

DESIGN PRINCIPLES FOR ONLINE INSTRUCTION:  
A NEW KIND OF CLASSROOM

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Online learning is deeply rooted in correspondence and distance education (DE) models. While the term “distance education” was coined from the earliest days of correspondence offerings, it is the evolution in technologies that seems to be changing the nature of DE significantly (Demiray & Isman, 1999). That is, newer technologies have cultivated paradigmatic shifts in education (Frick, 1991). In the 1900’s, distance education attempted to mimic the traditional classroom lecture via the transmission of live or “canned” broadcasts, regardless of the technologies used: satellite, television, film, or radio. These kinds of media predisposed DE to closely adhere to the lecture (sit and absorb) model, where content was disseminated in about the same time constraints as a traditional class: taught at scheduled times throughout the week – almost anywhere but not always anytime. Moreover, the modes of presentation in classic DE seemed to hinder the kinds of human interactions normally experienced in the traditional classroom, fostering individualized and isolated learning experiences.

Online learning is a hybrid between the traditional classroom and the DE experience. Like the traditional classroom, instruction is teacher-facilitated. The student is enrolled in a conventional course with topic (lecture) presentations, reading and homework assignments, classroom discussions, and class projects. Unlike the traditional classroom, courses are web-based and distributed from a distance, using an assortment of synchronous and asynchronous computer technologies -- and offered anywhere and anytime. In this way, online learning is different from the classic DE model by encouraging decentralized and collaborative learning environments.

## THE EVOLUTION TO ONLINE LEARNING AT LEHIGH

Distance Education at Lehigh formally began in 1991 as a sponsor of live Management of Technology courses to the National Technological University, providing Masters Degree programs via satellite to employees of large corporations. In an effort to leverage the investment in satellite technology, DE launched one of the first digitally compressed satellite networks in the spring of 1992 offering a Master's in chemistry to six corporate sites. The program has grown rapidly adding Master's Degrees in Chemistry, Chemical Engineering, Environmental Engineering, Quality Engineering, Business Administration, Molecular Biology, Polymer Science and Engineering, Pharmaceutical Chemistry. Since that time, over 700 distance education students have been admitted to eight Lehigh graduate degree programs through the Lehigh Educational Satellite Network.

In 1996, Lehigh University merged computing, telecommunications, and library services. After the reorganization, Lehigh progressively moved away from the classic DE model and towards web-based approaches. Specifically, the reorganization created an Instructional Technology Interest Group with members identified to specialize in course redesign, which precipitated the Instructional Technology team to rethink online instructional methodologies. Beginning in the Fall of 1999, DE added streaming-video courses to the University's distance education offerings. Around the same time, Lehigh adopted Blackboard as an online learning management component for university courses. Blackboard was well received by faculty. Within a year, the number of courses incorporating Blackboard grew to well over 200. Finally, the Clipper Project, a multi-year research and development initiative began in the Spring of 2000. The Clipper Project was funded by the Andrew W. Mellon Foundation to investigate the costs and benefits of Web-based university courses.

## THE NEED FOR DESIGN PRINCIPLES

Online learning is here to stay at Lehigh. Blackboard successes, Clipper online initiatives, and Distance Education programs will most likely spawn further research and online initiatives. In many ways, these initiatives have posed many pedagogical and instructional design questions.

- Can technology support sound pedagogy?
- If online learning de-emphasizes the classroom lecture as the primary source of instruction, then what replaces the lecture? While it is evident that technology is not pedagogy, it is equally evident that online learning offers a more decentralized and constructivistic environment. In this case, the emphasis is on active learning, collaboration, research and investigation, problem-solving, and situated learning contexts.
- Are faculty amenable to re-engineering their courses and adopting online learning strategies? How can Lehigh support faculty and facilitate these changes?
- Can online learning accommodate different kinds of learners?
- Historically, DE and online courses experience high attrition rates. Is this a result of a lack of motivation? A lack of community and sense of belongingness? Student frustration?

## A NEW KIND OF CLASSROOM

For the most part, online learning environments (OLEs) are teacher-facilitated, not stand-alone learning contexts. But, OLEs do provide the kinds of learning experiences and communication tools that assist learners to sculpt and assimilate new knowledge without the “live” lecture. There are several key goals to keep in mind when constructing this new kind of classroom.

- Center learning around the student. In the traditional classroom, time and distance are limiting factors in the learning process. In the online classroom, learning activities are decentralized without time as a limitation.
- Focus on the needs and strengths of students. As learning becomes more personalized, students will require the necessary skills and tools to engage and participate in this new kind of learning process.
- Provide just-in-time and anywhere-anytime instruction. OLEs break the distance and time barriers by providing learning experiences outside the classroom -- anywhere and anytime. Accordingly, teachers can adjust topic presentation and explanations “just-in-time,” when students need it the most.
- Foster collaborative learning environments. Collaborative networks provide the sense of a “learning community.” Moreover, cooperative teams characteristically achieve at higher levels of thought and retain information longer than students who work individually.
- Emphasize authentic learning experiences. Web-based OLEs can provide authentic frameworks that bridge computer and classroom instruction. Authentic learning contexts provide active and engaging experiences, where the computer can help mediate course activities and shape the learning process.

