

A Universal Design for the Classic Teaching Lectern

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Abstract

A survey of university instructors revealed that a majority are unhappy with the accessibility and features of available lecterns. Some instructors with visual or lower-limb disabilities reported a complete inability to physically access lecterns.

Project Goal

Design a teaching aid that (1) appropriately integrates with today's teaching technologies and styles, and (2) is universally accessible.

To achieve the project goal, further input from professors and the principles of Universal Design were applied to a multi-stage design lifecycle. The end result is a lightweight, height and tilt adjustable mobile lectern, usable in a variety of physical configurations. The lectern communicates wirelessly with a classroom PC and is re-locatable around the room.

A separate, stationary cabinet base houses necessary audio-video and PC equipment used by IT personnel. Docking the lectern into this base creates a larger desk-type structure, as shown in Figure 6. Finally, unique selection of power and data connectivity components further enforce the ideals of Universal Design. The project sponsor, Steelcase Inc., is considering the final functional prototype as a new product for manufacturing.

Background

The design process began with extensive research in the end-user market. Feedback from the interviews brought about three rough concepts; each meeting unique needs and requests uncovered during the research. The intent was to ensure that the final product would be considered *universally designed*.

What is Universal Design?

"The idea that all new environments and products, to the greatest extent possible, should be usable by everyone regardless of their age, ability, or circumstance" [1]

A single concept, shown in Figure 1, was identified by Steelcase Inc. as a product that could be a unique addition to their current offerings if further developed.



Figure 1: Initial concept proposal accepted by Steelcase Inc.

Research Methods

The team solicited user feedback during three progressive efforts in the course of the design process:

1. Pre-concept (Fig. 1): brainstorming and interviews
2. Chosen, refined concept (Fig. 2): questionnaire
3. Physical prototype (Fig. 3): demonstration

In total, 53 professors of various specialties at Northern Arizona University critiqued the concept during the design lifecycle. Questions posed through these interviews addressed open-ended design problems and helped characterize profiles of current teaching styles.

Sampling from the Step 2 questionnaire:

- Describe your teaching style. How would you envision yourself interacting with this product?
- A computer monitor could be inlayed into the work surface under a clear material. Where on the surface would you prefer the monitor be located?
- The lectern will be height adjustable. How important is it for the lectern work surface to also be tilt adjustable?
- Do the current dimensions of the lectern surface provide enough work space?
- Laptop/tablet connectivity will be included. Where should the plug-in be?
- The mobile lectern could be powered by (1) retractable cord, or (2) rechargeable battery. Which would you prefer and how strong is your preference?

