

ERGONOMICS AND UNIVERSAL DESIGN IN INTERIOR ARCHITECTURE EDUCATION

Nilgün OLGUNTÜRK and Halime DEMİRKAN

Received: 08.04.2009, **Final Text:** 30.07.2009

Keywords: accessibility; educational ergonomics; human factors; universal design.

The focus of this article is on the application of Human Factors and Ergonomics (HFE) principles on design process. Designers begin acquiring HFE principles and data during their university education. Universal Design (UD) approaches HFE as incorporating the whole of the population rather than a certain percent. This study explores the effectiveness of a specially designed course on UD in an interior architecture undergraduate program. After completion of the course, students were asked to evaluate their learning process. It was observed that learning UD principles is a process and requires some time, rather than being book information. The majority found the course helpful in increasing their awareness of UD issues. They also found the course helpful for improving their design work. The research suggests UD to be integrated into the interior design curriculum both as a separate course on its own and within the context of the design studios.

INTRODUCTION

The application of Human Factors and Ergonomics (HFE) principles and practices, and teaching of ergonomics courses in design schools, have achieved proven success in improving performance, productivity, safety and health in the built environment. Being aware of the relationship between HFE and education, Kao formerly addressed the importance of establishing an inter-disciplinary field of research for total educational effectiveness. He "identified 5 components for educational ergonomics: 1) learning ergonomics, 2) instructional ergonomics, 3) ergonomics of educational facilities, 4) ergonomics of educational equipment, and 5) the ergonomics of educational environment" (Kao, 1976, 667). Later, Smith (2007) focused on educational ergonomics by addressing its context specific aspects and claimed that student learning performance is dependent at a substantial degree on the specific design factors in the learning environment. While arguing that ergonomists did not pay much attention

to educational ergonomics, Woodcock (2007) addressed the fundamental issues of ergonomics in teaching, learning, curriculum, school and classroom design.

Karwowski (2005, 438) defined one of the general dimensions of HFE discipline as design. Furthermore, he concluded "the HFE discipline focuses on the interactions between people and systems, i.e. everything that surrounds people at work and outside of their working environment". Universal Design (UD) has a close relationship with HFE. They both consider the diversified users in developing a product or a built environment. As Demirbilek and Demirkan (2004, 361) stated that a wide spectrum of professions is concerned with life-span design (universal design) for an ageing population; namely "design, engineering, gerontology, ergonomics and architecture". Research related to UD flourished more in the product field (Beecher and Paquet, 2005; Demirbilek et al, 2000; Demirbilek and Demirkan, 2004; Steinfield and Danford, 1994) compared to the built environment. On February 15th, 2000, the Council of Europe adopted a resolution to introduce the principles of UD to school programs for professions involved in the built environment (Resolution ResAP, 2001). In order to educate the architects and designers, the AAOutlis (Kennig and Ryhl, 2002) project co-funded by the European Union LEONARDO Program started to build innovative teaching tools for the UD students in Europe. With Belgium being the coordinator, Denmark, France and Poland were the other partners of the project. Designers are now aware of the changing role of designers and the function of UD education (Demirkan, 2007). The holistic perspective embedded in the UD theory guides designers to provide safe and functionally appropriate environments for people, regardless of their physical conditions or limitations.

UNIVERSAL DESIGN

Universal Design (UD) as a term is being used since 1970s. In 1985, the American architect Ronald Mace reinterpreted the term (Ostroff, 2001) that caused it to be widely used in many countries synonymous with alternative terms like 'inclusive design' and 'design for all' (Story et al, 1998; Preiser, 2001). Today there is a growing awareness of UD among both design educators and practitioners in order to satisfy the needs of the diversified users in many countries. Accredited interior design programs should consider UD principles as the basis for their design projects in order to enhance the function and quality of interiors. Universal Design (UD) is defined as "an approach to creating environments and products that are usable by all people to the greatest extent possible" (Mace et al, 1991, 156). There are seven principles of UD as seen in Table 1. It is "the best way to integrate access for everyone into any effort to serve people well in any field" (Story et al, 1998, 127). Although UD is not a recently coined term, it has not been widely used in Europe. The terms 'design for all' or 'inclusive design' are preferred over UD in Europe. Trost (2005) states the difference between these two terms as UD suggesting a comprehensive philosophy, whereas 'design for all' relates to practical applications. The UD concept lacks established criteria to determine what makes for a more usable environment. This gap between the ideal of 'usable by all people' and the actual solutions (Aslaksen et al. 1997) makes teaching UD a challenge in its own right. In addition, students have difficulty applying the information

