

E-Learning Systems: Promises and Pitfalls

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Objective: *This review examines the use of e-learning systems in psychiatric education.*

Method: *The authors review the Instructional System Design process, focusing on ADDIE (Analysis, Design, Development, Implementation, and Evaluation). The authors also report on two representative teaching projects, discussing the planning, work, and assessment required.*

Results: *The basic operations of these education software systems are relatively easy to learn. The real work is the project preparation which precedes software use and final implementation.*

Conclusions: *Internet-based learning software is another tool in the educator's armamentarium. Educators must still utilize sound educational pedagogy to create effective learning instruments.*

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The emergence of e-learning software has provided a new tool for psychiatry educators. Learning software that resides on the Internet is available to students and residents 24 hours per day, 7 days per week. It can be utilized from any computer with Internet access. The software can be used as a means to supplement or facilitate a live course, as a stand-alone teaching module, or as a distance-learning course. However, the software's availability does not ensure that it will be used efficiently or satisfactorily (1, 2).

Although many educators consider e-learning software a useful resource to capture and display PowerPoint presentations, there are multiple other opportunities to employ this technology. Instructors should ask themselves a series of questions.

- Can this software improve upon classroom teaching? In what ways? Usefulness will depend upon the specific teaching task, and this requires considerable forethought and planning by the educator.
- Will the course be taught exclusively online or will face-to-face contact with instructors also be included? In the absence of any face-to-face contact, online assessment of learning will become dependent upon what a student actually types on a keyboard.
- Will the software be used as an adjunct to classroom or clinical teaching? Here, it can be used to disseminate learning materials from a wide variety of sources.
- Is there a need for ongoing communication? Programs can also create online "office hours" so the students can go online for "live chats."

We will discuss educational pedagogy and instructional design strategies, such as the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) process (3–8), that are required to plan a teaching module using e-learning software. We also provide examples in residency and medical student education that review the general capabilities of two such programs, ANGEL (A New Global Environment for Learning) and WebCT (Web Course Tools), as representative examples.

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Background

Learning management systems and e-learning course management systems are terms given to learning software (9). The former term is used more in business for stand-alone teaching modules aimed at short-term performance, while the latter is used in academic settings that stress long-term learning and adjuncts to live instruction. E-learning course management systems also typically offer administrative features, such as online course enrollment, monitoring of online usage, and survey and testing tools with automated grading and input collating. However, many individuals tend to use the terms interchangeably, especially as the former systems add more administrative features.

There are numerous vendors with additional companies introducing more products (Appendix 1) cooccurring with market consolidation (WebCT and Blackboard have recently merged and Macromedia was purchased by Adobe). Programs differ slightly in their features, vary in their ease of use, and are often written in a proprietary code. Most systems are purchased for institution-wide use and must be supported by the purchasing school's academic IS department. Open source systems such as Sakai (www.sakaiproject.org) and Moodle (www.moodle.org) are free but require an extensive programming background and, hence, have an indirect cost (require institutional IS support). A listing of other open source software may be found at: <http://www.edtechpost.ca/pmwiki/pmwiki.php/EdTechPost/OpenSourceCourseManagementSystems>.

Most e-learning software or course learning management systems have common features, although these features may be implemented differently. They are designed to be used institution-wide and are housed on the institution's server, and can be made available to the universe (Internet) or restricted to within the institution (intranet). This software allows the posting or uploading of syllabi and other word-processed documents, digital photos, movies or animation, PDF copies of papers, PowerPoint slides with or without audio and video components, links to relevant Web sites, access to online full text journals and books, and any multimedia resource that this digital age has to offer. Students can then download these materials onto their own computers. Bulletin boards provide asynchronous (available 24/7), threaded (topic identified) discussions. Chat rooms allow scheduled real time discussions and/or online instructor office hours. Software scoring systems can automatically grade online multiple choice exams and can tally survey/evaluation data. The communication

sections permit the subgrouping of students into smaller workgroups and facilitate group and subgroup e-mailings. Additional features include activity reports, attendance managers, and e-portfolios.

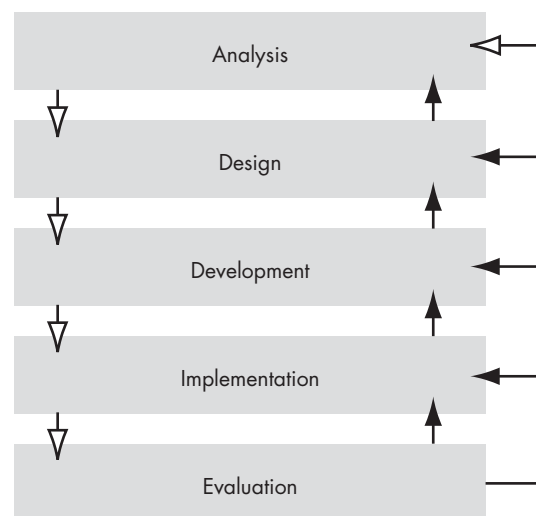
Because the commercial programs use proprietary code, lessons created in one software program are not necessarily transferable to another system. One solution available is Sharable Content Object Reference Model (SCORM) (10), a series of programming standards that permits the movement of a learning module created on one e-learning course management system to another system (<http://xml.coverpages.org/scorm.html>). Learning modules, once created, can be made SCORM-compliant. Some course management systems automatically perform this function while others require additional software purchases.

