Universal design in architectural education: Who is doing it? How is it being done?

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ABSTRACT: The World Health Organization estimates that over one billion people, or 15% of the world's population, have some form of disability. As demographics change and the world's population continues to age, this number is expected to dramatically increase. In response to this global trend, many designers, advocates, and anyone interested in making physical and visual environments more usable for people with diverse backgrounds and abilities have adopted the philosophy known as universal design (UD), inclusive design, or design for all. Despite the demonstrated need for designers who are knowledgeable in UD theory and practice, it seems that architecture programs in U.S. universities have been slow to adequately incorporate UD into their curricula.

In an effort to gain a better understanding of the current state of UD content in architecture curricula, researchers distributed an online survey to architectural educators and administrators in 120 U.S. institutions with accredited degree programs. The study, sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR), consisted of qualitative and quantitative questions that sought information related to the understanding, attitudes, and incorporation of UD into each participant's curriculum.

Responses were obtained from 463 participants representing 104 of the 120 surveyed schools. Quantitative analyses found relationships between perceived attitudes of administrators, faculty, and students and the effectiveness of UD components in a program. Qualitative findings were rich and complex, revealing great variability across schools, in terms of how, when (course level), and the degree to which UD aspects were incorporated into programs.

Implications for educational programs, as well as future research, will be discussed.

KEYWORDS: Inclusive Design, Universal Design, Design Education, Survey Research, Design Curriculum

INTRODUCTION

Universal design (UD), sometimes called inclusive design or design-for-all, is "a process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation" (Steinfeld and Maisel 2012, 29). Inclusive processes aimed at helping all of us to experience the full benefits of products, environments, communications, systems, and policies regardless of our age, size, situation, and abilities have been around since the mid-1970s (Welch 1995, 1-4). With roots in the Civil Rights and Disability Rights movements, UD is a socially focused design philosophy grounded in democratic values of nondiscrimination, equal opportunity, and personal empowerment (Tauke 2008).

UD is a growing trend for a number of reasons:

1. *Demographics are changing.* Over the next twenty years, the older population will increase by more than 50%. The World Health Organization estimates that over one billion people, or 15% of the world's population, currently have some form of disability. As demographics change, this number will dramatically increase. Universally designed products, systems, and environments that empower this growing sector will be in greater demand in the coming years.
2. *Social sustainability is a natural part of the environmental sustainability movement*. Social sustainability focuses on the development of programs, processes, and products that promote social interaction and cultural enrichment. It emphasizes protecting the vulnerable, respecting social diversity, and ensuring that we all put priority on social capital. Social sustainability relates to how we make choices that affect other humans in our 'global community'. UD is the key component of social sustainability and is receiving serious attention from the proponents of this movement.
3. *Mass customization is making it easier to develop universally designed solutions.* Mass customization is the application of flexible, computer-aided manufacturing systems to produce customized goods and services. Through this process, products that were once standardized are now able to change to meet the needs of individuals at the same low unit costs of mass production. This universally designed approach to manufacturing makes design for all more possible and affordable.
4. *Digital technologies are augmenting or eliminating static solutions to dynamic conditions*. Many

products and systems that previously were fixed entities are now active. For example, Global Positioning Systems (GPS) augment environmental signage and provide individual navigation and information that is specific to each user's needs. Dynamic and personalized products and systems add a critical layer of usability for everyone.

5. *World economies are changing.* The International Monetary Fund World Economic Outlook states that "although downside risks have diminished overall, lower-than-expected inflation poses risks for advanced economies, there is increased financial volatility in emerging market economies, and increases in the cost of capital will likely dampen investment and weigh on growth"(IMF 2014). This forecast moves attention towards smart conservation—ways to save money that maintain or improve standards of living. As a result, businesses and governments are looking at processes and approaches that change patterns of waste. UD, then, becomes part of the solution. For example, the cost of assisted living and nursing facility care is expensive, both for national health providers and for individuals. Vast amounts of money will be saved if people can stay in their houses or apartments longer because they are universally designed.
6. *Attitudes about consumption are changing.* The concepts of 'planned obsolescence' and 'consumer waste' so prevalent in the later part of the twentieth century are giving way to more prudent and conscientious notions of consumption. Rising energy costs and the slowdown in the world economy have encouraged consumers to rethink their purchasing patterns. Quality over quantity is making a comeback. Universally designed features save money in the end, and elevate the quality of living for all.