PRINCIPLES	DESCRIPTION
1. Equitable use	The design is useful and marketable to people with diverse abilities.
2. Flexibility in use	The design accommodates a wide range of individual preferences and abilities.
3. Simple and intuitive use	Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible information	The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. Tolerance for error	The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. Low physical effort	The design can be used efficiently and comfortably, and with a minimum of fatigue.
7. Size and space for approach and use	Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

Table 1. The principles of Universal Design (Center for Universal Design, 1997).

they received to design studio problems, thus it is an ongoing debate on how to best incorporate UD principles into the interior design curriculum. 1997).

Initial signs of UD teaching began with the attention given to users' needs in design schools as early as 1960s and 1970s (Welch and Jones, 2001). The development of UD education is undoubtedly intertwined with the acceptance and evolution of UD as a concept (Welch and Jones, 2001, 51.3 - 51.4). Efforts to integrate UD values into design courses was the main concern for schools in the USA and in European countries in five disciplines, namely architecture, industrial design, interior design, landscape architecture and urban design (Welch and Ostroff, 1995; Welch and Jones, 2001; Preiser, 2003). The most important criterion for addressing UD in a university curriculum was thinking of UD both in terms of teaching strategies and design process itself (Goonewardene and Pedersen, 2000).

In architecture and interior design schools UD was integrated into the curriculum in two different ways: as a separate course on its own right and within the context of the design studios. Some educators preferred introducing UD within the challenge of the design studios (Burke et al, 1998; Welch and Ostroff, 1995; Welch and Jones, 2001). Whether in the context of the design studios or as a course on its own right, it is important to describe person-environment relationships with a UD perspective in physical, social and psychological context (Iwarsson and Stahl, 2003).

In the USA, in 1994, under one pilot project, twenty-one design programs explored how to best teach UD (Welch and Ostroff, 1995). Six schools taught the material in the context of a studio, eight schools introduced the material in both studios and lecture courses, three schools taught UD in a stand-alone class dedicated to the value, four schools used events such as design conferences to focus attention on UD and to reach the largest possible group of students. When all these teaching strategies

were compared, no one strategy stood out as being most effective in rising students' awareness of the value of UD. This project concluded that single exposures, whether an element of a course or studio or an entire course or studio, were not enough for most students to fully engage the value of inclusivity and the principles of UD. It envisioned giving students a repetitive exposure to and sustained emphasis on the value of an inclusive design approach (Welch and Ostroff, 1995).

A four-year interior architecture and environmental design undergraduate program at an established university infuses the UD principles throughout its curriculum. The UD principles are required for student projects in all interior design studios. At the second year, the 'Human Factors' course explores human, behavioural issues and also incorporates UD issues. In addition to all these courses, it is experienced that a specially designed course only on UD is still crucial for inclusivity to be fully understood by the students.

The purpose of this specially designed course on UD is:

- to give an understanding of the concepts and principles of UD.
- to explore how UD approach could benefit the whole of the society in an inclusivemanner.
- to discuss the broad range of human abilities and design solutions for various real-world situations.
- to develop an appreciation for the diversity of the human race.
- to develop an ability to recognise UD in order to improve environments for maximum accessibility for all.

The course is designed to provide dimensional, human behavioural, sensory and environmental considerations of UD to interior architecture students. The course also aims to provide the students with environmental analysis and space evaluation tools. This specially designed UD course is being evaluated in this paper. The research conducted to evaluate the course aims to observe the progress of the students throughout the semester and to test the effectiveness of the course with a questionnaire. The aim of this paper is to determine the efficiency of the used assessment methods and their progress in the course of time with respect to UD and HFE skills taught in a separate course.

