, E. (2004). <i>Models of teaching</i> (7 <sup>th</sup> ed.). Boston: Allyn and Bacon	Ornstein, A. & Hunkins, F. (2004). <i>Curriculum: Foundations, principles, and issues</i> (4th Ed.). Allyn and Bacon, Needham Heights, MA.

	<b>EDT 612</b>	<b>MAT 640</b>	<b>MAT 641</b>	<b>MAT 642</b>	<b>MAT 643</b>	<b>MAT 644</b>
<b>Learning Outcomes</b>	<ol style="list-style-type: none"> <li>1. Integrate technology into classroom activities</li> <li>2. Develop research skills and locate educational resources</li> <li>3. Align technology-based learning activities with State Standards</li> <li>4. Enhance student learning and foster life-long learning through technology MAT</li> <li>5. Foster diversity and expand global perspectives</li> <li>6. Increase communication with students, parents and the community</li> </ol>	<ol style="list-style-type: none"> <li>1. Complete a three chapter capstone project applicable to their professional education needs. The project should reflect clear purpose, provide evident and logical organization, and be of publication quality. (Chapter 1: Introduction)</li> <li>2: Literature Review:</li> <li>Chapter 3: Application of Research (in a number of optional formats identified below).</li> <li>3. Write the research project showing clear organization, use of headings, and good mechanics of English.</li> <li>4. Use APA format for citations, references, and format of the research project.</li> </ol>	<ol style="list-style-type: none"> <li>1. Analyze and demonstrate the program competencies (knowledge base, attitudes/ values/ beliefs) to effectively work with recent immigrant groups as well as historically familiar immigrant/ ethnic communities.</li> <li>2. Research and analyze the social, political and interpersonal dynamics related to program efficacy.</li> <li>3. Diagnose school climate and cultures that impact culturally democratic practices.</li> <li>4. Investigate and analyze leadership principles related to program implementation and develop models of leadership principles related to program implementation.</li> <li>5. Analyze and identify dynamics of power and culture in local/ federal program design and</li> </ol>	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge competency of a quality educational program, which create democratic learning communities that succeed for a diverse population.</li> <li>2. Analyze the need for change, reforming, and restructuring of schools and the issues of accountability.</li> <li>3. Investigate literature on curriculum standards work, and implementation of standards-based assessment in the classroom, school and district.</li> <li>4. Analyze the design and implementation of curriculum including the philosophy, assessment, management and expectations as they relate to the</li> </ol>	<ol style="list-style-type: none"> <li>1. Compare and contrast at least four different models of teaching/learning, explaining their appropriate usage in a variety of classroom settings</li> <li>2. Conduct and analyze a classroom observation in the PK-12 setting</li> <li>3. Design and develop an effective instructional plan, teaching materials, and assessment instruments to measure the achievement of student learning outcomes within a standards based unit.</li> <li>4. Develop and describe effective methods for increasing student learning outcomes by integrating technology applications.</li> <li>5. Analyze and reflect on instructional strengths and</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify and discuss the central foundations, principles, and issues for the field of curriculum--with specific expertise about linguistic and cultural diversity in California public education.</li> <li>2. Describe and discuss the relationship between curriculum, instruction, evaluation, and the resolution of planning, design and delivery problems.</li> <li>3. Design strategies for evaluating curriculum effectiveness: including curriculum alignment techniques, formative and summative evaluations, and</li> </ol>

		<p>5. Choose a research topic directly related to teaching practice and write a clear, precise purpose statement.</p> <p>6. Access scholarly books and peer reviewed journal articles related to the research application, synthesize and report information in a literature review relevant to the topic of the proposal.</p> <p>7. Create and write an application for the completed research</p>	<p>legislation for English-speakers.</p> <p>6. Apply and connect cultural democracy theory to staff development practices.</p> <p>7. Assess personal and institutional growth that leads to multicultural competence.</p> <p>8. Apply critical pedagogy and social reconstructionist theory to both individual and societal examples of inequities and imbalances of power relative to educational practices.</p>	<p>mission of the school.</p> <p>5. Review state and federal assessment guidelines as they apply to school performance and expectations as well as meeting the state and federal compliance issues.</p> <p>6. Investigate the factors for distinguished Schools.</p> <p>7. Investigate procedures for doing self-studies, situations, district, and state personnel requirements for further study.</p>	<p>needed areas for improvement based on the State Standards for the Teaching Profession and/or the National Board for Professional Teaching Standards Five Core Propositions.</p> <p>6. Evaluate and discuss classroom applications of current research on effective teaching.</p> <p>7. Select and explain the application of effective strategies for developing learning communities within schools/ classrooms and for building professional relationships/networks.</p>	<p>norm-referenced, criterion-referenced, and authentic evaluations.</p> <p>4. Review research related to effective educational programs-- perform and promote local curriculum research.</p> <p>5. Explain the inter-relatedness of curriculum design, instruction, curriculum alignment, teacher effectiveness, and school effectiveness.</p> <p>6. Interpret curriculum to public, peers, administrators, and others.</p>
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# The Revised Version of the Educational Outcome Expectancy Scale

Brian Tilley

## Abstract

The researcher revised a measure of outcome expectancies as described in Social Cognitive Career Theory (Lent, Brown, & Hackett; 1994): the Educational Outcome Expectancy Scale (EOE; Springer, Larson, Tilley, & Gasser, 2001). Exploratory factor analysis supported a 23-item single-factor model with internal consistency of  $\alpha=.93$ . Convergent and criterion validity estimates using the College Self-Efficacy Instrument (Solberg, O'Brien, Villareal, & Kennel, 1993) and Your First College Year (Astin, 1993) are also provided. Results were indicative of a positive, moderate correlation between educational outcome expectancies and college self-efficacy and a significant correlation between educational outcome expectancies and satisfaction. Overall, the researcher found support for the EOE as a brief, reliable measure of educational outcome expectancies as well as a valid one when compared to related measures of self-efficacy and satisfaction.