Results

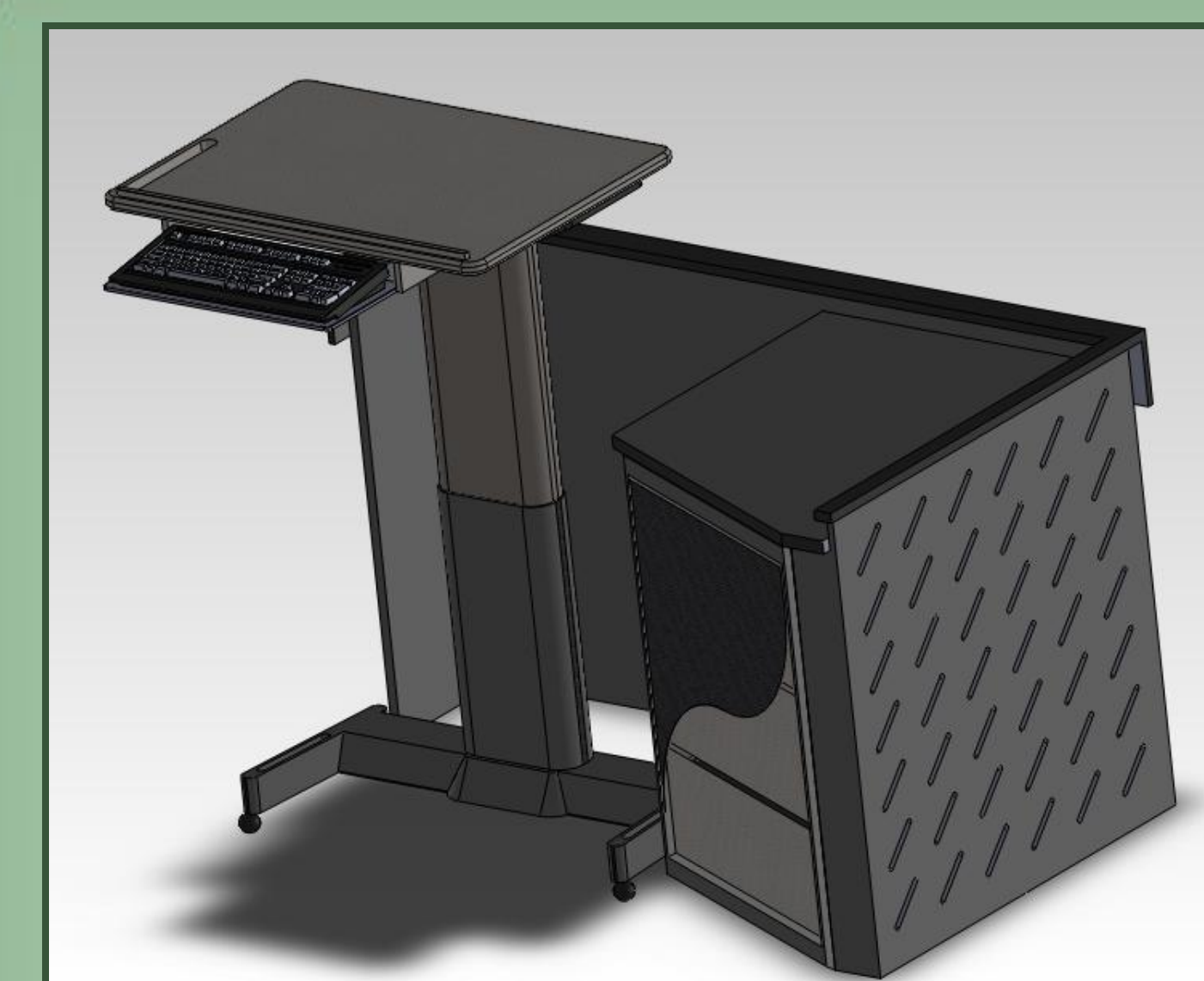
The following table presents significant findings pulled from the research data. Each outcome is paired with the change that it affected on the design during the lifecycle.

Table 1: Effects of research outcomes on design lifecycle

Outcome	Design Addition
1 Professors would like more freedom to move around the room.	Casters on the base, and reductions in weight so the lectern can be moved with one hand.
2 The work surface of the initial demonstration prototype (40x22 1/4 in.) was excessively large.	Size down the final work surface dimensions (30x24 in.), and base the area upon an open textbook and piece of 8.5x11" paper being next to each other.
3 When a teacher is seated, flat tables are uncomfortable to use.	A mechanism designed so that the entire lectern surface is tilt-adjustable. (Figure 4)
4 Common monitor placement (i.e. upright and center on a table surface) blocks the teacher's view of students, and vice-versa.	An inlayed computer monitor which is level with the lectern surface and can be written upon, or tilted upwards for a better viewing angle. (Figure 5)
5 Professors had strong, conflicting preferences on the type of power source for the lectern (battery vs. retractable power cord)	Include an uninterrupted power supply, which can be plugged into a wall outlet, or run the electronic components off battery power for 12 hours

Design additions 1 through 4 are pictured sequentially in the following representation of design lifecycle.

