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GOOD, BETTER, BEST: USING UNIVERSAL DESIGN AND DIGITAL TECHNOLOGY TO DEVELOP GREAT PRODUCTS

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Designers and users need to experience products in three dimensions, in real time and in real contexts.

Introduction

Industrial design and technology are lab-based disciplines with highly visual products, hands-on activities, and frequent interactions between faculty and students. As a result, the ways that online resources are used in these courses tend to be different from other subject areas with more lecture-oriented modes of learning.

This article addresses trends in industrial design and technology education that support expanded use of online materials. It also presents related developments that support increasing use of the Internet in industrial design and technology education.

Universal Design Education Online is a Web site that is a specific example of a teaching and learning resource that could be used in the industrial design and technology lab. The Web site is for those who are teaching and learning about universal design, and is intended to support a wide range of teaching situations. This article also presents a student project that uses the Universal Design Education Online site.

Trends in Industrial Design Technology and Education

Digital media has been a catalyst for change in the industrial design and technology fields in two important ways:

1) *It has replaced many manual representation techniques.* Hours that used to be spent at the drawing board or in the machine shop are now spent on the computer. Consider these skills that, before, were practiced only manually and are now often performed using digital media:

- Sketching – from graphite pencil to computer mouse or stylus;
- Rendering – from felt-tip markers to sophisticated software programs;
- Model making – from foam, wood, plastic, metal, Bondo, and paint to computer-aided manufacturing (CAM) and rapid prototyping machines;
- Shop drawings – from pencils and blueprints to computer-aided design (CAD) programs and printers and plotters.



A student looks at animated examples of a universally designed teapot.



A group of students discusses ways to improve a product.

2) *It has expanded the definition of "the product."*

The physical product is just one part of the product experience, particularly for those items with digital interfaces. The larger notion includes the systems required for using, supporting, and tracking the product, and providing added value through downloadable upgrades and product extensions. This often includes online communities that discuss the features and flaws of products as well as offer specific suggestions for improved or alternative use.

Digital media has affected the ways that education is delivered in two important ways:

1) *The role, value, and skills of the instructor are changing.*

Given the amount of expert information available online, educators are spending more time structuring, organizing, and connecting information to create meaningful learning opportunities. Their role naturally becomes one of facilitator or moderator. Establishing clear guidelines within a flexible framework with both quantitative and qualitative evaluation methods becomes even more important in the online environment. Equally important is the ability to foster online collaboration and interaction. Educators who are able to motivate from a distance are more likely to deliver provocative and relevant coursework.

2) *Wireless technology will allow Web instruction to be experiential—in the world.*

Wireless and wearable online access will allow freedom of movement. This

physical location flexibility will impact our learning, working, and leisure environments in ways yet to be imagined. We will have the capability to be "live" or on site but wirelessly connected at the same time—the world will become a lab/museum/studio, with digital annotation.

Using Universal Design in Industrial Design and Technology Education

Universal design is a concept that recognizes, respects, values, and attempts to accommodate the broadest possible spectrum of human ability in the design of all products, environments, and communications.

Universal Design Education Online is a Web site that has been developed collaboratively by three groups: the Center for Universal Design in the College of Design at North Carolina State University, the Center for Inclusive Design and Environmental Access (IDEA) at the School of Architecture and Planning at the State University of New York at Buffalo, and Elaine Ostroff of the Global Universal Design Educator's Network. Funding for the project is provided by the National Institute on Disability and Rehabilitation Research (NIDRR), a division of the U.S. Department of Education.

The project team developed a Web site to support the teaching and study of universal design anywhere in the world through the shared use of teaching resources. The site was designed for faculty members, students (of any age and stage), and user/experts—people with disabilities who use and/or inhabit the built environment. The project's logo illustrates some of the human dimensions that should be considered during the design process.

The Web site for Universal Design Education Online is located at the URL www.uideeducation.org. The site features a variety of materials for a range of disciplines, levels, and interests including:

- Instructional materials such as course syllabi, course modules, sample assignments, and evaluation methods.
- Content resources such as excellent examples of universal design and full text of classic universal design writings.
- An annotated bibliography of a wide range of materials.
- Links to relevant online resources.
- Online support for educators, including a discussion forum.

Project: Good, Better, Best—Using Universal Design Education Online to Develop Great Products

In this project for Grades 7 through 12, students use universal design concepts to evaluate existing designs, guide the design process, and educate themselves about the characteristics of more usable products and environments. To introduce them to these ideas, they are asked to read the article entitled "What Is Universal Design" at www.uideeducation.org/learn/aboutud.asp; to download the seven "Principles of Universal Design" at www.design.ncsu.edu/cud/univ_design/princ_overview.htm; and to take an online tour of an exhibit entitled "Unlimited by Design" at www.ap.buffalo.edu/idea/ubdweb/

After doing this online research, students are asked to choose three markedly different versions of the same product. (Example: Sensa Ballpoint Pen, Papermate Dynagrip Retractable Ballpoint Pen, Bic Clic Stic Retractable Pen.) They acquire the products, or collect images of each,



A group of students analyze the universal design principles of a mixing bowl.

and verbally describe all three. Each description includes:

- Name of Manufacturer
- Product Name
- Approximate Cost
- Purpose of Product
- Materials
- Manufacturing Quality
- Design Features
- Appearance
- Feel
- Function/Performance
- Ergonomics
- Learning Curve
- Safety Features
- Environmentally Friendly Aspects
- Lifespan
- Possible Misuses of Product

Then, students interview someone they know who is older than 65 or younger than 6—a grandparent, a young sibling, a neighbor, etc. Students verbally describe the interviewee in the following ways:

- Age
- Sex
- Race
- Ethnicity
- Physical Abilities/Disabilities
- Sensory Abilities/Disabilities
- Cognitive Abilities/Disabilities
- Appearance
- Personality
- Values

During the interview, students ask the tester to use or imagine using each of the products. Afterward, the student and interviewee evaluate the use of each product using the Principles of Universal Design. They decide which aspects of each product are good, which are better, and which are best. (See the chart below.)

Product 1			
Principles of Universal Design	GOOD	BETTER	BEST
1: Equitable Use			
2: Flexibility in Use			
3: Simple and Intuitive			
4: Perceptible Information			
5: Tolerance for Error			
6: Low Physical Effort			
7: Size and Space for Approach and Use			

After the interview and evaluation, students discuss their findings with each other and brainstorm about how to improve the products. They use this information and their research to develop a design proposal for a new version of the product. They can use the Online Universal Design Evaluation Tool at www.tracecenter.org/world/tool_nav.html to help them to generate ideas for the proposal.

Conclusion

The Internet offers great opportunities to expand the scope and depth of industrial design and technology education. The teacher's challenge is to harness this abundance effectively. Despite its value and power, the Internet will never replace human interaction. Designers and users need to experience products in three dimensions, in real time and in real contexts. Particularly when assessing product usability by the widest possible range of potential users in a variety of situations, there is no substitute for direct interaction with a diverse group of people.

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A student works on the design of an eggbeater.

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