## Key Words

Outcome expectancies, self-efficacy, satisfaction, Social Cognitive Career Theory, education. measure

## Introduction

According to Lent, Brown, & Hackett's (1994) Social Cognitive Career Theory (SCCT), outcome expectancies are personal beliefs about probable outcomes. With respect to SCCT, outcome expectancies are important because they underlie the functioning of the model. Lent et al.'s SCCT is based on the application of social cognitive theory (SCT; Bandura, 1986) to the career area. According to SCT, people act partially on the beliefs they have about the possible consequences of their actions. The areas in which these consequences can be manifested include, but are not limited to, physical, social, self-evaluative, and educational outcome expectancies. In other words, outcome expectancies are domain-specific.

Self-efficacy and outcome expectancies are important pieces of the SCCT model. Unfortunately, whereas self-efficacy measures abound, outcome expectancy measures do not. In addition, the domain-specificity of outcome expectancies has been taken quite literally, for the most part, in the literature. The literature includes multiple specific academic subject areas (e.g. math) in the study of educational outcome expectancies but does not include the context in which these academic subjects are completed (i.e., a college degree). The researcher argues that college degree outcome expectancy is closer to overall educational outcome expectancy than the subject-specific measures because it takes into account both the expectations of the student for her or his degree regardless of the area of study and for the cumulative effect of her or his education.

As noted, outcome expectancies and self-efficacy underlie the functioning of SCCT. The two constructs have been shown to be positively and moderately correlated in prior research (e.g., Brown, Lent, & Larkin, 1989; Lent, Brown, & Gore, 1997; Lent, Brown, & Hackett, 2000). A measure of a given outcome expectancy should be positively and moderately correlated with a measure of the same type of self-efficacy. College education is the domain so the self-efficacy measure selected must reflect that level of specificity.

The lone measure that attempts to capture the construct of educational outcome expectancies using the preceding criteria is the Educational Outcome Expectancy Scale (EOE; Springer, Larson, Tilley, & Gasser, 2001). Tilley (2002) found that the EOE as a one-factor measure discriminated between its factor and academic self-efficacy. However, the EOE is six items long and that may not be enough to fully capture the construct of educational outcome expectancies as described in SCCT, namely that educational outcome expectancies in college students not only cover the expectations they have in academic areas (as the EOE does), but also focus on the overall expectations surrounding the completion of a college degree.

Bandura (1986) provided rationale for why educational outcome expectancies might be studied in conjunction with the variable of satisfaction. In the article, he broke outcome expectancies into several classes. Along with the classes of social and physical outcome expectancies was the anticipation of self-evaluative outcomes. Bandura (1986) stated that the anticipation of such self-evaluative outcomes may importantly affect career behavior. Therefore, a

measure of satisfaction related to self and academic career should correlate with a measure educational outcome expectancies.

The paper covers the revision process of item addition, factor analysis, reliability, and validity estimates (convergent and criterion). The process discussed above is driven by one goal: the development of a reliable and valid measure of educational outcome expectancies. According to SCCT, educational outcome expectancies are important in the development of interests, the career choice actions a person would make, and the extent to which a person would persist in career-relevant behaviors (Lent et al., 1994).

It is by addressing and studying these concerns that the field will advance understanding of the interplay between college students' overall educational outcome expectancies and career development, choice, and persistence. This information would be helpful to any number of professionals working with students, such as career counselors or college instructors. Self-efficacy and outcome expectancies have been linked to college-related outcomes like grade point average (e.g., Lent Brown, & Larkin, 1984; Brown et al., 1989), persistence or continued enrollment (Brown et al., 1989; Lent, et al., 1984, 1997; Lent, Lopez, & Brown, 1986; Tilley, 2002), and overall achievement (Gainor & Lent, 1998). The development of a concise, reliable, valid measure of the construct, in this case educational outcome expectancies as measured by the revised EOE instrument, linked to these outcomes is meant to aid the efforts of those working with college students to both better understand and intervene with such clients.

## **Study One**

There were two hypotheses:

1. The EOE-R will consist of one single factor and the items will load on that factor.
2. The EOE-R measure will demonstrate internal consistency with a strong  $\alpha$  level.

## **Item Domain**

The researcher expanded the items in the EOE-R to represent an overall view of college beyond the six RIASEC domains of college (as

hypothesized in Tilley, 2002); educational outcome expectancies should represent expectancies for outcomes related to the overall earning of a college degree. Specifically, Bandura (1986) discussed outcome expectancies as incorporating physical outcomes (e.g., earning more money), social outcomes (e.g., pride), and self-evaluative outcomes (e.g., feeling better about one's self).

Therefore the researcher and two senior colleagues established in the vocational psychology research community met to discuss the content of the additional items. The group decided to produce three item types for addition to the original EOE to create the EOE-R: items capturing the expectations one would have as a result of getting a college education such as physical outcomes and social outcomes, and items capturing expectations for satisfaction as a result of achieving a college degree.

