
Editor’s Note: This article is an invited report on the design process used in the development of Avenue ASL, the winning entry of the Outstanding Achievement in Innovative Instructional Design and Development Award at the AECT conference in Anaheim, CA. Avenue ASL is a web-based assessment environment designed to promote American Sign Language (ASL) instruction. The environment was designed to improve the efficiency and reliability with which instructors evaluate student progress, but has resulted in structural changes being made in the way that ASL is taught, transforming the assessment process by encouraging learners to construct individual progress monitoring portfolios. The environment is currently being used by more than 100 instructors and over 5,000 students from universities and institutions across the US.
Between 1998 and 2002, enrolment in ASL curricula at the post-secondary level has increased 433% nationally, representing the largest enrolment percentage gain of all world languages (Welles, 2004). This unprecedented demand for ASL linguistic study has created a wide range of instructional challenges, the most pervasive of which involves assessing and measuring learner progress (Deno, 1985; Kemp, 1998). Most importantly, there has been an absence of efficient, effective, and technically valid systems available for instructors to evaluate ASL student outcomes and document learner progress. In this paper we will outline the challenges faced by one ASL program, detail the innovative features of our solution, describe the design process taken by our team, and discuss recommendations for future AECT design showcases.

The design challenge

Prior to 2006 at the University of Minnesota, approximately 1,800 students completed annual mid-semester and final-exam ASL linguistic assessments (Miller, Hooper, & Rose, 2005). However, the assessment and examination practices employed were burdensome for both students and instructors (Hooper, Miller, Rose, & Veletsianos, 2007). As a measure of learner fluency, instructors assessed videotape recordings of individual student interviews. To complete an exam, students were required to access a video camera from the ASL program office, schedule a meeting with a fellow student, and record a 15-minute signed conversation. After the videotape was submitted, the instructor reviewed the video (a process often lasting 45 minutes per tape, due, in large part, to fast-forwarding through incomplete edits, false starts, and “redos” of the exam), evaluated the student’s performance, assigned a single-digit score, and recorded brief textual feedback. Instructors repeated this cumbersome evaluation process for students in each of their three or four course sections. Learner feedback was delayed for an average of three
to five weeks, ultimately limiting valuable reflection opportunities for students. In addition, the interruption between examination and assessment detracted from the instructor’s ability to modify classroom instruction based on observed learner deficiencies in performance. Our design challenge was to improve ASL student learning and create a system that surpassed the efficiency of the existing assessment process using technology-based tools that were reliable, valid, motivating, cost-effective, and ultimately extendable to other institutions.

In 2004, our design team, a small group comprised of two faculty members from Learning Technologies and one faculty member from Special Education, set out to search for innovative opportunities that transcended the efficiency obstacles hindering the ASL program. Funded initially by a one-year seed grant from the University of Minnesota, we developed a proof-of-concept online assessment tool that recorded a learner’s ASL performance using a webcam and displayed the recording to an instructor for evaluation. Following development of the prototype, we received a three-year Department of Education FIPSE grant (Fund for the Improvement of Postsecondary Education) to design, develop, implement, research, and disseminate the ASL online environment across multiple institutions.

The design solution

We developed *Avenue ASL*: an integrated software system to capture, evaluate, and manage ASL learner performances. Although the Deaf/Hard of Hearing community has a history of innovative technology use (e.g., video-phone relay services, video-conferencing technologies, etc.), *Avenue ASL* advances technology innovation by integrating performance videos with emerging computer technology and contemporary instructional assessment measures in a reliable, valid, cost-effective, and efficient online system. The online environment enables students to capture videos of ASL assessment tasks and create online portfolios for monitoring
progress over time. These performance portfolios allow students and instructors to visually display language proficiency gains and demonstrate maturing communication abilities, ultimately encouraging students to be more reflective regarding their ASL communication skills (Lupton, 1998). Moreover, instructors can use various feedback modalities (e.g., text, numeric, video, etc.) based on the needs of individual students (Miller, Hooper, & Rose, 2005).