Phases of Design and Implementation

Like the Internet itself, Instructional Design was first developed by the military (11). Its purpose was to improve the effectiveness of soldier training. There are dozens of approaches to designing instructional resources, and one of the most commonly used is ADDIE (5–7), which stands for Analysis (defining what is to be learned), Design (specifying how it is to be learned), Development (authoring and creating the program), Implementation (going “live”), and Evaluation (assessing the success or failure of learning) (6,7). Though seemingly a linear, sequential approach, ADDIE is really a systems-based method of creating course content with feedback at every level (Figure 1).

Planning an online course requires forethought. Live face-to-face teaching may not necessarily transfer well to

FIGURE 1. ADDIE Process



the online environment. A course planner must decide if the new medium will convey an educational advantage or disadvantage. The teacher must decide if the online material will be a stand-alone tutorial or if it will supplement the classroom.

Analysis Phase. The analysis phase of instructional design is a background and planning task. The instructor must consider the goals and objectives of the course. Looking ahead at the end result, the instructor should have a vision of what it is that the student is expected to learn.

- Is it knowledge, a skill or an attitude?
- Can attitudes be taught and assessed using this medium?
- Who is the audience and how sophisticated should the teaching be? Materials for residents would be more advanced than those for medical students.
- Does the intended audience have prior knowledge in the subject matter?
- Will the course be sufficiently rigorous without being overly difficult? Conversely, can the course be basic yet maintain interest?
- What are the resources available?
- How much time do you have to complete the project?
- Are there constraints (fiscal and otherwise) on what you can do?
- How will you determine if your students have achieved competency in the subject matter?

When these issues are addressed, the curriculum design begins.

Design Phase. Using the information gleaned from the analysis stage, the teacher should write goals and objectives for the project to provide a documented direction that can be revised as the project proceeds. She/he selects the strategy, multimedia resources and any other materials required to convey the lesson. An evaluation instrument is needed as well as a timeline and a storyboard to sequence the lesson.

Storyboards are used by the motion picture industry to plan the filming of movies in detail. These cartoon versions of the film permit the planning of camera placement, filming panoramic views versus close-ups, positioning the actors, sequencing the action, etc. Storyboards can provide a similar function for the learning project, giving an overview of how the course will flow and allowing the educator to view the content nonlinearly and make any necessary modifications. These navigation maps permit checking for completeness, effectively organizing and chunking the mate-

rials, and providing a visual document for supporting the author’s thought processes. Sample storyboards can be accessed at www.storyboardsonline.com/find_a_style.asp.

Development Phase. The development phase entails the actual creation of the media content. Modules should utilize techniques that facilitate learning. Bloom’s taxonomy (12) highlights a hierarchy of learning objectives and helps identify where blended learning techniques can be useful (Figure 2) (see also Edgar Dale’s Cone of Learning accessed at www.intech.com/education/pdf/ConeOfLearning-Flyer.pdf). Prototype modules can be field tested for effectiveness.

Implementation Phase. This is the “go live” stage where the learning project is delivered to the student. This stage can also involve further field testing or piloting a near final prototype with continuing feedback from the intended audience. The quality of the distributed product should be monitored (e.g., sound fidelity and video resolution). One must also be prepared for technical problems and have a backup plan.

Evaluation Phase. Kirkpatrick’s four levels are a means of organizing program evaluation (13). His identified levels include reaction, learning, behavior/transfer, and results, and build upon one another.

1. Reaction measures the response to a learning program. Did the learners like it? Was the material rele-

FIGURE 2. Bloom’s Taxonomy of Educational Objectives



vant? All programs should be evaluated at least at this level.

2. The learning level moves beyond user satisfaction to measure the progression of advancement in knowledge, skills, or attitudes.
3. The transfer level attempts to measure if there was behavior change as a result of the program. While this could be the most valid assessment of effectiveness, it is also more difficult to measure. Did the program actually change practice habits?
4. The results level attempts to assess the impact of the program on the organization, also a difficult measurement. Did the program result in a positive return on investment (ROI)? For example, did a program to teach physicians standardized abbreviations on medical orders actually reduce medical mistakes and subsequent malpractice claims?

