

“Mixing process and evaluation criteria for meaningful design outcomes ”

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This presentation will outline the results from case studies in the development of the mixture of design process and a design evaluation strategy for Industrial Design student projects. Integrating the design process of user-centered design with universal design principles we have attempted to provide design students with an approach in order to solve a design project that focuses on designs for an aging population. This development has been ongoing for the past eight years at the University of Alberta in Canada. Within the last year this approach to learning has been expanded with workshops and class projects utilizing this approach being conducted in Canada, Japan, Germany and Australia. This strategy of approach to design has produced examples that have facilitated not only the necessary ergonomic and functional needs but seems to help the students integrate the social and psychological desires of the user groups. This strategy has assisted the students in the understanding and incorporation of all the user related issues in a more cohesive manner. The recent project briefs presented to all the various groups was to examine how to assist the elderly in the tasks associated with daily activities surrounding personal grooming within the bathroom environment. The briefs and the presentation of the project in each location varied due to a number of factors. The factors of variance within the design briefs was primarily due to the fitting in of the project within each of the individual institutions curriculum requirements and the level of knowledge of particular design processes of the students. Despite those variances the results appear to support the value of this design problem solving approach.

Design students view themselves as problem solvers, the act of taking a problem and producing a solution. What they have difficulty in is being problem identifiers. We had to provide the students with a process to take a step back and look at the actual needs of the individuals or groups. This was achieved by approaching the procedure from a user-centered design methodology. This type of process encompasses a consistency in its advocacy of a human-factors approach to problem solving. In adopting a user-centered methodology we were able to incorporate the user requirements, user goals and the user tasks in the very early stages of developing the design brief from which a solution would be forthcoming. Similarly by working with the universal design guidelines other stakeholders are brought into the blend of design requirements. This early stage

incorporation is essential as this is the most flexible stage in the design journey and as such things can be changed with relative ease without impacting on the project schedule.

The use of the Universal Design Guidelines provided a means for evaluating the research material in a way that gives meaning and relative value to a grading of the material into positions of importance when the students undertaking the task of writing the design brief. At the University of Alberta, Canada, the projects have been a collaborative interdisciplinary effort with groups comprising of Industrial Design and Occupational Therapy students.

“Research” being a critical element for both professions, allowed each group to do investigation in their own areas of concern and then to share this knowledge. The sharing became another learning task for the students as information and terminology had to be understood for the different professions, forcing the students to better understand their own specific fields of information and how best to inform others of this. This task of transfer of research knowledge between professions is perceived by the instructors as an important element to the successful writing of the design brief and to the coming together as working partners. Transferring of knowledge and to do it in a way that the other participants are confident in the quality of the material, and the presenter’s abilities to do that task of dissemination evokes an atmosphere of confidence in their individual abilities. This confidence is essential in this style of group activity so that tasks can be assigned where a level of confidence in each others abilities to perform those tasks without excessive overseeing can be undertaken.

“Design” is the activity in the project process that the students needed to change their perspective from being individuals in a group to being a part of the group. This investment of creative thinking for all participants in a solution gave each member a sense of ownership. This feeling of ownership by the students played out in the level of commitment to the project in time, effort and a passion to not only do their best but to not let down their fellow team players. This attitude can be directly related to an understanding of professional practice for both groups of students.

From the integration of user-centered design theory and Universal Design Guidelines the projects follow this basic structure:

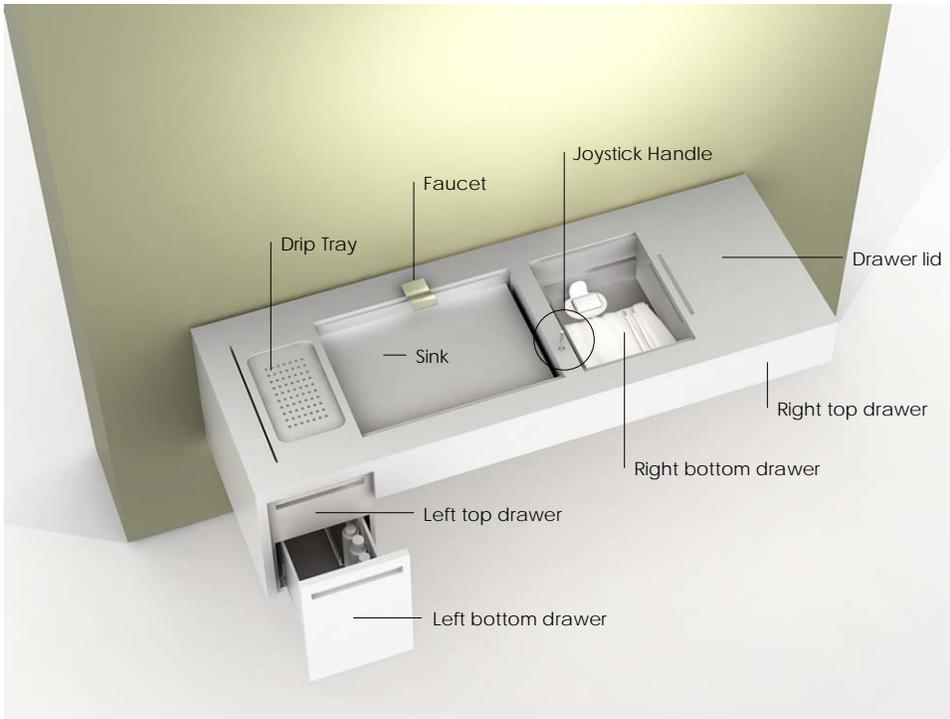
- 1. Problem Identify:**
 - a. Research
 - ethnographic
 - existing products / materials
 - ergonomic / anthropometrics / kinesiology
 - market trends
 - sociological / psychological
 - b. Research Analysis
 - c. Design Brief
 - criteria / needs
 - methodology
 - goals / challenges