To account for these trends, design fields must respond by adapting their methods of practice to meet the changing demands of their clients. University education is the key to changing professional culture in the design fields. Design professionals develop their professional interests, values, and priorities early in their careers. Students who are exposed to UD concepts and practices during their architectural education are more likely to accept UD as a key aspect of good design than those who are exposed later in professional practice, which currently does not put a high priority on UD. Knowing the overall state of teaching practices in teaching UD is an essential step in improving education in this field.

1.0 UD EDUCATION IN LITERATURE

1.1. Literature overview

To date, the literature does not document the current state of UD content in design programs. Existing literature examines barriers to UD education and outlines possible strategies for implementation of UD content into design curricula, but discusses these topics only in general terms. As a result, faculty and administrators must make decisions on UD content based on assumptions and beliefs rather than facts. In addition, this lack of information prevents possible sharing of valuable information and course materials between disciplines and schools. The following two sections address areas related to UD and architectural education documented in the literature.

1.2. Barriers to UD education

Studies have found a number of reasons why design programs have been slow to incorporate UD into their curricula, the most cited being a general lack of understanding of what the concept means and/or advocates. UD often is misunderstood as a synonym for accessible design and, therefore, is used interchangeably by design instructors (Welch and Jones 2001, 51.4). Additionally, the philosophy sometimes is referred to as a utopian notion (De Cauwer et al. 2009). 'Utopian' has both negative and positive connotations, and in the case of UD, design faculty have been wary of adopting a philosophy based on utopian ideals (Steinfeld and Tauke 2002). The topic is viewed by some as unscientific and, although considered a set of good intentions, is something that is difficult to achieve because it is not possible to completely adapt the environment to all users' needs. In this view, it is felt that, at best, "designers can only strive to limit the damage" (De Cauwer et al. 2009).

In addition to skepticism related to the validity of UD as an area of discourse, another challenge cited is the nature of university design education in general. Given the fact that university education is research-based and academic, many feel that design education should enable students to integrate 'necessary' concepts and standards into their work. While UD has the potential to be one of those concepts, in contrast to accessibility standards, it is not directive (De Cauwer et al. 2009). Moreover, faculty resistant to change often articulate their discomfort with the argument that design curricula are overloaded and that UD-related considerations are best learned post-graduation in the professional setting (Welch and Jones 2001, 51.20).

A third challenge to incorporating UD content in design curricula is the frequent negative association of the term with regulation. Historically, architecture faculty have approached the topic of accessibility, the precursor to UD, as "one extra piece to be fit into the design puzzle" (De Cauwer et al. 2009). As a result, faculty and students view UD as something that is added instead of incorporated and often, "students…fear

social science might straitjacket their architectural creativity" (Lifchez 1986, 184). Faculty resistant to change also equate UD with "ugly ramps and homogeneous spaces" (Welch and Jones 2001, 51.20). According to Raymond Lifchez, "client accommodation is not merely the third element in design, alongside aesthetics and technology, but is in fact the context within which all factors of architectural design must be placed" (Lifchez 1986, 180).

1.3. Implementation strategies for UD education

In an effort to overcome the barriers to implementation, design faculty around the world have adopted various strategies to incorporate UD into their architectural curricula. Most curricular responses are classified into one of two categories: injection strategies or infusion strategies. Injection strategies often are attempted before infusion strategies because their benefits tend to outweigh any potential shortfalls. Examples of injection methods include incorporating a stand-alone UD unit into a course, devoting an entire course to UD, or offering a one-time event/workshop dedicated to UD (Welch and Jones 2001, 51.10-51.14). Infusion strategies are implemented when injection strategies are successful and faculty seek to "diminish the potentially marginal status of the course content… and illustrate to students the interconnectedness of factors impacting design, while challenging the students to internalize and apply their understanding to projects and tests in much the same manner as they do in a design problem" (Welch and Jones 2001, 51.15). Infusion strategies include infusion of UD materials into a subject area course, a studio problem focused on UD, a single year of the curriculum devoted to UD, and incorporation of UD into the entire design curriculum. Unlike injection-type curricular responses, infusion responses require a critical mass of faculty members well versed in and dedicated to the topic (Welch and Jones 2001, 51.15).