One example of an item representing physical outcomes is "be able to make more money." An example of an item representing social outcomes is "make my family proud." The preceding items are representative of a group of items added to the EOE-R in order to capture the need for physical outcomes and social outcomes discussed above. Beyond these, other items were included as representative of the general expectations one might have for obtaining a four-year undergraduate college degree.

In order to capture the expectations one would have as a result of getting a college education, the researcher added 22 total items. Two of the items were added to address the expectations for satisfaction component discussed by Bandura (1986) and Lent et al. (1994). The remaining 20 items were added in order to capture possible content areas of what students expect from obtaining a college degree, including the aforementioned items addressing physical and social outcomes.

## **Method**

### *Participants*

Data were collected from students ( $N=1045$ ) at a large Midwestern university. The sample was 582 (56%) females and 463 (44%) males. The sample included 663 (63%) freshmen, 246 (23%) sophomores, 97 (8.5%) juniors, 49 (5%) seniors, and 4 (.5%) other/grad students with ethnic background as follows: Caucasian/White ( $n=927$ ), 88%;

African-American ( $n=30$ ), 3%; Asian-American/Pacific Islander ( $n=38$ ), 4%; Latino/a-American ( $n=20$ ), 2%; International Student ( $n=13$ ), 1%; Multi-Racial ( $n=11$ ), 1%; Native American ( $n=3$ ), .5%; Other ( $n=4$ ), .5%.

### *The Educational Outcome Expectancy Scale-Revised (EOE-R)*

Springer et al. (2001) constructed the original EOE to measure educational outcome expectancies. The original EOE is a six-item, Likert-type scale that requires the participant to gauge from 1 to 6 to what extent he or she expects an outcome (item) when he or she has completed a bachelor's degree (1=not at all expecting the outcome, 6=very much expecting the outcome). Item examples include [To what extent do you expect to...] "be more competitive in the job market" and "reduce the chance of being fired." As noted, items were added to create the EOE-R.

Springer et al. (2001) reported one factor (educational outcome expectancies) that accounted for 69% of the variance. The internal consistencies in the sample were  $\alpha=.83$  for the females and  $\alpha=.86$  for the males with test-retest reliability ( $r = .48$ ). High scores on the EOE have been shown to be significantly related in a positive direction with academic outcomes such as higher GPA and academic persistence (Tilley, 2002).

### *Procedures*

Data on the EOE-R were collected as part of two 90-minute-long mass-testing sessions that included multiple other measures from other researchers. Participants volunteered to take part in the study for extra credit in psychology courses. There was no penalty for participants that did not finish the session. There was also no penalty for those choosing not to take part in the session.

The data from the participants on the EOE-R were factor analyzed in order to determine whether the measure represented one-factor. As stated in the introduction, a goal of the study was to produce a brief one-factor measure of educational outcome expectancies.

## Results

For the purposes of addressing Hypothesis 1 the researcher conducted a factor analysis to investigate whether the measure clearly captures one factor (educational outcome expectancies). A principal-axis factor analysis was performed on the 28 items of the EOE-R. Squared multiple correlations were used as the initial communality estimates, and the communalities were iterated. The analysis yielded a factor with an Eigenvalue of 9.23 that accounted for 32.97% of the total variance. The first factor, with 23 items, was labeled college educational outcome expectancies. The factor had loadings ranging from .45 to .74, as shown in Table 1. The items with factor loadings greater than .40 ( $n=23$ ) were internally consistent ( $\alpha=.93$ ).

## Study Two

The researcher investigated the following hypotheses:

1. College-related educational outcome expectancies will be positively and moderately correlated with college self-efficacy.
2. College-related educational outcome expectancies will be positively and moderately correlated with college satisfaction.

## Method

### *Participants*

Data were collected from students ( $N=173$ ) at a large Midwestern university. The sample was 94 (54%) females and 79 (46%) males. The sample included 103 (60%) freshmen, 40 (23%) sophomores, 14 (8%) juniors, and 16 (9%) seniors with ethnic background as follows: Caucasian/White ( $n=157$ ), 91%; African-American ( $n=6$ ), 4%; Asian-American/Pacific Islander ( $n=2$ ), 1%; Latino/a-American ( $n=4$ ), 2%; International Student ( $n=2$ ), 1%; Other ( $n=1$ ), 1%.

## Instruments

### *Educational Outcome Expectancy Scale-Revised (EOE-R)*

The 23 items resulting from Study One as the EOE-R were used in Study Two. The internal consistency of the measure in the second sample was  $\alpha=.93$ .

## **The College Self-Efficacy Inventory (CSEI)**

The CSEI (Solberg, O'Brien, Villareal, & Kennel, 1993) is a measure of college-related self-efficacy. The construct was defined as a college "student's degree of confidence that she or he could successfully complete a given college-related task" (Solberg et al., 80). The CSEI is a 20-item instrument with 3 subscales: course efficacy (self-efficacy related to completing course requirements such as assignments and tests; 7 items), social efficacy (self-efficacy related to working with others in the college environment such as professors and friends; 6 items), and roommate efficacy (self-efficacy related to living and relating with roommates such as dividing apartment space; 7 items). The researcher conducted internal consistency tests on the current sample and obtained a satisfactory alpha value ( $\alpha = .89$ ) for the overall measure.

## **Your First College Year (YFCY)**

The Your First College Year (Astin, 1993) measure is produced yearly by The University of California at Los Angeles. The original measure includes 50 items; in this study only the two sections measuring satisfaction (18 items; College Satisfaction and Campus Life) were used. The items are answered with higher scores indicating less satisfaction, meaning that the researcher expected the YFCY and EOE-R to be positively correlated on a conceptual level but negatively correlated on a statistical level. Because the YFCY Campus Life Scale asks the participant about facilities or opportunities that may not be available to every student, individual item means were examined for that scale.

