Exploring Universal Design with Product Design Students
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ABSTRACT
This paper will review a student project from Swinburne University Industrial Design program, which was focused on Universal Design. Swinburne University offers a 3-year undergraduate program in Industrial Design. We will look at the history, interpretation and the application of a specific set of Universal Design Guidelines as developed by NC State University and via some preliminary text analysis of student submissions investigate if there is any correlation between the application of the guidelines as a part of the design process and the degree that the final outcome appears to be a Universal Design proposal. We will discuss and describe an analysis of the experience of a cohort of students, as determined from a review of text submissions and lecturer review of the design outcome, post the undertaking a product design studio incorporating Universal Design.

INTRODUCTION
Universal Design (UD) is widely employed as a framework for the development of design products and spaces with a concern for a broadest possible user group. Teaching universal design to industrial design students has also become a common factor in higher education curriculum. The detail and challenges to teaching such an approach has, however, not been the subject of much examination. This paper reports on the teaching and evaluation such an approach with undergraduate industrial design students at Swinburne University, Australia.

I. WHAT IS UNIVERSAL DESIGN?
Ostroff (2001) observes that universal design as a term emerged in the USA in the mid eighties but exists in other countries under different banners, including inclusive design (see figure 2). The term refers to approaches which stress ‘equity and social justice by design’ (2001, p.5), and is increasingly driven by an ageing population, technology possibilities, sustainability and other current concerns.

Such a broad moral and political program has been more practically identified with several principles. The North Carolina State Centre for Universal Design (http://www.design.ncsu.edu/cud/about_ud/about_ud.htm), for example, suggests that UD must exhibit seven principles: Equitable use; Flexibility in use; Simple and intuitive; Perceptible information; Tolerance for error; Low physical effort; Size and space for approach and use. Each of these principles has more detailed realizations and explanations in practice, as illustrated in the above example from principle 3. These principles and others were central to the working definition we developed.

Figure 1: NCSU UD Guidelines: Source http://www.design.ncsu.edu/cud/
Figure 2: Inclusive Design Process: Source http://www.inclusivedesigntoolkit.com
II. TEACHING UNIVERSAL DESIGN

While the agenda for universal design has been developed for design practice, how such principles and practices can be taught to students remains unclear. Although it is not universally taught, the ability to understand and use universal design is considered an essential competency for the current and future industrial design student (Yang, You and Chen 2005). The experience of students and lecturers remains little understood.

Our interpretation of Universal Design is that it is design of products that are easy to use by people with a disability. This takes into account both the physical and virtual interfaces and implicitly involves the concept of affordance (Norman 1999) where a product’s form or aesthetic indicates to the user how the product is to be used, and therefore includes so-called product semantics (Krippendorf 2006).

III. SWINBURNE CONTEXT

A. Working Definition

To us Universal Design is very much about the usability of any product. In developing this working definition, two main sources were referenced; the Center for Universal Design, NC State University and the Inclusive Design Tool Kit.

The underpinning definition for us was the concept that a product could be easy to use by someone with a disability and easy to use by someone without a disability. Such a definition of universal design allowed students to develop a broad range of projects, ranging from those addressing a very specific disability such as a developing a one handed keyboard for use by people with cerebral palsy to a kettle that was easy to fill and pour for people with weak wrists but usable by everyone.

B. Educational Context

In the early semesters of the Industrial Design program at Swinburne students are exposed to skills such as sketching and visualisation and CAD programs such as Solidworks and 3d Studio Max. One studio runs each semester based around a particular theme that is intended to synthesise these skills through their application to a particular design project.

The studio that is this paper’s focus is titled Professional Practice, and it’s objectives are to expose students to industry ready professional protocols such as proposal writing (setting the brief), costings for design work (estimating hours) and presentation (both oral and visual communication of design ideas) and documentation for manufacture (3d CAD models, edrawings and traditional 3D Engineering Drawing documentation). As a means of encouraging students to explore the concepts of user centred design (in the sense of gaining empathy for a user that is very different to oneself), a further theme and client were selected within the area of Universal Design. (or inclusive design as it is called in the UK). A local disability service provider was selected as the client, one who has an extensive library of assistive technology products, ranging from walking frames, to baths to kitchen utensils.

The first few weeks of the semester were focused on sensitizing exercises related to Universal design. After an introductory lecture students worked in groups to analyse and categorise a selection of products (based on the work of Brian Donnelly, Design Consultant, Former Associate Professor, Department of Design and Industry, San Francisco state University, San Francisco, California, USA ). The products evaluated were; the toto toilet (fully automatic toilet), a red kids trike, a toothbrush, a power tool, itunes website, and oxo icecream scoop. In small teams students were asked to determine the extent that each product appealed to an age group, is used in public or private and the capacity for the product to be redesigned within the Universal Design Guidelines.

This process of grading through discussion encouraged the students to discuss what each guideline might mean in a product context. In the next exercise all students provided a selection of images of products which they determined to be Universal based on their knowledge of the guidelines and principles, which were used to stimulate discussion around what Universal might really mean when applied to product design.

CLASS EXCERPT…(WEEK 2)

One student showed an image of a stair-climbing device for wheelchair users. Lecturer asked “Is this an example of universal design?”

Student: Don’t Know

Lecturer: What if it could be used by people without a disability?

Student: Not sure?

Student shows an image of a pump pack soap dispenser

Student: “This is a great example of universal design because everyone regardless of ability can use it.”