Using injection and infusion methods, several design programs in the United States and internationally have successfully been able to incorporate UD into their curricula. Methods including empathic modeling in a Human Factors course, teaching the Principles of UD as a special topic in a large studio, and inviting users with diverse backgrounds and abilities to speak to classes all are examples of how faculty have attempted to introduce students to UD concepts (Altay and Demirkan 2014). While a small number of design-based academic programs offer a concentration focused on UD, such as the Inclusive Design Graduate Research Group at the University at Buffalo—State University of New York, little acknowledgement of these programs in literature exists, making it difficult to understand the extent to which UD is infused in design curricula (Tauke, Steinfeld, and Basnak 2014). One documented study examining student and instructors' attitudes toward UD focused only on students and faculty in the Department of Interior Architecture & Environmental Design at Bilkent University in Ankara, Turkey. Although the survey provided valuable data related to the effectiveness of certain teaching methodologies in creating awareness of UD in students, the limited survey population of only 23 instructors and 79 fourth year students failed to give a comprehensive overview of infusion not only in the school as a whole, but in the region, country, and world (Afacan 2011).

1.4. Summary

Despite the demonstrated need for designers who are knowledgeable in UD theory and practice, based on the existing literature, it seems that architecture programs, particularly in the United States, have been slow to incorporate UD into their curricula. There is little documentation examining the breadth and quality of UD education in design programs. In an effort to gain a better understanding of the state of UD education in architecture schools in the United States, researchers conducted an online survey of architecture administrators and faculty from institutions with accredited degree programs.

2.0. METHODOLOGY

2.1. Sample

Architectural faculty and administrators in 120 accredited degree programs in the United States were targeted for the survey. Principal investigators compiled a list of potential schools from which to contact faculty and administrators for the survey using an online directory of accredited degree programs provided by the Association of Collegiate Schools of Architecture. Based on this list, the names and email addresses of architecture faculty and administrators were gathered from each school's online faculty and staff directory. Over 4,400 individuals were invited via email to take the online survey.

2.2. Instrument

The survey consisted of questions that sought both quantitative and qualitative data. Questions included both multiple choice and open-ended answer styles and covered three major content areas: 1) background information about the participant, 2) attitudes and understanding related to UD, and 3) the nature of incorporation of UD into the curriculum. The first content area asked participants to identify their institution type (public, private, etc.) and role in the program. The second content area sought information related to attitudes and understanding of UD such as the participant's understanding of UD and general faculty, student, and administrator attitudes toward UD in their programs. The third content area pursued information more related to UD's role in the curriculum including whether or not it is addressed, at what level it is addressed, in what courses it is addressed, and general ways in which it is incorporated. Questions also

sought information related to how effective the participant felt UD components were in their curriculum and asked for suggestions for increasing UD's relevancy not only in their program, but in architectural education in general. The survey concluded by giving participants the option to provide their institution's information in order to allow the investigators to track school response rate (number of schools responded versus number contacted).

2.3. Analysis

Survey Monkey, an online cloud-based company, was used to collect survey responses. Responses were downloaded into Microsoft Excel and SPSS. Other than an I.P. address, Survey Monkey recorded no other identifying information from participants.

Two data sets were created from the survey responses; one consisted of the responses to all items by the *individuals* who completed the survey. The other was a set of responses to all quantitative items for the *schools*. Because there were differing numbers of respondents from each school, a mean score (for all respondents within a school) was computed for each quantitative item. This was done to avoid over-representation by schools with large numbers of respondents.

Descriptive, comparative, and correlational analyses were used to provide information about two primary questions: 1) Who is teaching UD? and 2) How are they doing it?

3.0. RESULTS

3.1. Sample

Responses to the survey were obtained from 463 participants representing 104 of the 120 surveyed schools. Based on identifying information provided by survey participants, schools from all six ACSA-defined regions—Northeast, Mid-Atlantic, West, Gulf, West Central, and East Central—were represented in the survey results. The region with the lowest response rate (in terms of number of schools represented versus number of schools contacted) was the Gulf region, with a response rate of 63% (10 out of 16 schools). The East Central region had the highest response rate of 100%, with participant responses from 20 schools out of a possible 20 schools contacted.

Of the 463 respondents, 70% reported that they were faculty members and 12% identified themselves as administrators. In regards to the level of understanding of UD, 24% exhibited a high level of understanding and 52% exhibited an adequate level of understanding. Only 4.8% were not aware of the term or did not know what it was. However, 18.8% made no response, or wrote in something that was not relevant to the question.

3.2. To what extent do respondents feel that UD material is being incorporated into design education at their school?

Individuals. Of the individual respondents, 68.8% said that UD *was addressed* in their program's curriculum, 18% said it was *not addressed*, and 13.2% indicated that they did not know whether or not it was addressed. Of those respondents who said that UD was not addressed, only one-third reported that there was an interest in incorporating it into the curriculum.

When looking at this question by respondent role, Table 1 below shows that the more 'experienced' respondents were more likely to say that UD was addressed in their curriculum.

Table 1: Is universal design addressed in your curriculum?