## **Procedures**

Data for Study Two were collected in testing sessions that included the EOE-R, the Your First College Year measure, the CSEI, and demographic questions. Participants volunteered to take part in the study for extra credit in introductory psychology courses. There was no penalty for participants that did not partake in or finish the session.

## *Results*

For Hypothesis 1, the researcher expected the EOE-R to be significantly positively and moderately correlated with the CSEI, a measure of college-specific self-efficacy. The result was that the CSEI and the EOE-R were significantly positively correlated ( $r = .27, p < .001$ ) for the overall sample. These findings support the first hypothesis.

The researcher also expected the EOE-R to be significantly and moderately correlated with the YFCY College Satisfaction Scale. The researcher conducted a Pearson product-moment correlation between the mean score of the YFCY College Satisfaction Scale and the participant's mean score on the EOE-R. The results indicated a significant negative correlation ( $p < .05$ ) with a coefficient of  $-.16$  for the overall sample. The correlation was significant and in a negative direction as expected due to the reverse scoring. Only two individual correlations between items on the YFCY Campus Life Satisfaction scale and the EOE-R items were significant for the total sample, namely classroom facilities ( $r = -.20$ ) and orientation for new students ( $r = -.17$ ). There were two significant correlations as well, for females, classroom facilities ( $r = -.28$ ) and computer facilities ( $r = -.27$ ).

## **Discussion**

The results support both hypotheses of Study One, namely that the EOE-R can be presented as a single factor and that the 23 items in this sample are internally consistent. The results of the factor analysis also show support for educational outcome expectancy as a single factor that need not be broken down by subject or interest area. The researcher found support for a satisfaction expectancy component to load in a way similar to other educational outcome expectancy items. The satisfaction expectancy items were among the highest loaders, at  $.67$  and  $.68$ , supporting Bandura's (1986) statement that outcome expectancies include a satisfaction expectancy component. With respect to Hypothesis 2, the researcher obtained an internal consistency estimate ( $\alpha = .93$ ) that supported his hypotheses and found support for the EOE-R as a single-factor measure of college outcome expectancies with 23 items that loaded at  $.40$  or above on the factor.

The purpose of Study Two was to obtain validity estimates for the EOE-R. Due to prior reports that educational outcome expectancies and self-efficacy are positively and moderately correlated (e.g., Brown,

et al., 1989; Lent, et al., 1997; Lent, et al., 2000), it stands to reason that a measure of a specific outcome expectancy should be positively and moderately correlated with a measure of a similar type of self-efficacy.

The results reflected the positive correlation between college self-efficacy and educational outcome expectancies, as discussed in the research above. The EOE-R and the CSEI were significantly and positively correlated ( $r = .26$ ). The result adds information to the ongoing research on the relation between outcome expectancies and self-efficacy by exploring educational outcome expectancies with college self-efficacy, a construct not nearly as prevalent in the extant research as career self-efficacy, for example. Beyond that, the result of Hypothesis 1 is consistent with and supports the existing research.

In SCCT, the hypothesis 11A states that educational outcome expectancies should be positively related to reinforcing consequences that one has directly experienced (Lent et al., 1994). One of those reinforcing consequences would be satisfaction with the college experience. No one has tested this hypothesis in educational outcome expectancies domain.

The researcher examined the correlations for each part of the YFCY measure and the EOE-R separately; the institutional piece of the YFCY was examined on an item-by-item basis (included in the Results section). For Hypothesis 2, the researcher found a significant negative correlation ( $r = -.16, p < .05$ ) between the EOE-R and YFCY College Satisfaction, which was the expected relation between satisfaction and educational outcome expectancies.

Study Two provided support for the idea that educational outcome expectancies and college satisfaction are related. The study also supports the domain-specific rationale for further study of college satisfaction in conjunction with educational outcome expectancies: that the college domain is related to educational outcome expectancies when the participants are female students at a four-year undergraduate college. The results supported hypothesis 11A of SCCT (Lent et al., 1994), which states that educational outcome expectancies should be positively related to reinforcing consequences that one has directly experienced, e.g. satisfaction.

## **Conclusion**

The first conclusion is that, by virtue of both hypotheses in Study One being completely supported, the EOE-R is indeed a solid, reliable one-factor measure of educational outcome expectancies when applied to students at a four-year undergraduate university. The researcher proposes that college is a domain and need not be broken down by interest or subject area in order to be valid. The criterion validity estimates supported the relation between educational outcome expectancies and college satisfaction for women. The significant and positive correlation between the EOE-R and the CSEI supports the research discussed throughout the paper linking outcome expectancies and self-efficacy (e.g., Brown et al., 1989; Lent et al., 1997; Lent et al., 2000). This provides one positive sign of convergent validity for the EOE-R.

## **Limitations**

The main limitation is the lack of diversity in the sample (91% Caucasian). The research was conducted using students in a Midwestern university that does not have a very diverse enrollment and that shortcoming was reflected in the sample. It would be more helpful in terms of generalizability for the study to be normed with a sample that is more diverse.

Another limitation was that the surveys were taken at the same time by the same group of participants. Although it was unavoidable for purposes of data collection and assessing the mind state of the participants, there is a possibility that part of the correlations among the measures can be due to the rating tendencies of the participants (e.g. participants that tend to rate items highly or lowly) and not indicative of the true relations between constructs as described in the Discussion.