Design Lifecycle



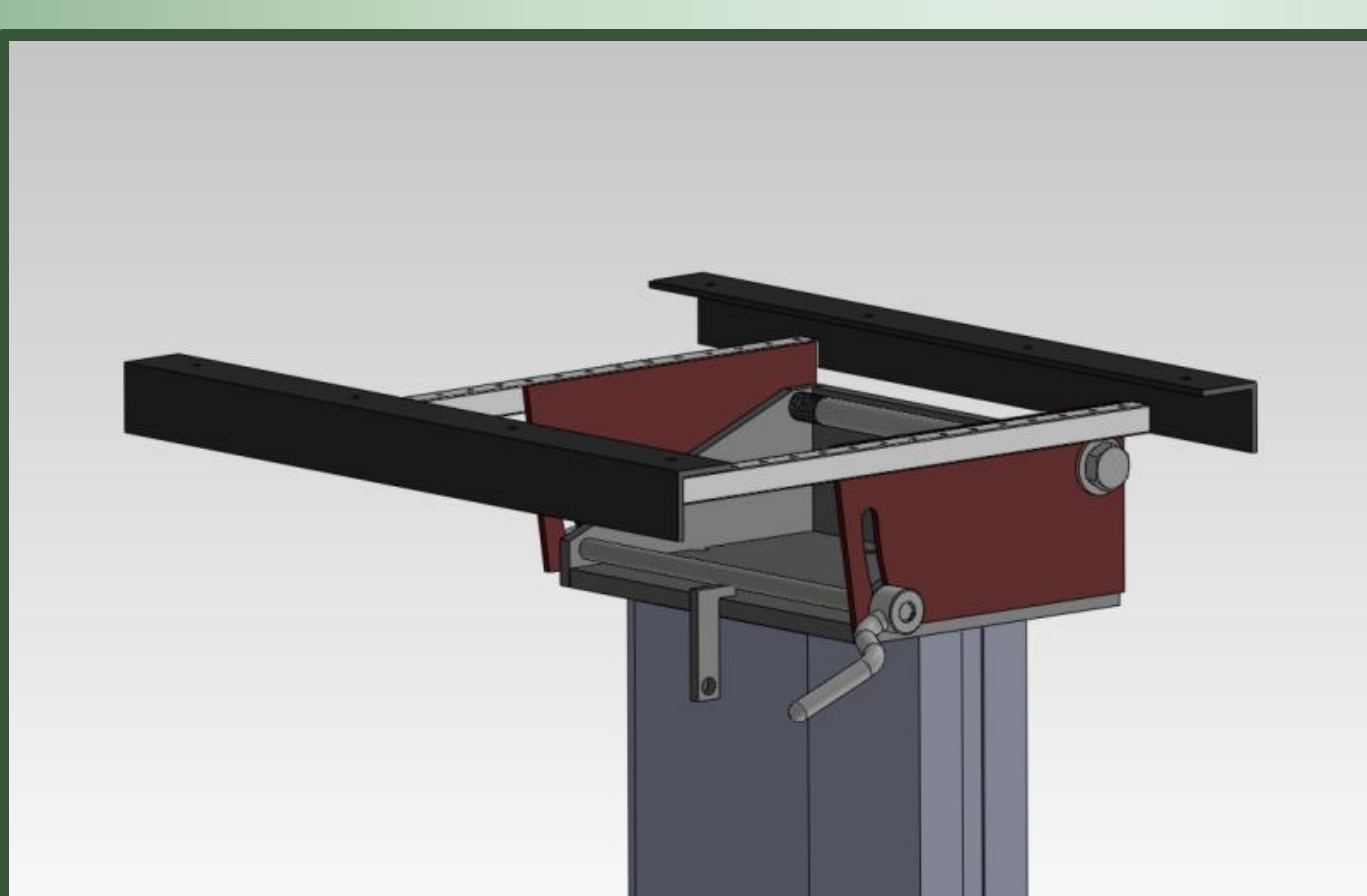
January 2012

Figure 2: Refined initial concept



February 2012

Figure 3: Physical prototype for user testing



March 2012



April 2012

Figure 5: Adjustable monitor mount

Final Design

The final, constructed design is pictured below in Figure 6.

Features

- Height and tilt adjustable (*spring assisted*)
- Compliant with **2010 ADA standards** [2]
- Wireless to room PC and AV equipment
- Capable of 12 hours battery power
- Sliding AV rack in ventilated cabinet
 - Accessible and lockable by IT personnel