In addition, Avenue ASL uses an emergent evaluation framework known as Curriculum Based Measurements (CBM) (Deno, 1985). CBM, evaluation criteria initially designed as a “yard stick” to measure learner progress in reading, writing, and mathematics, are easy to implement, cost-effective, and sensitive to student linguistic growth (Fuchs, Fuchs, & Hamlett, 1989; Frank & Gerken, 1990). Through implementation of CBM in the Avenue ASL environment, we have developed standardized CBM assessment criteria (i.e. fluency, linguistics, expression, and accuracy) to promote continuous progress monitoring in ASL instruction at the postsecondary level (Hooper, Miller, Rose, & Veletsianos, 2007).

In the following sections we describe the four layers of the online software environment, provide a brief overview of implementation data and research from the project, and identify the technologies used for development.

The Avenue ASL online environment

The first layer, Capture, is used by students to record ASL assessment performances with a web-cam (see Figure 1). Students from each level of the ASL program complete three CBM fluency assessments designed specifically for this online environment: Picture Naming, Photo Description, and Story Retell (for descriptions see Hooper, Miller, Rose, & Veletsianos, 2007). Students’ recordings are stored on a server allowing teachers to retrieve and assess performances, ultimately replacing the tedious evaluation practices of archiving student progress.
and eliminating the existing financial and organizational obstacles of managing several hundred videotapes each semester. Assessment media appropriate to each level of ASL instruction are dynamically generated for each student in the Capture layer (i.e. content is selected randomly from over 1200 evaluation videos, photographs, and illustrations to maintain assessment security and objectivity).

-- Insert Figure 1 about here --

The second layer, Evaluate, is an assessment tool used by instructors to assess student performance videos recorded in the Capture layer. Instructors rate student performances using standardized CBMs and provide feedback using text, numeric scores, and/or signed video. Most importantly, the Evaluate layer creates opportunities for instructors to monitor and adapt to students’ evolving needs. For example, by gaining immediate access to students’ performances (rather than the aforementioned 3-5 week delay), instructors can document current learning problems and modify personal teaching practices in the classroom.

-- Insert Figure 2 about here --

Assessment data in ASL programs are traditionally used to assign grades rather than to improve performance. However, in the third layer, Portfolio (see Figure 2), students view their evaluations and feedback, monitor personal progress as they advance through the ASL course-sequence, and reflect upon and set personal linguistic achievement goals. ASL performance records may be viewed graphically in the Portfolio, ultimately encouraging students to compare, contrast, and build upon ongoing performances.

-- Insert Figure 3 about here --

Finally, the Coordinate layer (see Figure 4) serves as a content management module allowing performance and evaluation data to be stored, reused, searched, and shared across the
software system. Essentially the “brains” of the environment, the Coordinate layer is transparent to students and instructors, and allows the system to be implemented across diverse educational settings and institutions.

-- Insert Figure 4 about here --

The four software layers of the Avenue ASL online environment solve an important practical problem and create significant instructional potential for post-secondary ASL education. Collectively, the methods used to assess student performance and the techniques used to capture, deploy, and archive evaluation and progress data create a system that is technologically-sophisticated and pedagogically-sound, resulting in improved ASL learning and instructional assessment (Hooper, Miller, Rose, & Veletsianos, 2007).

**Implementation and research**

The Avenue ASL environment, currently in its final dissemination phase, is being used by more than 20 instructors and over 1800 students per year at the University of Minnesota, in addition to several thousand students and instructors from universities and institutions across the US. During the fall and spring semesters of the 2006-2007 academic year, more than 165,000 video performance assessments were captured and evaluated by students and instructors in the environment. At present, in excess of 225,000 practice and assessment tasks have been completed in the Avenue ASL environment, in what is believed to be the largest collection of post-secondary ASL assessment performances captured in an online environment. Additionally, through curriculum-wide implementation and the inclusion of a dedicated lab credit for student practice and evaluation with the Avenue ASL software, University of Minnesota ASL students now receive 5 credits per course, as opposed to 4, aligning the credit structure of the ASL
program with other world languages offered at the University. Moreover, funds generated from additional credits are being used to ensure future sustainability and maintenance of the system.