THE COURSE

COURSE DESCRIPTION

This research was conducted in a course that was first time taught in the Department of Interior Architecture and Environmental Design. The course is a one-semester elective course titled 'Current Issues in Interior Design I / Universal Design'. The course spans fourteen weeks and is based on the seven principles of UD put forth by Story, Mueller and Mace (1998). The course aims at discussing the UD and HFE principles. The course is three class hours a week (one class hour is fifty minutes). Each week consists of one class hour of presentations on a chosen product or space and discussions on a previously introduced UD and related HFE principles, one class hour of lecture on a new UD and related HFE principles and one class hour of lecture on current research and application of UD until the eleventh week. At the eleventh week the students are assessed with a midterm

examination, and then at weeks twelve through fourteen, students are supervised in their final research paper.

SKILLS TO BE GAINED AND THE COURSE ASSESSMENT METHODS

The course consists of two teaching approaches integrated into each other. One is information transfer through lectures and the other is building student skills through assessment methods.

The lectures reinforced with real-life applications and research examples, intend to give the theoretical background to the students. The lectures are needed to provide the students with the information necessary to produce UD solutions to problems in the built environment. Several information sources are used to prepare the lectures: books, periodicals, building and product standards, on-line sources, video recordings and CD-ROMs.

Assessment methods are used as exercises to improve students' environmental analysis and space evaluation skills with a UD perspective. Environmental analysis and space evaluation skills, whether the design project is in its draft stage or has been built, would supply the student with problem identification ability. Once possible future problems of a project draft or the existing problems of a built space are identified, then the next stage would be to improve the draft or the built environment with UD solutions. The course comprises of three assessment methods that not only follow the student progress in developing a UD approach, but also challenge them on thinking and creating solutions on the subject.



Figure 1a. Household objects as examples for the UD principle, low physical effort.



Figure 1b. Signage as an example for the UD principle, perceptible information.



Figure 1c. A ramp and a staircase as examples for the UD principle, flexibility in use.

The first assessment method is a set of assignments given after each class on the principle that was discussed that day. There are a total of eight assignments and except for the first assignment, all are on the UD and related HFE principles. For the first assignment, students are asked to spend some time with an individual in their community whose abilities are different from their own and to analyse the effects of an environment on his or her abilities. They are asked to write one page on their experience. The remaining seven assignments ask the students to find, photograph, describe and critique an example for the principle discussed that week in the class lecture (**Figure 1**). The students submit the photographs with at least one paragraph discussion of their example. They also provide power-point slides of their examples to be presented and discussed in the class.

In Figure 1a, the student brought four household objects that would exemplify the UD principle, **low physical effort** (**Table 1**). The first image

is a bottle opener (**Figure 1a**, top left), which the student thought to be effective as it would reduce the effort when opening bottles. In the in-class discussions, this example was not found to be a strong example, as the opener would still require a certain hand function and dexterity to be used efficiently and people with hand limitations would not be able to use it easily (the product can not be used with a closed fist).

The second product is a pepper grinder (**Figure 1a**, top right). This example was brought by the student to be better than knob-head pepper grinders as its head piece could be used with a closed fist and people with hand limitations could use this product as well. In regards to low physical effort, the product could be efficiently used with a minimum of fatigue.

The third product is an egg whisk tool (**Figure 1a**, bottom left). It has a button which could be pushed down to rotate the rond metallic piece to whisk eggs. The student described this example to be more efficient than whisking the eggs with a fork, as the latter would require repetitive movement.

The fourth example is an apple cutter (**Figure 1a**, bottom right) where an apple is put beneath the product and by pressing on the sides of the product an apple or similar food is cut into several pieces. The product was found to contribute low physical effort as it was more efficient than slicing an apple with a knife, which would require a certain hand function and dexterity.

In **Figure 1b**, the example was brought to exemplify the UD principle, **perceptible information** (**Table 1**). The student brought a photograph of an interior where she drew attention to one backlit (seen on the left) and one regular signage (seen on the right), indicated in circles. Backlit signages are better viewed by visually impaired people and all. The signage also uses white lettering on a darker green surface, which also helps communicating the information more effectively. The regular signage, on the other hand, blends in the environment as it does not contrast enough with the lighted ceiling.

In **Figure 1c**, the example was brought to exemplify the UD principle, **flexibility in use** (**Table 1**). The student brought a photograph of a public entrance. The ramp and the stairs provide choice of access to the building, representing an example for flexibility in use.