Another student shows a straw: “Everyone can use this too!”

Other products that stimulated discussion were a coffee pot designed for use by a Stewardess on an aeroplane with a balanced centre of gravity making it easier to pour “…it would be easy for people with low wrist strength to use as well.” A washing machine with the opening on an angle makes access for wheelchair users far easier. An electric plug with a finger hole for removing the plug from the socket makes removal of the plug easier for all users.

Our client provided a 3 hour workshop on the application of Universal Design Guidelines to the design of products for people with disabilities. Real world examples were presented and a brief introduction into the types of everyday activities that require assistive technology products. Students were also able to explore the product library, which for design students proved to be pivotal in finalising their own projects. Design students love to touch and feel everything!

Visiting our client’s Product library also generated many comments such as “…why does everything look so ugly? Why is it all so medical looking? Why can’t it be aesthetically pleasing, it just looks so functional!”

The client also suggested 5 specific case studies drawn from their own client base, which students could embrace for their own project. A handful of the cohort selected these projects, whilst others preferred to draw upon personal experiences to define a design problem, such a friend or relative with dementia or a cousin with cerebral palsy, the remainder used the visit to the library for project inspiration.
The theme of Universal Design was selected as the focus for a user centered design approach as the guidelines provide an excellent framework for both investigating and setting a problem. By encouraging the use of the guidelines to evaluate a design concept through out the design process, we attempted to focus the students’ attention on the suitability and usability of the final product by a wide variety of people. We felt that often students find it hard to design for people other than themselves and our objective was to facilitate the development of a certain consciousness pertaining to designing products for people with very different needs.

C. Analysis of Student Outcomes

As a part of the final submission, students were required to submit 3 texts, a reflection on their learning experience throughout the semester, a summary of project and it’s stages and a summary or description of the final product. These 3 texts were used as the basis for the text analysis. It should be noted that the students were simply asked to reflect upon the project and their learning experience and not to specifically write about the application of the universal design guidelines as we wanted to ascertain if the guidelines were important to the learning experience and the formulation of the final design outcome, because if they were, we considered that the students should mention them, or phrases that indicated a consideration of the end user at least, in their submissions.

The text analysis searched for the following words phrases in the following categories, and for the initial investigation looked simply for the occurrence of each word or phase in each category and totalled the results. This preliminary overview was intended to look for any patterns in the data that would reinforce the correlation between the reflection or discussion of universal design guidelines in the text and their application in the final design outcome.

A. Specific stated Application of NCSU universal design guidelines

Equitable use
Flexibility in use
Simple and Intuitive use
Perceptible information
Tolerance for error
Low Physical Effort
Size and Space for approach and use

B. Other indicative phrases of application of a universal approach

Independent living
Usable by all people
Demographic
Inclusive to all users
Enhance user experience
Appeal to wide audience
Used by all ages

C. Other phrases that indicate some level of engagement with usability

Comfort
Ergonomics
Simplicity
Improved design
Well being
Suit the user
Ageing population
Integrated
Normal users
User friendly
Usable and understandable
Positive experience
Adapt to the needs
User observation
Anthropometrics
Problem faced by
User

D. Phrases that refer to the learning experience
Positive experience
Difficult Learning
Design Knowledge
Universal Design Knowledge
Application of knowledge
Product Development.

D. Lecturer Assessment of incorporation into product

The Table following depicts the initial text investigation mapping the occurrence of words or phrases in the student reflections against the lecturers subjective evaluation of the level of incorporation of the universal design guidelines into the final product proposal. A preliminary review of this data suggests that there is some correlation between the students’ project description of the UD guidelines (Theme A in the table) in their reflection and the lecturer’s assessment of the inclusion in the final product proposal (Lecturer assessment in the table).

This suggests to us that the inclusion of the UD guidelines into both the preliminary and review phases of the project, in other words throughout the design process does in fact result in an end product, that is at least anecdotally usable by a broad spectrum of users. Interestingly the students that were considered to have a lower incorporation of the UD guidelines into their final proposal (Lecturer assessment in the table), actually used a great number of phrases or words that indicated they had considered usability in formulating their final design. (Themes B and C). Theme D noted responses that were about the Learning Experience.

![Figure 4: Table of Indicative Phrases and Product Evaluation](image)

IV. CONCLUSION

The limitations of this project were the small sample size, the type of student reflection used (some students did in fact design products did respond to the UD guidelines but did not write about this in their reflections) and the truly subjective nature of the lecturer assessment. However we believe that this data does suggest that using the UD guidelines as framework for both developing the student understanding of Universal Design as area of investigation and as a real focus for product design, does result in design students that are more sensitive to users’ needs and as a direct result of this design products that better meet these needs.

Interestingly the students that were considered to have a lower incorporation of the universal design guidelines into their final proposal actually used a great number of phrases or words that indicated they had considered them in formulating their final design. This however is a small sample at this stage and a further mapping of a larger sample should reveal whether this was in fact the case across a larger sample of the student cohort.

There is no doubt that Universal Design will become a mandatory consideration for industrial designers much like manufacturing knowledge, sustainable design or marketing, and there is evidence that international standards and legislation will push this agenda. Our experience suggests that The Universal Design guidelines developed by NC State University are good evaluative and strategy tool for the development of well-designed products for both able bodied and disabled users. Many design schools are incorporating Universal Design into their curriculum, but what needs to ascertained is the best way to enhance student awareness and knowledge of this area and more importantly how best it can be applied to design outcomes.

REFERENCES