Role of respondent		Administrator	Tenured faculty member	Tenure-track faculty member	Adjunct faculty member
Yes	N	46	118	57	42
	%	**85.2%**	**75.6%**	**68.7%**	**51.2%**
No	N	6	26	15	21
	%	11.1%	16.7%	18.1%	25.6%
Don't know	N	2	12	11	19
	%	3.7%	7.7%	13.3%	23.2%
Total	N	54	156	83	82

Schools. When the individual responses for each school were averaged to create a 'school score', we found that 69% (70 schools) had unanimous agreement among their respondents that UD was addressed in their curriculum. Twenty three percent (23 schools) gave mixed responses (yes and no), and 8% (8 schools) said that UD was not present.

From the aggregated school data, we could learn if there were other differences, e.g. between ACSA regions, or between public and private schools, in terms of whether or not UD was addressed in their curriculum.

No significant difference (t-tests for independent samples) was found for the comparison of *public to private schools*, in terms of UD being addressed in their school. Nor were there any significant differences (one way anova) among the six ACSA regions. This suggests uniformity in level of UD presence in curricula across the country.

3.3. Attitudes about universal design

Respondents were asked to describe the attitude of their administrators, faculty, and students about UD, on a five-point scale (from very positive to very negative).

Individuals. Individuals responded positively, with very little difference in terms of the groups about which they were asked. Figure one below shows that, in general, respondents felt that others in their program were quite positive about UD. (Note: The figure shows the percentage of people for each response choice.)

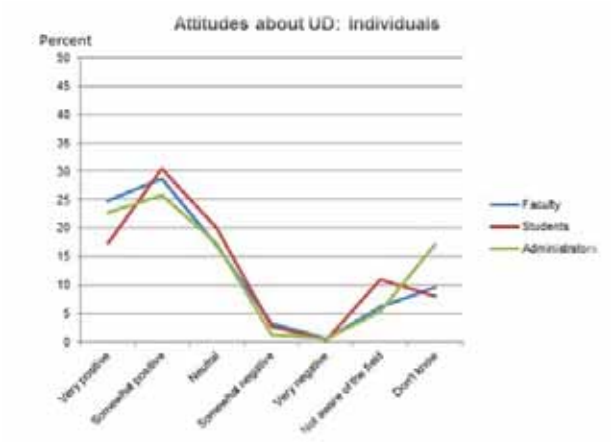

Figure 1: Attitudes about universal design (Individual respondents)

It is also important to note the relatively large percentage of people who responded that they were not aware of the field, or were not aware of their colleagues' feelings.

Schools. When asked about administrator, faculty, and student attitudes toward the concept of UD, responses showed that faculty held the most positive attitudes, with students and administrators having somewhat less positive attitudes.

3.4. How is UD material being taught and/or incorporated into design education?

The information about where UD is covered in the curriculum proved to be quite complex. One way to understand it is to look at what grade level UD material is taught and/or incorporated into the curriculum. Table 2 below is a summary of the degree to which UD education is present within the program curriculum. Out of the 104 schools surveyed, data on the level of infusion was obtained from 72 schools. Some programs covered it only at the early undergraduate level, others only in the graduate level, while others had a mix of locations in which it was covered. As can be seen, most schools addressed UD *only* in a portion of their programs. Only 8% of the schools addressed UD throughout their entire program.

Table 2: Presence of universal design in curriculum

Level of Presence	# of Schools	Percent
1st or 2nd year OR 3rd, 4th or 5th year OR grad	55	76.4
Mixed (lower & upper) OR (upper & grad OR lower & grad)	11	15.3
Infused throughout	6	8.3

When asked how effective the UD components were in their curriculum, only 8% said they were very effective, and over 18% said they were 'neutral', 'ineffective', or 'didn't know'. Figure 2 below shows the detailed findings for individual respondents. This clearly suggests that only about one-third of respondents who have UD content incorporated into their curriculum felt that the content was at least moderately effective.