During the design and research phases of the Avenue ASL project, we established video capture and deployment specifications for ASL performance evaluation, developed and validated standardized ASL-CBM measures for the promotion of continuous progress monitoring in post-secondary ASL instruction, and generated insight into the potential of emerging communication technologies for new forms of electronic assessment. Currently, we are using a lens of design-based research to explore how the theoretical foundations of the project evolved through iterative cycles of pedagogical development, contemporary design approaches, and research-based classroom implementation.

Design and development tools

Avenue ASL was developed using Adobe Flash to create the front-end and administrative user interfaces; Flash Media Server to record and deploy all video performances in the system; XML to deliver and manipulate system-wide data and controls; Microsoft SQL Server to store, organize, and manage assessment data and student demographics; and webcams to capture student and instructor performance and evaluation videos.

The design approach

An examination of our design process may be of some interest to the Instructional Design community. It is important to note that we not did adhere to a traditional design model or process: some problems lend themselves better to systems engineering solutions. Such approaches, typified by the cyclical phases of analysis, design, development, implementation, and evaluation (i.e. ADDIE) tend to be most appropriate for well structured problems (in particular those that can be understood completely before a problem solution is devised) or for
novice designers. ADDIE often involves breaking down a problem into a series of sub-problems that can be solved and re-combined. Given the nature of the task (i.e. to create a tool that would both replicate traditional assessment processes and transform the manner in which ASL is taught in a large university-level course), we adopted a design approach that we hoped would produce a highly innovative solution. Although, post hoc, it is possible to identify within the finished product the elements of the ADDIE phases, we opted for what we believed would be a more creative design process, one that would ultimately prove to be more effective.

We will describe our design process by outlining several design approaches that reflect our design orientation: design for creativity, design for interactivity, design for transformation, design for emotional impact, and design as redesign.

*Design for creativity*

Our design process was influenced heavily by the Four Modes of Instructional Design (Hokanson, Miller, & Hooper, 2007). The four modes represent four common, but distinctive approaches to the instructional design process: artist, architect, engineer, and craftsperson. Our intent was to balance the valuable, yet distinctive design approaches embodied within each of the modes. Thus, we consciously spent time operating as instructional artists or explorers (Kelly & Littman, 2007) in an attempt to identify and channel the most creative solutions made possible by combining the affordances inherent within new technologies. Similarly, considerable time was spent as instructional engineers, assuring that the pedagogy employed would mesh within contemporary and emerging notions of effective instruction. We also recognized the importance of craftsmanship in development. The craftsperson is ultimately responsible for the execution of ideas, ensures that the quality of development matches the quality of design, and is critical in the creation of environments that are aesthetically pleasing and simple to use. Ultimately, we
attempted to operate as instructional architects -- holistically conceptualizing the project, setting the tone for the design process, and balancing the contributions of other design modes.

**Design for interactivity**

Our design was also influenced by the 5 Levels of Teaching (Hokanson & Hooper, 2004) which describe instructional decision making along a continuum including content presentation, near transfer, far transfer, problem-based learning, and problem posing. Although much of the system reflects only level 3 use (i.e. practice and assessment of ASL sign generation), embedded self-evaluation tasks reflect a higher level. Moreover, the 5 Levels acted as a catalyst for design, serving as a constant reminder to strive for higher cognitive outcomes and deeper learner interactivity.

**Design for transformation**

Whereas our initial project goal involved using technology to replicate the existing assessment procedures, we realized that mere replication of existing instructional practices presented little challenge to the design team. Indeed, such approaches are associated with a long history of failure in the field (Saettler, 1990): Ultimately, replication produces only changes in efficiency. In contrast, our goal was to change the manner in which ASL students were instructed with the ultimate goal of improving student performance. That is, our goal was to transform ASL instruction.