The second assessment method is an open-book midterm examination. In the first forty minutes of the exam, the students are asked to examine two individually assigned areas in the department building. They are asked to write down all the data concerning the compliance of the assigned areas to UD and HFE principles and standards. They are also advised to note down any ideas or issues that come to their mind to improve the areas under concern. After this data gathering phase, the students are admitted in the exam room where they are free to use any references and the data they have collected. This phase of the exam lasts about one-and-a-half hours. The students are asked to use the seven UD principles, related HFE principles and data, standards and dimensions in their evaluation. They are asked to:

- Discuss whether or not the area they have examined is designed for all.
- Discuss possible solutions to inaccessible areas.
- Explain how the UD and HFE principles available in the examined areas are working for the benefit of all.



Figure 2a. Entrance of a university congress centre.



Figure 2b. Entrance to one of the conference rooms of a university congress centre.

The third assessment method consists of a take-home final research paper. Three to five students come together for this final research paper and they decide on a public building in the city to examine. They each select one part of the building (entering and exiting, using circulation systems, wayfinding, using public amenities and services (restrooms, etc.) or one designated area) and conduct their research on that particular area. The group is expected to come together to discuss different areas and aspects of their selected building. They then prepare a final research paper evaluating the whole building based on a given outline (**Figure 2a, 2b**).

For example, one of the final research papers submitted by the students concentrated on a university congress centre. **Figure 2a**, shows one of the entrances of the building. The sliding doors and the large area on both sides of the sliding doors satisfy several UD principles. Sliding doors are convenient for all people, whether they are wheelchair users or their hands are full, thus they exemplify **equitable use** (Table 1). They are **simple and intuitive to use** (Table 1). They provide **perceptible information** to visually impaired people and all as the movement of the doors are easily felt and seen (Table 1). It would be better to have manifestations on the glass to further improve visibility of the doors. Sliding doors also require **low physical effort** (Table 1). The large area on both sides of the sliding doors provide adequate **space for approach and use** in this area (Table 1).

Figure 2b shows entrance to one of the conference rooms of the same building. In this image it is not clear whether all people could access the area as it is not clear whether or not there is an alternative access to staircases. Because of the contrasting finishing materials of the flooring and the staircases, the usage areas are perceptible (**perceptible information**, Table 1). Also, there is enough **space for approach and use** of the space (Table 1).

THE QUESTIONNAIRE: STUDENTS ASSESSING THEIR LEARNING PROCESS

There were 20 students that were registered to the course entitled 'Current Issues in Interior Design I / Universal Design', but only 18 of them participated in the questionnaire. Each student was also registered to an interior design studio course that was held as twelve class hours per week where they carried out design projects. All students taking part in the study were in interior architecture and environmental design department and the majority (83 %) were fourth year graduating class students taking their last interior design project. They filled in a questionnaire that was statistically analysed. At the end of one semester, when students were done with all of their course work, they were asked to fill-in this questionnaire evaluating their own learning process of UD and HFE principles. The questionnaire consisted of 17 questions (Q): 11 questions with Likert-scale of one to five, three multiple-choice questions and three open-ended questions (see Appendix).

The main concern in distributing this questionnaire was to understand when and how did the students gain the ability to understand, apply and evaluate UD and HFE principles in interior spaces. The questionnaire consisted of questions in order to determine the efficiency of the assessment methods and their progress in the course of time with respect to UD and HFE skills. Also, there were questions related to the course improvement.

- The questions related to the efficiency of assessment methods with respect to UD and HFE skills involve:
- The amount of knowledge acquired through weekly assignments (Q3), in-class discussions (Q4).
- The amount of skills gained (Q5) and the starting point of gaining skill of space evaluation with respect to the assessment method (Q6).
- The assessment method that helped the most in gaining the skill of space evaluation (Q7).
- The questions related to the progress in the course of time with respect to UD and HFE skills involve:

- The amount of acquired UD knowledge at the beginning and end of semester (Q1 and Q2).
- The level of difficulty of object evaluation at the beginning and end of semester (Q10 and Q11).
- The level of difficulty of space evaluation at the beginning and end of semester (Q12 and Q13).
- The general questions related to the course improvement with respect to UD and HFE principles:
- The preferred public building type for the final assessment (Q8) and the reason of choosing that specific building (Q9).
- Increase in skills of space evaluation (Q14).
- Increase of awareness of UD and HFE issues (Q15).
- Increase in quality of design (Q16).
- Comments for course improvement (Q17).