As indicated in Figure 1, evaluation and feedback take place at every phase of development in the ADDIE process and not just in a sequential manner with evaluation at the end.

Case Examples

ANGEL Example. Consider the scenario in which a faculty member is given the assignment of creating an online teaching module on psychiatric rating scales for psychiatry residents on the institution's ANGEL system. In analyzing the project, there may be several reasons for learning about rating scales. Residents should become familiar with rating scales in order to critically appraise scientific studies. For example, if a journal's definition of a response to antidepressant medications means a 50% reduction in the Hamilton Depression Rating Scale (HAM-D) scores, residents ought to appreciate the clinical importance of a specific HAM-D score as well as the significance of a 50% score reduction. It is also important for residents to learn about conducting clinical research and how researchers can reduce observer variability by practicing ratings as a group. Finally, residents may someday also want to utilize similar rating scales in their practice.

In designing the course, the instructor keeps these goals in mind and decides to maximize class time by uploading some exercises to be completed online before the class meets. Classroom time can then be used for group review and discussions. The instructor confirms the choice of the Hamilton Depression Rating Scale over other instruments. He or she wants each resident to observe a filmed clinical interview and apply the rating scale to the interviewed patient. Residents will be expected to e-mail their HAM-D scores to the instructor before the class meets. During

class, the instructor will review the variation in scores and discuss individual rating scale items and their scoring nuances with the residents. They will try to develop a consensus or working rules for ranking each item that will, hopefully, improve the reliability (and decrease the variability) of each resident's score. To assess the effectiveness of this exercise, the class would repeat the process with another interview and look for a reduction in the range of HAM-D scores. Other rating scales, such as the Montgomery-Asberg Depression Rating Scale, could be made available online for the residents to review and apply on their own time.

Developing the materials could involve the instructor locating a Web site that permits the downloading of rating scales, or the instructor could locate a hard copy of the required rating scale, create a PDF copy and upload it to ANGEL for residents to download as needed. Then she/he would obtain a videotape of a patient interview to upload to ANGEL. The instructor must first obtain the proper HIPAA (Health Insurance Portability and Accountability Act) and video release authorizations. Alternatively, the instructor could locate and film an actor (again with proper video releases) to role-play a depressed patient. In this example, a repeat rating exercise would constitute an assessment tool, the instructor may also construct a brief survey for additional feedback.

The implementation phase would include checking sound quality and the image resolution as the recording is transmitted over the Internet or intranet. Field-testing the film may also include feedback on the length of the film for the task, as well as the completeness and quality of the interview. (It turns out that during a practice rating session, a comprehensive interview resulted in low observer variability. Hence, the film required editing to provide more ambiguity in the symptoms presented.)

The evaluation phase not only demonstrates to the instructor the ability of residents to modify their patient ratings but it shows the residents how agreeing upon operational criteria for individual item rankings can reduce observer variability. Residents might also better appreciate the difference between reliability and validity. A survey could reveal the residents' responses and attitudes toward the teaching experience in general and toward rating scales in particular and whether they intended to use them in their practices. If desired, the lesson could be done entirely online, using bulletin boards and/or chat rooms to communicate.

WebCT Example. In another scenario, a medical school has chosen WebCT as the vehicle to disseminate

learning programs. The program's initial function was primarily for information distribution and scheduling courses. Medical school course/clerkship directors were given the option to use the program as they saw fit.

During the analysis phase, the psychiatry clerkship director reviewed the evaluations for the existing weekly psychiatry lecture series, which was given by various faculty during each 6-week rotation cycle. The reviews were uneven with frequent complaints that content material was often repeated. Occasionally, faculty had to miss a lecture. There was also a desire to increase the amount of clinical time for students and reduce the lecture hours, particularly in the context of a shortened clerkship duration. The clerkship director decided to replace live lectures with an online lecture series and fill the classroom time with other activities.

In redesigning the series, the director decided that one lecturer could provide greater continuity and quality control, and, hence, would cover all the topics, which were primarily the various DSM-IV diagnostic categories. These online lectures would supplement class sessions on clerkship orientation, psychopharmacology, psychotherapies, cultural issues, and a session using film clips to illustrate diagnostic categories. Regularly scheduled online quizzes would reveal the student's retention of the lecture content.

The lectures were developed using PowerPoint slides. Each presentation was then audiotaped and, using a separate software product called Impactica, the slides and audio were combined into a coordinated audio/visual presentation and then compressed to facilitate uploading to WebCT. Multiple choice quizzes were constructed for each week's lecture series. The didactic series was delivered online. Students viewed the presentations from any computer with Internet access either during down time on their rotations or away from the rotation, or when their daily clinical duties were completed. The use of film clips ran into snags because of film studio refusals to release copyright protection or because of the high fees requested.