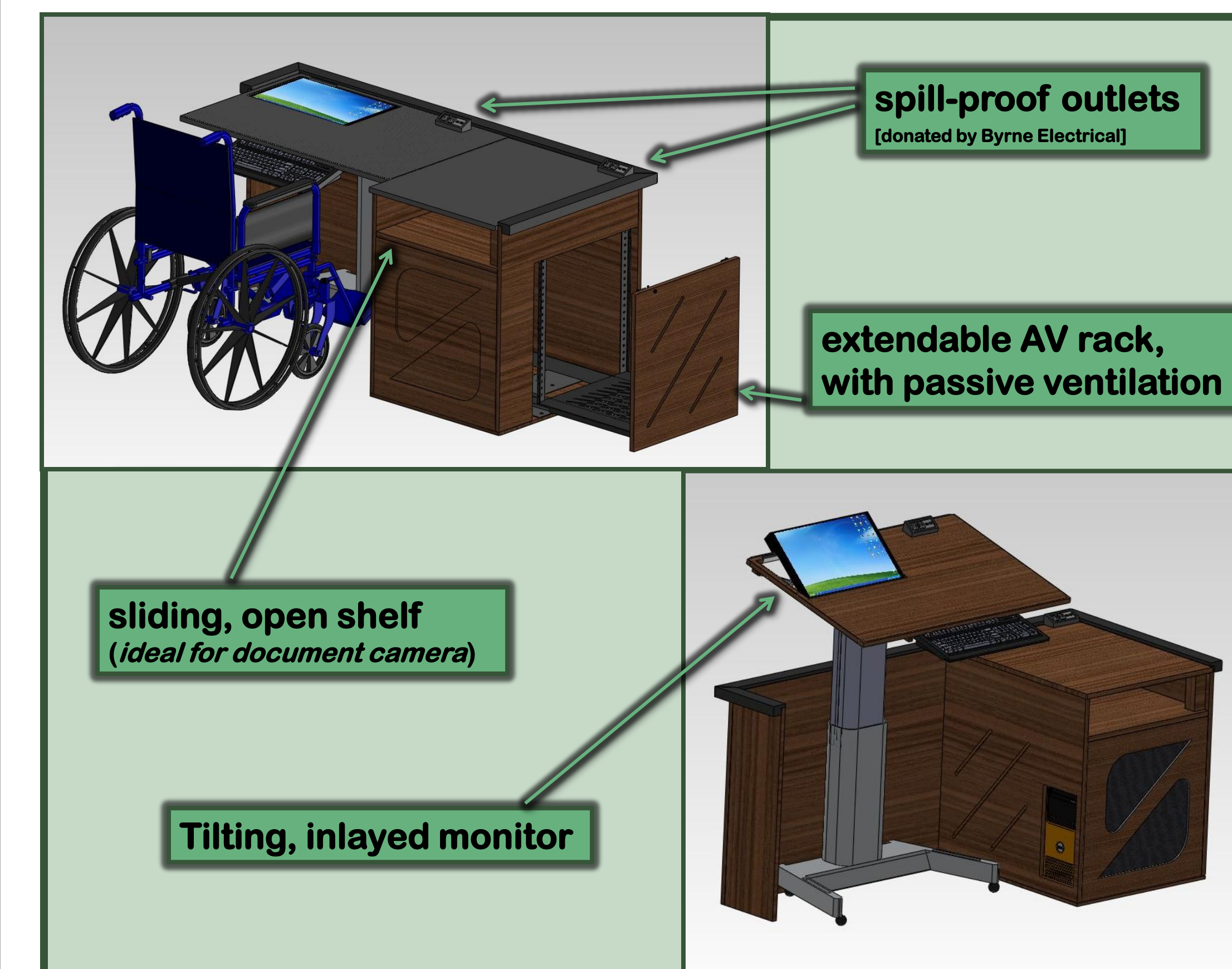


Figure 6: Representation of final design, April 2012

Conclusions

- Each step of the design lifecycle was driven by actionable requests from prospective end-users
- The final prototype is fully specified and documented for manufacturing
- The product's compliance with 2010 ADA standards and its height and tilt adjustability, make it unique in the current lectern market

References

- [1] Center for Universal Design. North Carolina University. September 7, 2010. <http://www.ncsu.edu/project/design-projects/udi/>
- [2] "2010 ADA Standards for Accessible Design." ADA Home Page - Ada.gov - Information and Technical Assistance on the Americans with Disabilities Act. Web. 08 Dec. 2011. http://www.ada.gov/2010ADASTandards_index.htm

Acknowledgments

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