FINDINGS

EFFICIENCY OF THE ASSESSMENT METHODS

Answers given to the questions that are related to the amount of knowledge acquired through various assessment methods were statistically analysed. The weekly assignments (Q3) were always helpful to understand UD and HFE principles (mean=4.22). Similarly, the in-class discussions on weekly assignments (Q4) were also found to be always helpful in understanding UD and HFE principles (mean=4.06). Both in-class discussions and weekly assignments had the greatest frequency (mode=5). Also, the students stated that they gained the skill of space evaluation (Q5) in terms of UD and HFE very much in this course (mean=4.61) as seen in **Table 2**.

Majority of the students (67 percent) indicated that they started to gain the skill of space evaluation (Q6) during the weekly assignments, while 17 percent started to gain the skill during the midterm exam. No students reported to start gaining the skill during the final research paper. Five percent of the students said they already had the skill before taking the course, five percent said they acquired the skill after the completion of the course and six percent of the students did not answer the question. When the students were asked what helped them the most (Q7) in gaining the skill of space evaluation, 61 percent stated the weekly assignments and in-class discussions, 28 percent stated the midterm exam and 11 percent did not answer the question.

Acquired UD and HFE knowledge	Mean	Std. Deviation	Mode
Initial	1.94	1.06	1
Final	4.89	0.32	5
with weekly assignments	4.22	1.11	5
with in-class discussions	4.06	1.94	5
with space evaluation	4.61	0.78	5

Table 2. Findings related to acquired knowledge.

ACQUIRED UNIVERSAL DESIGN KNOWLEDGE IN THE COURSE OF TIME

The students stated that they knew very little about UD at the beginning of the semester (Q1) (mean=1.94) and that they knew very much at the end of the semester (Q2) (mean=4.89) as seen in **Table 2**.

Questions 10-11 and questions 12-13 (see Appendix) were analysed with Wilcoxon signed-rank test. From the Wilcoxon signed-rank tests it could be said that while comparing the beginning and end of the semester, object evaluation in terms of UD and HFE became easier for students at the end of the semester (p-value=0.02) (positive ranks=13, negative ranks=2, ties=2). When it comes to space evaluation in terms of UD and HFE, while comparing the beginning and the end of the semester, it also became easier for students to evaluate spaces at the end of the semester (p-value=0.001) (positive ranks=16, negative ranks=1, ties=0).

IMPROVEMENTS PROVIDED BY THE COURSE

In order to increase skills of the students in space evaluation, the students had to evaluate public buildings from the perspective of UD and HFE. In the questionnaire, Q8 and Q9 explored the reasons why certain building types were preferred to be examined in their final research papers by the students. The building types that the students preferred to analyse for their final were: 55 percent shopping malls, 28 percent hospitals and 17 percent transport environments (train station, bus station, airport, underground, etc.). The reasons for choosing these building types were indicated as suitable building type (22 %), recently built (17 %), frequency in use (17 %), difficulty in usage (17 %) and multi-functionality (11 percent). Sixteen percent gave no answer to the question.

The course was found very helpful in increasing their skills of space evaluation (Q14) in terms of UD and HFE (mean=4.78; std deviation=0.55; mode=5). The course was also found very helpful in increasing their awareness of UD and HFE issues (Q15) (mean=4.72; std deviation=0.57; mode=5).

In Q16, the students were asked if the UD course was helpful to improve their design work. Out of the given responses, 22 percent were negative and 72 percent were affirmative that the course improved their design work. Six percent gave neither negative nor affirmative answers. As the last question (Q17), students were to indicate any other comments they had. Out of the given responses, 28 percent of the students wanted even more exemplars in the course, 28 percent of the students thought the course improved their critical skills and 44 percent said it was a good course.

DISCUSSION

Complying with UD and HFE principles is stated in many studio project final requirements lists. Unfortunately when the student design projects are evaluated in final juries, many of the UD and HFE principles seem not to have been applied. This raises the question of how the UD and HFE principles could be used in increasing the skill of space evaluation. While there is no easy answer to the question, a separate elective course concentrating on only UD issues with various assessment methods seems to be very helpful in increasing the skill of space evaluation. This is supported by the below significant correlations:

In-class discussions on weekly assignments (Q4) and the course being helpful in increasing the skill of space evaluation (Q14) in terms of UD and HFE (Pearson corr.=0.60; p-value=0.009).