## **Implications**

The results of Study One and Study Two have implications not only for the field of vocational psychology but also for the academic environment, particularly the college environment in which the EOE-R was validated. The first of these is the results supporting the validity of the EOE-R. The EOE-R, even after adding items to the original EOE, is still a relatively short measure. Because educational outcome

expectancies have been shown to be positively related to persistence in obtaining a degree (Tilley, 2002), scores on the EOE-R can be used to predict persistence.

When an academic institution is concerned about finding students who are unlikely, for a variety of reasons, to complete their education the institution can screen students to find out which students are at risk of leaving a program before completion. The EOE-R could be used as a screening instrument for identifying students at risk for withdrawing from school. As an instrument that detects early possibility of future early withdrawal, the EOE-R can be useful within the context of career counseling, career-focused classes, and possibly as a screen at the start of each semester for all students. Once the students are identified, the institution can take action such as offering tutoring, meetings with career counselors, or engaging other support systems.

Class time is valuable at every academic institution, especially the growing number of colleges and universities with schedules that condense courses into a one- or two-month period. The brevity of the EOE-R allows it to be administered in a relatively quick fashion so that if it were administered in a classroom setting, it would not take up much of the time planned for other activities. In addition, the brevity makes it ideal for administration before counseling meetings when the client is sitting in a waiting room or during counseling meetings without taking a significant amount of time away from the session.

As found in Study Two, the EOE-R is significantly and positively correlated with a measure of college-related self-esteem. As discussed in the introduction, outcome expectancies and self-efficacy are linked conceptually in Social Cognitive Career Theory (SCCT; Lent et al., 1994). A number of researchers have explored this link in the academic realm and the findings support the value of assessing academic-related self-efficacy and outcome expectancies.

Shell, Colvin, and Bruning (1995) examined self-efficacies and outcome expectancies for reading and writing concurrently at several grade levels using measures for both of the above constructs as well as a reading and a writing assessment. They found that students' self-efficacy was strongly and positively correlated to their performance on reading and writing assessments and their outcome expectancy beliefs were moderately and positively correlated to their performance on reading and writing assessments.

Fouad, Smith, and Zao (2002) addressed this very issue by investigating SCCT principles, including the roles of self-efficacy and outcome expectancies, across educational areas of art, social science, math/science, and reading/writing. Using structural equation models, they found support for the SCCT-based concept of the relation of self-efficacy and outcome expectancies in the educational domain: that self-efficacy and outcome expectancies are positively and moderately correlated and influential in the educational domain.

Bores-Rangel, Church, Szendre, and Reeves (1990) provided strong support for SCCT views of career and academic self-efficacy. They found moderate relations between academic self-efficacy and outcome expectancies and academic achievement although academic achievement was not measured using grade point average (GPA). Tilley (2002) addressed the potential relation between self-efficacy and outcome expectancies with grade point average. He studied educational outcome expectancies and self-efficacy as they related to academic performance (GPA), ability (ACT score), and persistence (continued enrollment). He found that the EOE scored similar to a measure of academic self-efficacy in predicting GPA and ACT score. The EOE stood out as a predictor of persistence where the academic self-efficacy measure did not, lending credence to educational OE as an independent and important predictive construct in the domain of education.

Overall, research has supported the positive correlation between self-efficacy and GPA (e.g., Lent, Brown, & Larkin, 1984; Brown, Lent, & Larkin, 1989) and self-efficacy and persistence (Brown, et al., 1989; Lent, et al., 1984, 1997; Lent, Lopez, & Brown, 1986). Another study showed a link of outcome expectancies to achievement (Gainor & Lent, 1998). Just as with self-efficacy, there is a link provided between educational outcome expectancies and persistence (Tilley, 2002). Research also has found higher self-efficacy and outcome expectancies to be positively related to better reading and writing (Shell et al., 1995).

Given the preceding information, knowledge of a student's academic-related outcome expectancies, especially obtained through a non-intrusive, time-limited approach like the EOE-R, could be quite valuable both to academic institutions and to therapy providers.

## Future Directions for Research

As stated in the introduction and literature review, how self-efficacy has been studied is often an indicator for how outcome expectancies can be studied, given that so much more of the research on SCCT has been devoted to self-efficacy. Future research in a variety of areas on educational outcome expectancies is made simpler because the EOE-R is such an easily administered and scored instrument. There are still numerous areas in the vocational literature where self-efficacy has been studied but outcome expectancies have not. This paper provides not only an instance of research on outcome expectancies in areas self-efficacy is more prevalent but also validity estimates for an instrument with which to conduct such undertakings.

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## Tables

Table 1  
*Factor Loading Matrix for the One-Factor Educational Outcome Expectancy Scale-Revised*