**Design for emotional impact**

Donald Norman (2004) describes three levels of emotional design: visceral, behavioral, and reflective. Well designed environments, he claims, find balance between the three. Our intent was to incorporate the three levels into our design to improve usability and to generate short- and long-term emotional impact. We addressed visceral design though various approaches
that impact the look and feel of the environment (e.g., attractive visual design, seamless transitions throughout the software, overall unity of experience, etc.). Behavioral design was addressed by attending to elements that were intended to make the overall experience and usability more intuitive and pleasurable for users. Learning a foreign language (such as ASL) can be a daunting experience in the best of settings, but being assessed on-line using a webcam can be downright frightening! Our goal was to establish a pleasurable learning experience, so that students could focus on the nature of the assessment task rather than the nature of the technology. Lastly, reflective design, perhaps the most difficult to achieve, was addressed by attempting to influence the long-term impact of the system. That is, through an iterative design process that focused on usability, utility, and aesthetics, we attempted to design an environment that would continue to be pleasurable and productive long after users had become familiar with the system.

*Design as re-design*

The nature of the design process may prove frustrating for many practitioners as true designers rarely achieve a sense of complete satisfaction with their work (Hokanson, Miller, & Hooper, 2007). Instead, like the Flying Dutchman, unable to reach its final port and doomed to sail on forever, the designer often completes an iteration only to experience a belief that the product could be improved with additional work. We believe that our search for innovation and improvement forced us to consider alternatives that ultimately improved our design. Indeed, the term “re-design” arguably became the project mantra. We employed rapid prototyping to create both proof-of-concept models and to integrate effective new concepts into the overall design. However, rather than simply “attaching” new ideas onto the existing design, we focused on questioning how new ideas changed our overall design.
For example, when designing a Story Retell assessment task (i.e. watch the media, record a signed video, self-assess performance, and submit for evaluation), we discovered that users would shift toward and away from the webcam while watching the video, recording their performance, and navigating, ultimately misaligning their signs with the webcam. As a response to the way naive users would interact when first using the system, we designed an “align-camera” tool that superimposes a semi-transparent outline of an individual’s torso, head, and arms over the video of the student, providing them with a guide for signing into the webcam. Rather than introducing alignment at the beginning of the environment as a separate, but decontextualized instructional event, we re-designed the flow of each assessment to incorporate the tool seamlessly into the task sequence (i.e. located between the “watch video” and “record video” phases), thus avoiding interruptions in interactivity, concentration, and task involvement. This design change helped us realize that we could simplify navigation by requiring users to click only once to initiate a task, promoting concentration on the assessment, rather than the technology. Re-designing the Story Retell task was one of many “design as re-design” evolutions we experienced throughout the development of Avenue ASL.

The design showcase

Having participated in the first annual AECT design and development showcase, it is interesting to reflect upon the manner in which innovation is recognized and rewarded. In particular, there may be a tendency to focus exclusively on traditional evaluation measures where the inclusion of alternative criteria may also be appropriate. One such criterion is aesthetic design. Evaluating for aesthetics involves examining how design elements are crafted to achieve more than pedagogical and technological project requirements. Aesthetic design, in terms of designing online learning environments, creates opportunities for users to connect with an
environment and addresses the nature of the learner’s experience rather than focusing solely on how learners use a product to achieve a pre-determined goal.

Moreover, we envision a day when award winning designs represent the pinnacle of an AECT conference. It is notable that our field tends not to identify exemplary products. Whereas other design professions, particularly architecture, graphic, and product design enjoy high public visibility and identify specific instances as exemplars within their fields, Instructional Design often focuses more on issues of epistemological orientation and implications for pedagogy, than it does on specific cases that represent instantiations of the theoretical models. Ultimately, our field might be served best by balancing the design and development of exemplary learning experiences with the underlying theory and models upon which those products are based.
Author Note

This research was supported in part by grants from the Fund for the Improvement of Postsecondary Education (FIPSE), U.S. Department of Education. However, these contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.
References