The time when the students start gaining the skill of space evaluation (Q6) and the course being helpful in increasing the skill of space evaluation (Q14) in terms of UD and HFE (Pearson corr.=0.55; p-value=0.021),

Weekly assignments (Q3) and the course being helpful in increasing the skill of space evaluation (Q14) in terms of UD and HFE (Pearson corr.=0.47; p-value=0.049).

This one-semester UD course was found very helpful in gaining more information and skill on UD and HFE. Out of the three assignments types (weekly assignments, midterm exam and final research paper) the students found the weekly assignments (67 percent) most helpful probably due to the longer time period, twelve weeks, spent on these assignments. Also, a significant correlation was found between weekly assignments (Q3) and in-class discussions on weekly assignments (Q4) in understanding UD and HFE principles (Pearson corr.=0.84; p-value=0.000).

The students not only found the assignments themselves useful, but also the weekly in-class discussions on these assignments crucial to their development. A significant correlation was found between in-class discussions on weekly assignments (Q4) and assessment methods helping the most (Q7) in gaining the skill of space evaluation in terms of UD and HFE (Pearson corr.=0.51; p-value=0.046).

By the time the students enter their midterm exam they already seem to have an understanding of UD and HFE principles and space evaluation tools. By this way, they could progress to apply the UD and HFE principles in interior spaces in their midterm exam and their final research papers. A significant correlation was found between the time when the students start gaining the skill of space evaluation (Q6) and assessment methods helping the most (Q7) in gaining the skill of space evaluation in terms of UD and HFE (Pearson corr.=0.61; p-value=0.016).

The correlation coefficients among the questions related to the progress in the course of time with respect to UD and HFE skills were measured and significant correlations were found between the below issues:

- Object evaluation at the beginning of the semester (Q10) and object evaluation at the end of semester (Q11) (Pearson corr.=0.54; p-value=0.026).
- Object evaluation at the beginning of the semester (Q10) and space evaluation at the end of semester (Q13) (Pearson corr.=0.60; p-value=0.008).
- Object evaluation at the end of the semester (Q11) and space evaluation at the end of semester (Q13) (Pearson corr.=0.61; p-value=0.009).

The instructor found the discussion time on weekly assignments a challenge, as many students seem not to be interested in the discussions or they were quiet until prompt with questions. At the end of the semester, it was very good to find out that the discussions proved to be useful. Most students thought, at the end of the semester, that this elective course on UD has also improved their design work. Many students also indicated

that they thought the course should become obligatory, as the information gained during design studio classes were not enough.

CONCLUSION

Findings of this study would contribute to education in general by suggesting that UD should be integrated into the interior design curriculum as a separate course on its own as well as within the context of the design studios. In-class discussions and weekly assignments are two assessment methods that are helpful in increasing the skill of space evaluation in terms of UD and HFE principles. Importance of the assessment methods proved that learning UD principles is a process and requires some time, rather than being book information that can be read and understood at once. Furthermore, it is seen that a separate course is helpful in increasing the skill of space and object evaluation that could improve the project quality in design education.

REFERENCES

- ASLAKSEN, F., BERGH, S., BRINGA, O.R., HEGGEM, E.K. (1997) *Universal Design: Planning and Design for All*, The Norwegian State Council on Disability, Oslo.
- BEECHER V., PAQUET V. (2005) Survey Instrument for Universal Design of Consumer Products, *Applied Ergonomics* (36) 363-72.
- BURKE, M.D., HAGAN, S.L., GROSSEN, B. (1998) What Curricular Designs and Strategies Accommodate Diverse Learners? *Teaching Exceptional Children* (31)34-8.
- CENTER FOR UNIVERSAL DESIGN (1997) *The Principles of Universal Design*, version 2.0, North Caroline State University, Raleigh, NC.
- DEMİRBILEK, O., DEMİRKAN, H., ALYANAK, S. (2000) Designing an armchair and a door with elderly users, *Proceedings of Designing for the 21st Century*, (<http://www.adaptenv.org/21century/proceedings5.asp#parmchair>; retrieved: December 2001).
- DEMİRBILEK, O., DEMİRKAN H. (2004) Universal Product Design Involving Elderly Users: A Participatory Design Model, *Applied Ergonomics* (35) 361-70.
- DEMİRKAN, H. (2007) Housing for Aging Population, *European Review of Aging and Physical Activities* (4) 33-8.
- GOONEWARDENE, R., PEDERSEN, A. (2000) Introducing Universal Design to a Western Australian School of Art and Architecture, *Proceedings of Designing for the 21st Century*, (<http://www.adaptenv.org/21century/proceedings.php>; retrieved: December 2001).
- IWARSSON, S., STAHL, A. (2003) Accessibility, Usability and Universal Design – Positioning and Definition of Concepts Describing Person – Environment Relationships, *Disability and Rehabilitation* (25) 57-66.
- KAO, H.S.R. (1976) On Educational Ergonomics, *Ergonomics* (19) 667-81.
- KARWOWSKI, W. (2005) Ergonomics and Human Factors: The Paradigms for Science, Engineering, Design, Technology and Management of Human-Compatible Systems, *Ergonomics* (48) 436-63.