Educational Outcome Expectancy item	M	SD	I	h <sup>2</sup>	Item total
19. be able to solve problems more efficiently	4.97	1.03	<b>.74</b>	.55	.68
15. make great progress toward being an expert in my field	5.17	1.03	<b>.72</b>	.52	.66
23. demonstrate that I can succeed on my own	5.17	1.07	<b>.71</b>	.50	.66
18. be better equipped to apply for and obtain a desired job	5.23	0.97	<b>.70</b>	.49	.63
21. be more satisfied with myself	4.83	1.17	<b>.68</b>	.46	.65
14. learn skills that would make me a good employee in the eyes of management	5.21	0.99	<b>.68</b>	.46	.63
11. be more likely to influence others	4.95	1.09	<b>.68</b>	.46	.63
20. feel better about myself	4.78	1.20	<b>.67</b>	.45	.64
10. make my family proud	5.41	0.91	<b>.65</b>	.42	.59
8. have opportunities to use my organizational skills	4.90	1.13	<b>.64</b>	.41	.60
5. to have learned skills for my career	5.42	0.92	<b>.64</b>	.41	.57
12. be seen as an important person	4.61	1.25	<b>.63</b>	.40	.92
7. to have learned to express myself	4.60	1.24	<b>.63</b>	.40	.61
3. be able to better serve other people	4.97	1.14	<b>.60</b>	.36	.54
9. be more likely to give back to the community	4.62	1.26	<b>.57</b>	.32	.54
13. learn necessary mechanical skills to help my career	4.77	1.33	<b>.56</b>	.31	.54
17. have a wider variety of friends	4.53	1.29	<b>.56</b>	.31	.56
16. be less likely to be stuck in a job I don't like	4.83	1.49	<b>.53</b>	.28	.50
4. reduce the chance of being fired	4.64	1.26	<b>.53</b>	.28	.50
22. be qualified to pursue an advanced degree (e.g. Masters, Ph.D.)	4.95	1.27	<b>.51</b>	.26	.46
2. be able to make more money	5.17	1.06	<b>.50</b>	.25	.47
1. be more competitive in the job market	4.92	1.18	<b>.46</b>	.21	.43
6. be more likely to be friends with others who are college educated	4.31	1.37	<b>.45</b>	.21	.45
<u>Items with loadings below .40</u>					
-- make more money than my parents	4.45	1.47	.39		
-- be viewed as qualified to create, design, and/or modify products in my career	4.01	1.60	.35		
-- refine my artistic talent to create a better product (e.g. sculpture, performance, design)	3.57	1.07	.34		
-- be able to design a new product (e.g.					

	machinery, mechanical devices)	3.39	1.67	.27
--	be more likely to work outdoors	3.24	1.42	.23

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The main factor is labeled as "I." Item loadings .40 and above are bolded.

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# **Benefits of Study Abroad and Creating Opportunities: The Case for Short-Term Programs**

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## **Abstract**

The 21<sup>st</sup> Century is characterized by global economic interdependencies in business, finance and trade. University education must now include more opportunities for students to gain firsthand knowledge of global interdependencies and develop superior cross-cultural skills. Nevertheless, currently less than 1% of college students from the United States study abroad. This paper examines the reasons behind such meager performance, and considers short-term study-abroad alternatives for offering students more opportunities. Analysis of data on the effect of such programs reveals several interesting findings. Based on survey research conducted by the authors and previous studies, the paper concludes by offering guidance to faculty policymakers and university administrators. The paper contains recommendations for the design of favorably competitive curricula offerings, and suggestions for developing highly integrated and flexible study-abroad programs that can be much less expensive, more available and widely marketed than traditional programs.

## **Key Words**

Study-abroad opportunities, short-term, curriculum.

## **Introduction**

The 21<sup>st</sup> Century is characterized by global economic interdependencies in business, finance and trade. The rapid expansion and convergence of technology and the burgeoning entry of India, China, and many other developing economies into the global super-marketplace has serious implications for university education. Indeed, globalization demands more worldly educational opportunities. Now, most everyone realizes that inexpensive telecommunications networks and lower costs for international transportation eliminate the major impediments to international competition. Indeed, the word "globalization" (Hanvey, 1982) and economic references to a "flat

world" (Friedman, 2005) are now an essential part of the common vocabulary.

Study-abroad programs, whether short or long term, can significantly enhance students' formal education and improve their future employment opportunities. Study-abroad programs are defined as educational programs that take place outside the geographical frontiers of the students' country of origin, and these programs may be short- or long-term learning experiences. Several studies focusing on study-abroad outcomes have provided evidence that such programs enhance students' worldview (Carlson & Widaman, 1988); the students' global perspective (McCabe, 1994); even their cross-cultural effectiveness (Kitsantas & Meyers, 2002; Tegning & Polson, 2006). Previous research, focusing on specific outcomes of study-abroad programs, has provided further evidence that the programs enhance students' worldview. For example, the study by Carlson and Widaman (1988) surveyed 450 study-abroad program students on whether student perspective on global issues and cross-cultural understanding changed as a result of their participation in the programs. The students were queried at the onset and at the conclusion of their experience. As part of the pre- and post- questionnaires, the students were asked to respond to a parallel set of items within their current perspective. This technique allowed the researchers to formulate assessments concerning students' change in global perspective and worldview. The same queries were made on similar groups of students who did not participate in the study-abroad program. The study-abroad experience resulted in higher levels of international political concern, cross-cultural interest and understanding when compared to the students who did not participate in a similar program. The conclusion is that participation in study-abroad programs provides students with an opportunity to view the world from completely new and different perspectives.

There are the obvious benefits from study-abroad programs such as the greater potential for acquisition of a foreign language, increased knowledge of the different cultures, developing cross-cultural skills and potential for transformational worldviews. Yet, less than 1% of college students from the United States study abroad each year (NAFSA, 2007). Why do so few students from the United States take part in such programs? Students stay in this country for a variety of reasons, but the primary reasons concern three factors: affordability, time constraints and flexible integration within major programs (Lewis & Niesenbaum, 2005). With apparently enormous benefits from study-abroad programs, the most important question is: "how can our

academic programs improve opportunities?" The answer can be found in short-term study-abroad programs, where the program is less than a semester and perhaps only one or two months in duration. Such short-term programs can be a good option to the more costly traditional study-abroad offerings. A one- or two-month program makes living in a foreign country much less costly, easier, less threatening and much less of an interruption in a student's ordinary life responsibilities, particularly when considering the responsibilities of older adult students with families (Brown, Pegg, & Shively, 2006). Rapid globalization, and the consequent growing demand for employees with cross-cultural skills, puts pressure on university faculty and administrators to develop and operate at least some study-abroad programs within their curriculums, particularly within the departments of the Business Schools. Universities can no longer sleepily ignore this imperative to provide high-quality outcomes for their competitive enrollments (Poole & Davis, 2006).