## STRATEGIES FOR LEARNING

1. Make it Interactive. An OLE is different from the classic DE environment: the responsibility is on the student to become an active participant rather than a passive recipient of learning. An interactive learning environment encourages discovery, experimentation, and experiential (hands-on and activity based) instruction that provides multiple representations of knowledge. Active learning is more effective than passive learning, showing how knowledge is interrelated and associated.
2. Keep it Engaging and Motivating. Motivation can be affected by the task, learning environment, the teacher, and the student. But without motivation, there can be no learning. Shneiderman (1998) stated that "memorable educational experiences are enriching and transformational." Motivation theory argues that relevant experiences satisfy intrinsic needs or goals, encouraging effort and performance. Some ways that OLEs can foster motivation and increase perceptual arousal are: (1) incorporate novel, surprising, incongruous and uncertain events; (2) pose questions or problems to solve; (3) vary the elements of instruction; and (4) use concrete and familiar examples that are related to learners' *a priori* experiences. Also, learner confidence

and satisfaction can be bolstered by explaining the utility of instruction, providing positive learning experiences, and supporting internal attributions for success. Learners should feel that they are, for the most part, in control of their outcomes and that their success is a direct result of the amount of effort they have put forth.

3. **Put Things in Context.** Learners can experience problems using knowledge and skills in everyday contexts. This inability to make meaningful connections results from the decontextualization of formal learning experience: learning is isolated from the contexts in which it derives meaning (Bransford, Sherwood, Vye, & Rieser, 1986). Context, then, is seen as a critical environmental factor in how knowledge is assimilated, represented, negotiated, and used (Hannafin, Hill, & Land, 1997): how new information is meaningfully connected to prior knowledge.
4. **Maintain Diversity.** OLEs can support multiple modes of representation by being able to incorporate various kinds of media such as text, illustrations, animations, video, audio, and simulations. Consequently, learning can take place through different sensory channels, and learning is more effective when more channels are engaged in learning. Diversity also helps to keep the student moving, focused, and motivated.
5. **Use Collaborative Strategies.** Learners are capable of performing at higher intellectual levels when asked to work in collaborative environments. Group diversity and experience contributes positively to the learning process. Bruner (1985) argued that cooperative learning methods improve problem-solving strategies when learners are confronted with different interpretations of the given situation. Peer support makes it possible for the learner to conceptualize both external knowledge and critical thinking skills and to convert them into tools for intellectual reasoning. Collaboration involves the mutual engagement of the participants in a coordinated effort to solve the problem together. The active exchange of ideas within small groups also generates interest among learners. Shared learning gives students an opportunity to engage in discussion, take responsibility for their own learning, and become critical thinkers.
6. **Reduce Cognitive Load.** Cognitive load may be seen as the level of mental energy required to process a given amount of information. As the amount of information to be processed increases, so does the associated cognitive load. Cognitive load theory suggests that effective instruction promotes learning by directing cognitive resources towards activities that are relevant to learning rather than to processes that are adjunct to learning. Thus, providing too much information all at once with distracting or competing information, increases complex information and further exacerbates cognitive load and associated mental energy. Chunking information into “information bits,” focusing attention to coincide with explanations, reducing information “overload,” and providing appropriate support to aid in the reduction of cognitive load.
7. **Provide adequate scaffolding.** Scaffolding is a learner support structure essential for student success. That is, as the student increases in competence, the teacher relinquishes the learning situation to the student and withdraws support. The move to less scaffolding is achieved by teaching students problem-solving strategies, fading assistance, and introducing more complex contexts--to help students distinguish

essential and nonessential details (Becker & Carnine, 1981). In other words, there should be a conscious attempt to foster independent and higher-order thinking.

Interactions between peers and teachers provide the kinds of scaffolding and coaching support which teachers normally bring to the traditional classroom setting. Mechanisms to support and motivate students isolated in online learning environments are considered necessary to encourage active participation, inquiry, discourse, and progress. Moreover, a social context stresses the importance of learning being germane within the cultural context of the group.

### CHALLENGING FUTURE

In many ways, the online learning strategies proposed here are not unlike those strategies currently used in the traditional classroom environment. Walk into most classrooms and you will see the teacher incorporating interactive and motivating instruction, posing questions and employing novel and sometimes unexpected instructional approaches. Teachers keep the class moving, paced, and focused by using a diversity of presentation and theatrical methods. Content is placed in a meaningful context through concrete and relevant examples. Scaffolding is provided by first showing students how things are done -- then allowing students to take charge of their own learning experiences. Finally, teachers provide the kinds of activities and experiences that allow students to see and experience things from different perspectives. The challenge, therefore, is not how to reproduce the lecture online; but rather, how to transform the quintessential experiences of the classroom to online instruction.

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