- KENNIG, B., RYHL, C. (2002) *Teaching Universal Design: Global Examples of Projects and Models for Teaching in Universal Design at Schools of Design and Architecture*, AAoutlis, ANLH, Brussels.
- MACE, R.L., HARDIE, G.J., PLAICE, J.P. (1991) Accessible environments: Toward universal design, eds. W. Preiser, J. Vischer and E. White, *Design Interventions: Toward a More Human Architecture*, Van Nostrand Reinhold, New York.
- OSTROFF, E. (2001) Universal Design: The New Paradigm, eds. W.F.E. Preiser and E. Ostroff, *Universal Design Handbook*, McGraw-Hill, New York; 1.1-1.12.
- PREISER, W. (2001) Toward universal design evaluation, eds. W.F.E. Preiser and E. Ostroff, *Universal Design Handbook*, McGraw-Hill, New York; 9.1-9.18.
- PREISER, W. (2003) Inclusiveness through Universal Design Feedback and Evaluation, *Proceedings of Include 2003, Education and evaluation - resources and methods at student level*, Royal College of Art, London.
- RESOLUTION RESAP, 2001. On the Introduction of the Principles of Universal Design into the Curricula of All Occupations Working on the Built Environment [online]. Council of Europe, Committee of Ministers. (<http://cm.coe.int/ta/res/resAP/2001/2001xp1/hm>; retrieved: December 2001).
- SMITH, T.J. (2007) The Ergonomics of Learning: Educational Design and Learning Performance, *Ergonomics*, (50) 1530-46.
- STEINFELD, E., DANFORD, G.S. (1994) Automated Doors: Toward Universal Design, *The Construction Specifier*, August.
- STORY, M.F., MUELLER, J.L., MACE, R.L. (1998) *The Universal Design File: Designing for People of All Ages and Abilities*, The Center for Universal Design, North Carolina State University, Raleigh.
- TROST, G. (2005) State Affairs in Universal Design, *Fujitsu Science and Technology Journal* (41) 19-25.
- WELCH, P., JONES, S. (2001) Advances in universal design education in the United States, eds. W.F.E. Preiser and E. Ostroff, *Universal Design Handbook*, McGraw-Hill, New York; 51.1-51.24.
- WELCH, P., OSTROFF, E. (1995) The Universal Design Education Project, ed. P. Welch, *Strategies for Teaching Universal Design*, Adaptive Environments Center and MIG Communications, Boston and Berkeley; 19-25.
- WOODCOCK, A. (2007) Ergonomics, Education and Children: A Personal View, *Ergonomics*, (50) 1547-60.

Alındı: 08.04.2009; Son Metin: 30.07.2009

Anahtar Sözcükler: eğitimsel ergonomi; erişilebilirlik; evrensel tasarım; insan faktörü.