### **Survey Research on Study Abroad**

The authors of this paper have experience in study-abroad curricula, particularly short-term programs. For example, one of the authors regularly teaches an undergraduate course during the summer called "Global Marketing," which is only six weeks in length and held in Denmark. The author has taught this course on weekdays at the Copenhagen Business School's campus since its inception 10 years ago. Incorporated within this program is an additional study-abroad experience available on the weekends. To increase the short-term program's effectiveness, it is designed to focus on the eclectic nature of the students in the classroom environment (Xiong, 2003). A typical class of 30 students consists of five cultures and/or nationalities. The program has theory and case-learning components, in which students are organized into groups that assure a diverse cultural mix. This design guarantees a study-abroad encounter that is characterized by a very different learning experience. The group study experience assures a close association with students from different cultural backgrounds within the foreign environment. This also helps free students from any feelings of isolation, and relieves potential anxiety from confrontation in a foreign environment.

The theoretical argument for an enhanced learning experience from study abroad programs is supported by the previously cited studies. The authors conducted empirical research based on a survey instrument of 10 questions administered on a total of 150 students

over a five-year period. The purpose of this study was to measure the actual extent of impact on the students enrolled in this particular Copenhagen short-term program. Also data was collected on follow-up and reporting of post-program experiences. The students in the program were surveyed pre and post the study-abroad experience. The data gleaned from this study-abroad course revealed four general conclusions:

1. When the students returned to their home campus, many took courses outside their major specifically because of their participation in the program.
2. Almost half the students traveled or studied abroad again. Those who did, make a clear connection from their experience in Denmark to subsequent study-abroad.
3. Majority of the students demonstrated increased interest in interdisciplinary studies.
4. All students indicated that their participation in the short-term program had influenced their perceptions of the costs and benefits of globalization. Students' analysis of globalization became more sophisticated through the strategies of interlinking the short-term study abroad with all their other coursework.

The authors' survey findings reveal that short-term study-abroad programs can meet many of the same goals of students and faculty as the long-term programs, but without the long-term disadvantages. Although some students have expressed fears about studying abroad since September 11, many scholars and policymakers have argued that it is even more important now for students from the United States to learn firsthand about other cultures. One of the chief benefits of study-abroad programs is learning about people from different cultures as the students live within the foreign environment.

Another research study examined the impact that these short-term study-abroad programs have on students' cross-cultural skills and global understanding, and also examined the role of students' goals for participating in such programs and to what extent students' goals affect outcomes (Kitsantas, 2004). Two hundred and thirty two ( $N = 232$ ) study-abroad college students were surveyed regarding their cross-cultural skills prior to and at completion of the programs. A factor analysis developed a Study Abroad Goals Scale (SAGS) and revealed three common factors that students have for joining these

programs: (1) to enhance their cross-cultural skills, (2) to become more proficient in the subject matter, and (3) to make friends and socialize. As expected a priori, the empirical results find that students' cross-cultural skills and global understanding improve. However, students' goals to study abroad may also influence the magnitude of these outcomes. Goals being defined as intentions to attain some specific standard of proficiency, within a specified time limit (Locke, Shaw, Saari, & Latham, 1981). For example, according to Locke and Latham (1990) goals influence the behavioral functioning and outcome by concentrating attention and manipulating effort. Research on the impact of goals in the acquisition of skills finds that goal setting significantly enhances the participant's performance (Schunk, 2000).

Therefore, this study-abroad research explored the effect of students' goals for studying abroad on their cross-cultural skills and global understanding. In order to assess the effect of goals, a "Study Abroad Goals Scale" (SAGS) was devised, based on Carlson's and his colleagues research (Carlson, Bum, Useem & Yachimowicz, 1991; Opper, Teichler & Carlson, 1990). It has been reported that the most important reason for which students select to participate in study-abroad programs are: to improve their career prospects; to improve their cultural understanding; to study the subject matter not offered in their home institution; and finally simply to join friends who enroll or make new friends. The Scale items were formulated according to these motives for participation in study abroad programs. The hypotheses were classified as: (1) Study-abroad students return to their home country with an improved global understanding and enhanced cross-cultural skills. (2) Students reporting their primary goals are to develop their cross-cultural skills would result in the highest development of cross-cultural skills, followed by those students reporting their goal was to become more knowledgeable in their subject area; whereas little or no gains in cross-cultural skills or global understanding were expected for students whose goals were generally to simply socialize.