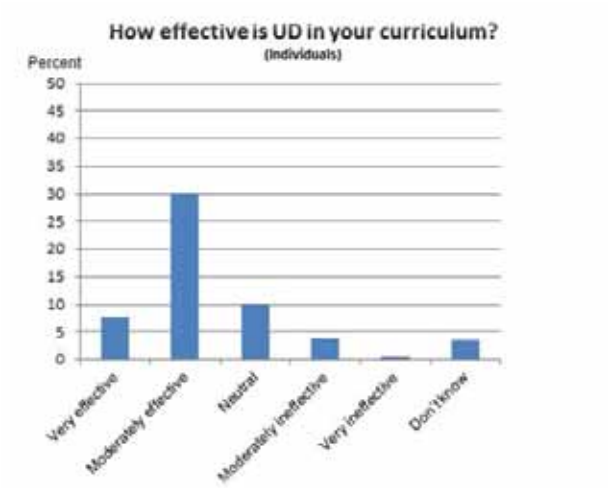

Figure 2: Effectiveness of UD in curriculum (Individual respondents)

3.5. THE RELATIONSHIP BETWEEN ATTITUDES AND EFFECTIVENESS OF UD

It is interesting to look at the relationships between the three questions asking people to indicate what attitudes about UD would be for other people in their program and how effective they thought the UD components in their curriculum were. Table 3 below shows correlations among these questions for both the individual responses and for the school scores.

Table 3: Correlations among attitudes and effectiveness of UD components

	Correlations: Individuals (N~300)				Correlations: School scores (N~93)		
	UD Effective-ness	Faculty Attitudes	Student Attitudes		UD Effectiveness	Faculty Attitudes	Student Attitudes
Faculty	**.33****				**.36****		
Students	**.36****	**.55****			0.14	**.35****	
Admini-strators	**.33****	**.62****	**.41****		0.15	**.29****	**.52****

**. Pearson Correlation is significant at the 0.05 level (2-tailed).*

***. Pearson Correlation is significant at the 0.01 level (2-tailed).*

For the individual respondents, there are significant relationships between attitudes and UD effectiveness for all items; however, for school scores, only faculty attitudes are positively related to UD effectiveness. But the most parsimonious question to ask is: Which, if any, of the attitude items can significantly *predict* the

perceived effectiveness of UD components in a program? A stepwise linear regression analysis was done for both data sets. In both cases, *only* faculty attitudes were a significant predictor of level of UD effectiveness in the program.

In addition to the topics discussed above, the survey also sought information related to courses in which UD content is incorporated, suggestions for increasing relevancy of UD in program-specific design curricula, and suggestions for increasing the relevancy of UD in architectural education overall. These answers were provided through open-ended questions; these questions are currently being analyzed. Results will be shared at a future date.

DISCUSSION

Despite the lack of existing literature documenting the incorporation of universal design into university-level architectural education, this study found that a significant number of accredited programs in the United States address the philosophy somewhere in their curriculum. Sixty-nine percent of both individual respondents and aggregated school responses indicated that their curricula addressed UD. Based on preliminary and anecdotal evidence of UD content in architecture programs, this value was higher than expected. Although 76% of survey respondents exhibited adequate to high levels of understanding of the term UD, the higher-than-expected value for incorporation may be as a result of respondents mistakenly identifying accessibility curricular elements as UD. Accessible design is a *subset* of UD. UD considers all human-environment conditions, especially those that typically are overlooked. While accessible design often is noticeable in a stigmatizing way, Universal Design blends in with the mainstream.

In addition to the higher than expected extent of incorporation of UD curricular elements into architectural education, the study also found that perceived attitudes of administrators, faculty, and students toward UD were more positive than expected in comparison to what we saw in the existing literature. Almost half of all individuals responded that they felt their students, faculty, and administrators had at least somewhat positive attitudes toward UD. The results showed that attitudes that are more positive are strongly correlated with a positive presence of UD in the curriculum and higher levels of understanding of the philosophy.

Infusion of UD content throughout the curriculum demonstrates a school's exceptional commitment to UD as a component of architectural education. Of the 69% of schools that reported incorporating UD content into their curricula, 8% (6 schools) reported full infusion. Again, this value is higher than expected based on preliminary and anecdotal evidence of UD content in architecture programs and the newness of this area of research and field of study.

RECOMMENDATIONS FOR FUTURE RESEARCH

Overall, this research found that UD content is more prevalent in architecture curricula in the United States than we expected. While this finding is important, additional research is needed to explore the level of understanding of the specifics of UD. This would help to ensure that respondents mistakenly identifying UD course content as synonymous with accessibility would not inflate incorporation numbers.

While faculty and administrator responses are important in assessing the presence and effectiveness of UD in architectural programs, knowledge of student response is essential as well. Additional research focused on student understanding and attitudes about UD would provide insight into the success of existing methods of UD instruction and would provide an overview of the current state of UD knowledge amongst students.

In addition, researchers need to distribute a revised and more comprehensive survey of this preliminary study to those who are involved in education in other design areas, including visual communication, industrial design, interior design, urban design, and landscape architecture. This would allow researchers to gain a broader understanding of UD's relationship with design education and may provide valuable insight into ways in which information can be shared across design disciplines.

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