İÇ MİMARLIK EĞİTİMİNDE ERGONOMİ VE EVRENSEL TASARIM

Ergonomi derslerinin tasarım okulları eğitim programlarına katılması ve İnsan Faktörü ve Ergonomi (İFE) kural ve deneyimlerinin tasarım uygulamalarına yansımaları sonucunda, yapılanmış çevrelerin verim ve üretkenliğinde artış, güvenlik ve sağlıklı yaşam şartlarında ise iyileşmeler gözlemlenmiştir. Bu çalışma, tasarım sürecinde İFE kurallarının uygulanmasına odaklanmıştır. Tasarımcılar, üniversite eğitimleri sırasında İFE kuralları, erişilebilirlik, ergonomi ve çevre faktörleri gibi konularla ilgili standart ve mevzuat konularında bilgi edinirler. Evrensel Tasarım yaklaşımı, ürün veya mekan tasarım sürecinde İFE kurallarının uygulanmasında toplumun bir kısmının değil, olabildiğince fazla bireyin göz önüne alınmasına olanak sağlar. Evrensel Tasarım bir dünya görüşü olarak, farklı söylemlerle birçok ülkenin eğitim programlarında yer almaktadır. Ülkenin Evrensel Tasarıma yaklaşımı ve eğitime bakış açısı doğrultusunda tasarım eğitimi programlarında da hayat bulmaktadır. Bu çalışmada, Evrensel Tasarım yaklaşımını yıllardır ders programında stüdyo derslerine katarak yapan bir eğitim kurumunda, farklı bir uygulama denemiştir. Bu bağlamda, Evrensel Tasarım kurallarını öğretme ve uygulama olanağına sahip bir ders kapsamında, eğitimsel ergonominin iç mimarlık lisans programında etkinliği incelenmektedir.

Dönemin ilk sekiz haftasında ders, her hafta bir Evrensel Tasarım prensibinin öğretim elemanı tarafından sunulması ile başlamaktadır. Sunumlar sırasında kaynak olarak kitaplar, makaleler, standartlar, çevrimiçi kaynaklar, video ve CD-ROM sunumları kullanılmaktadır. Takip eden haftada her öğrenci grubu tarafından, bir önceki hafta öğrenilen Evrensel Tasarım prensibini kapsayan ödevin sunumu yapılmakta ve seçilen ürün üzerinde öğrencilerin katılımıyla konu tartışılmaktadır. Yedi Evrensel Tasarım prensibinin öğrenilmesinin ardından bir dönem ortası sınavı ile öğrenciler değerlendirilmektedir. Bu sınav kapsamında öğrencilere incelenmek üzere buldukları bina içinde iki yer verilmekte ve bu yerlerin Evrensel Tasarım ve İFE prensipleri ve standartları ışığında analizlerinin yapılması istenmektedir. Gerekli incelemeleri 40 dakika içinde tamamlamaları, ardından istedikleri kaynakları kullanarak sınav mekanında 90 dakikalık süre içinde Evrensel Tasarım ışığında bu mekanların değerlendirmelerini yapmaları ve gelişimleri için önerilerini yazmaları istenmektedir. Üçüncü değerlendirme yöntemi olarak bir araştırma raporu hazırlamaları beklenmektedir. Öğrencilerden 3-5 kişilik gruplar halinde, şehirde bulunan bir kamu binasını seçmeleri istenmektedir. Her öğrenci, grup olarak belirledikleri kamu binası içinde bir alanı seçerek (giriş ve çıkış yeri, dolaşım alanları, yönlendirme sistemleri, ortak mekanlar, vb.) incelemektedir. Daha sonra grubun bir araya gelerek, sonuçları tartışması ve bütün binayı kapsayan bir araştırma raporu hazırlaması beklenmektedir.

Dönem sonununda verilen anket formu ile öğrencilerden, öğrenme sürecini değerlendirmeleri istenmiştir. Bu çalışmada kullanılan üç değerlendirme aracı olan, haftalık ödev, dönem ortası sınavı ve araştırma raporu arasından, haftalık ödev ve arkasından yapılan tartışmaların öğrenme konusunda en faydalı bulunduğu saptanmıştır. Öğrencilerin dönemin ilk haftalarında yaptıkları ödevler kapsamında tasarlanmış ürün ve mekanları inceleyerek, Evrensel Tasarım kavramlarını öğrendiği ve sınıf içinde yapılan tartışmaların da bu kavramların pekişmesine yardımcı olduğu saptanmıştır. İFE kurallarını ve Evrensel Tasarım dünya görüşünü kavradıktan sonra, iç mekanları analiz etmede kendilerini yetkin olarak kabullendikleri gözlenmiştir. Çoğu öğrenci, bu dersin Evrensel

Tasarım sorunlarına farkındalıklarını artırdığını ve bu farkındalığın öğrencilerin tasarım stüdyolarında başarılarını artırmada etkin olduğunu belirtmişlerdir.