The effectiveness instrument administered was the Cross-Cultural Adaptability Inventory (Kelley & Meyers, 1995) and this was used in order to assess student cross-cultural effectiveness and self-awareness. The Global Perspective Survey (Hanvey, 1982) was administered to the participants to assess the students' understanding and global perspective. All participants signed informed consent, and they responded to the survey instruments online before departure and upon return to the United States. Paired t-tests revealed that student's initial scores on all (except the perceptual acuity subscale) of the

Cross-Cultural Adaptability Inventory instrument were significantly different at the .05 level or better, following completion of the short-term study-abroad programs. The goals hypothesis, that students' goals to study abroad predict the level of cross-cultural skill development is supported. Correlation analysis shows that the variance in students' cross-cultural skills is largely explained by the goals for studying abroad. As expected, the goal to develop cross-cultural competence was most portent. Similarly, the variance in global understanding was also explained by the students' goals. Correlations show that the goal to improve competence is associated with higher levels of development in cross-cultural skills and global understanding. Finally, no significant correlations is found for the purely socialization goals.

The findings of these studies further confirm the value and effectiveness of short-term study-abroad programs: these programs enhance students' cross-cultural skills and global understanding. Furthermore, students' reasons for participating in these programs significantly predict the outcome of skills development.

## **Conclusions**

The rapid globalization of businesses and the consequent demand for skilled employees greatly increases the need to prepare students for international assignments. Universities that provide study-abroad programs that are designed to enhance students' goals can expect to increase their competitive advantage in the educational marketplace by better serving their students. A recent report of the Strategic Task Force on Education Abroad, convened by NAFSA (Association of International Educators), has argued that after the terrorist attacks we are in a "Sputnik moment" in which "it is time to launch a major national effort to ensure that every college student graduates with both an understanding of at least one foreign area and facility in at least one foreign language. If a semester-long or year-long experience is too costly and seems too daunting, the research suggests that a shorter, well-planned program can help many more students to achieve those goals" (NAFSA, 2007). Another important consideration is that numerous students are opting to take many of their courses online. Indeed, many universities are experiencing significant increases in their online courses with concomitant decreases in the percentage of on-ground classroom enrollments. The major advantage to students enrolled in these online programs is the flexibility and asynchronous scheduling. However, offering options for a short-term

study-abroad experience could greatly enhance the overall appeal of some online degree programs, particularly those related to international studies and foreign language studies. This addition provides another avenue for increasing overall university program enrollments because it adds an attractive option to these programs.

Taken together, the findings of short-term study-abroad research have important policy recommendations for helping smaller and non-traditional universities to be more effective as they compete with larger traditional schools. The conclusion is that most any campus could design favorably competitive curricula offerings. However, to be successful, such programs must be developed as highly integrated and flexible study-abroad programs. They also can be designed to be less expensive, more available and more widely marketed than traditional programs.

### **Recommendations and five critical factors**

The advent of globalization demands more worldly educational opportunities. Universities that respond with creative and valuable programs that include study-abroad experiences are the most competitive because they satisfy a real need. More universities can succeed by incorporating short-term study abroad courses into curriculum. Nonetheless, five factors are very important to consider when designing short-term study abroad experiences. The five critical factors are as follows:

1. *The financial constraints of most students are real and must be acknowledged in the design of programs.* Offerings of study-abroad experiences should be designed to cost little more than study at home. Obviously, there is the extra expense of travel and accommodation, but this can be kept to a minimum by judicious use of group resources and planning. For example, universities that already have accelerated-courses, such as the one-month course design can quickly gear-up to offer a summer one-month study-abroad course in all their schools. These one-month course designs are much less costly to the student than traditional semester-length, study-abroad programs. The student expense can be kept very low, little more than the airfare and cost of dormitory, and a small amount for local transportation. The university can quickly and easily arrange extremely low-cost one-month dormitory accommodations with cooperating universities in other countries. Professors are often available

during the their annual break and will probably want to teach a one-month course in another country because it can count toward satisfying the teaching load and the experience provides a pleasant break in routine. Again, the university has very little extra expense, simply the cost of professors' airfare and dormitory lodging. It is a win-win situation for everyone. Another economical option is for stationing one or more professors for more than one month in a foreign country, and these professors teach sequential one-month courses.

2. *The perceived and real fit of the study-abroad experience within the academic program and its relationship to the student's major field of study.* Students must be able to see that the study-abroad offering is unequivocally a good fit within their curriculum and not simply a frivolous extra course.

3. *Timing of offerings.* All study-abroad offerings should be made available during the most appropriate sequence within programs, and offered in the months when non-traditional students are more likely to be able to schedule and enroll.

4. *A small or non-traditional university must make a firm commitment to a consistency of offerings.* Study-abroad classes that are later canceled because of low enrollment are very detrimental to the university programs because students soon learn that enrollments are not assured and can seriously jeopardize their schedules. Canceling courses because of initial low enrollments is unwise. The students will see this type of administrative action as evidence that the university is not serious about growing a study-abroad program component. Conversely, consistently offering these courses, irrespective of their initial enrollments, and following through by never canceling classes will eventually develop an excellent reputation for the university. The "word of mouth" eventually results in self-supporting programs with high demand.

5. *Finally, a small or non-traditional university must also make a firm commitment to substantial advertising for the new study-abroad offerings.* Initially this is an added expense, but the prestige and increase in university reputation more than offsets this added expenditure.

Curriculum designers can develop appropriate programs for any university, whether traditional or non-traditional, residential or non-

residential. Such programs and courses only require a little “out of the box” thinking and sound administrative support. In the rapidly globalizing economy of the 21<sup>st</sup> Century, university faculty and administrations cannot ignore the increasingly competitive need to quickly enhance their reputation for curricula with substantive and regular study-abroad experiences. The research finding that even short-term study-abroad programs can be highly effective means that the process of expanding opportunities can be much more manageable, not only for large universities but for the smaller less-endowed institutions as well, particularly for accredited universities with substantial experience in accelerated programs.

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