Students were expected to take quizzes within 1 week of each presentation, but immediately after completing the quiz, they also received feedback on their test performance. The WebCT system allowed the instructor to open and close quizzes as desired; that is, quizzes could only be taken during a specified time period. Each week's topics also offered hypertext links to supplementary materials and Web sites.

Students were pleased with the change in the clerkship and preferred the extra clinical time made available. Course evaluations no longer contained complaints about

"boring, repetitive" lectures. The software provided greater administrative control over the learning process. Expectations were listed and it could be documented that they were met. There were no longer canceled lectures nor was faculty recruitment for lectures an issue. Although there was a considerable amount of time required to set up and monitor the Web site, student time spent in lectures did decrease.

Discussion

These projects were meant to serve as illustrative examples of how this software could be used and not as product endorsements. They demonstrate how teaching can be time-shifted using online resources that are available 24/7 from any site with Internet access.

Another longer-range benefit of these programs is the potential to share teaching modules across institutions. Lessons that are SCORM-compliant can be transferred across different proprietary software, reducing duplication of effort, which is especially important during this era of diminished resources. For example, a unit on Professionalism could be shared not only across different specialties but also among separate institutions. Peer-reviewed teaching modules could aid in faculty promotion.

Preparing these modules can be labor intensive and time-consuming. A frequently asked question is, "How much time will it take to create an e-learning module?" The answer is, "It depends." There is an aphorism that it takes 8 hours to prepare a 1 hour lecture for the first time, and this may even be a conservative estimate. The time required to learn the basics of a particular brand of e-learning software can be as little as 1 to 2 hours. The time needed to implement the ADDIE process can be just as brief or can extend for hours more, depending upon, for instance, the complexity of the subject matter, the length of time of the module (a several minute stand-alone teaching module versus a semester-long course with online discussions, papers, etc.), and the desire for comprehensiveness versus simplicity.

Time invested in preparing a module will save time later. Our medical student teaching example suggested less administrative time spent recruiting substitute lecturers and more efficient use of faculty time by not providing repeated lectures for each new clerkship.

There are some pitfalls to avoid. Anecdotal data from the Thoracic Surgery Residency Directors Association suggests that teaching modules longer than 20 minutes lose

teaching effectiveness. Information overload is a real possibility and the instructor must decide on the important points to be learned.

Though there may be relief in completing a project, learning modules are similar to writing a paper or delivering a lecture. There can be constant editing, rewriting, and refinement of the piece or presentation based on user feedback. The “end product” is often a “work in progress.” What may work for one group of students may not be as successful with another.

Working solo on e-learning projects can be demanding. Having a team of educators working together allows a distributed workload and permits additional sources of feedback throughout the instructional design process.

Finally, course designers must secure permission to post copy-protected materials or risk legal exposure for themselves and their institutions. Most medical libraries can provide the legal background for copyright protection and fair usage (14). Using real videotaped patients, even with HIPAA releases and video consents, can also be risky because digital media can be easily duplicated and disseminated. Actors, although an additional cost, add a layer of confidentiality.

Five Things to Remember

1. Sound educational design using processes such as ADDIE apply to any teaching, not just online.
2. It is important to keep the end result in mind. This will aid in developing active learning exercises.
3. Bloom’s taxonomy reminds us that learning is more than the memorization of facts. Focus more on what and how you want the student to learn rather than what you have to teach.
4. Instructional design is an ongoing, continuous feedback process.
5. Software is the easy part. Planning, designing and assessing teaching tools require considerable time and effort.

Conclusions

E-Learning Course Management Systems provide educators with new tools and media to aid their teaching. Students can learn at their own pace at whatever time they wish. Yet these systems are not turnkey operations that can simply be turned on. They require an understanding of educational pedagogy and instructional design and demand a considerable amount of planning and preparation.

APPENDIX 1. Summary of Online Teaching Tools

Teaching Tool	Web Site
Angel	http://www.cyberlearninglabs.com
Blackboard*	http://www.blackboard.com
Breeze**	http://www.macromedia.com/resources/elearning/?promoid=BINE http://www.adobe.com/buy/volume_license/hed/breeze/
CentraOne	http://www.centra.com/solutions/training.asp
Desire2Learn	http://desire2learn.com/welcome.html
Educator	http://www.ucompass.com
FirstClass	http://www.softarc.com
Gradepoint	http://www.gradepoint.net
KEWL	http://kewl.uwc.ac.za
My Course	http://mycourse.thomsonlearning.com
SumTotal	http://www.sumtotalsystems.com
WebCT*	http://www.WebCT.com
<p>*Blackboard and WebCT have recently merged **Macromedia recently purchased by Adobe All sites current as of September 20, 2006</p>	

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Other Web Resources

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