- 2. Problem Solving:**
- a. Concept development
 - b. Design Refinement
 - c. Prototyping
 - d. Testing
 - e. Final Iteration

- 3. Problem Reduction:**
- a. User – feedback
 - b. Evaluation

Most students become comfortable with the first two stages, Problem Identify and Problem Solving. It is a new experience for the students to do an analysis of their solution from the original design brief and to evaluate the performance to the set of initial goals. This last stage is important as it can help the students understand where in the process they may have faulted and how this may in the future be avoid. Another aspect to this evaluation is to examine if they have truly been a problem reducer or merely transferred the problems from one area of concern to another. A choice or solution for a material for production of a design may reduce the cost per unit in production but could lead to the introduction for the user the problem of a slippery grip; in essence the introduction of another problem or the transference of a problem.

The Canadian student design result presentations incorporated a report from the members of the team belonging to the Faculty of Rehabilitation Medicine studying Occupational Therapy. The reports reflected the knowledge background of those students in that they evaluated the results on perceived effective utility of the design to the ergonomic requirements of the user groups. This evaluation assisted the refinement of a number of design features as to their functionality but still lacked the evaluation of how well users accessed that functionality.



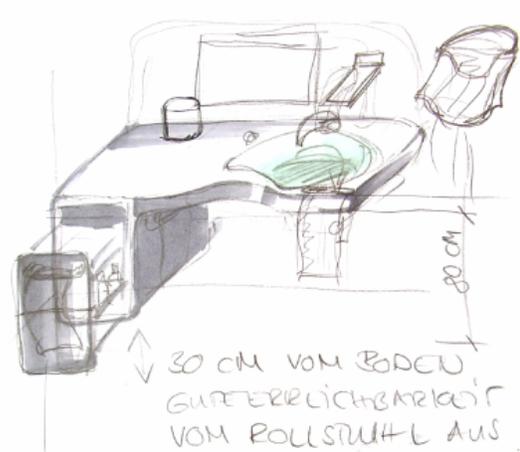
University of Alberta, Canada.

Industrial Design: Keira Burgess, Tianyi Dong, Melissa Krystofiak

Occupational Therapy: Laura Penttinen, Leila Sidi

The acceptance of the design features and the knowledge of how to access and maximize the benefits of the designs by the users were not addressed in the OT's evaluation process. The Industrial Design students were asked in an open forum discussion to relate the design features that they felt important in their individual designs to the seven principles of Universal Design. The results from this discussion highlighted that in the absence of an evaluation system, known at the beginning of the project, a very ad-hoc and personal evaluation system is applied.

In Germany the presentation of the project included the task of evaluation of the results by the students. This evaluation was a simple 0-10 scale going from 0 being the least to 10 being the most of the seven Universal Design principles. The students were asked to rate each design result according to the seven principles of Universal Design guidelines, these were then tabulated and reviewed. Even though they knew that all of the guidelines were going to be assessed the results still indicated an ad-hoc and personal application of the principles by the students to the project.



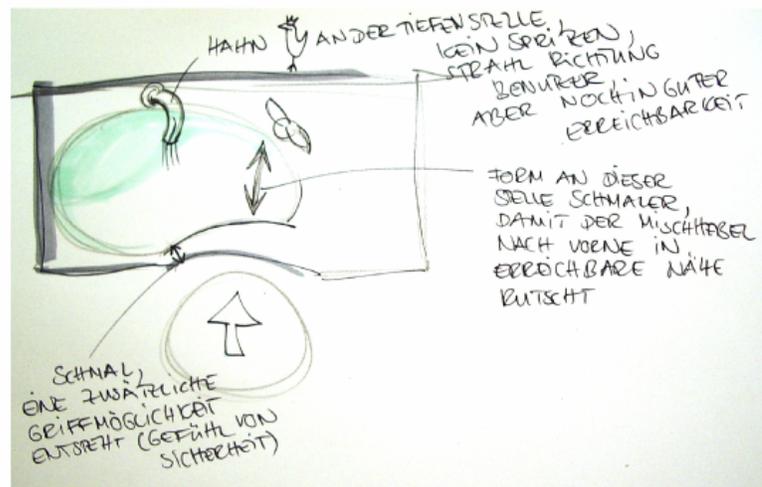
The Containers

container on one side

-> leaves the rest of the washing area's lower part clear

drawers, don't reach down to the floor

-> in range, contents visible from above, one larger drawer for taller products, smaller one for tiny things



The Sink

tabs and faucet separated

-> taps in range and on the favorite side but faucet moved to a position that allows to attain the sink easily

narrow part of the sink

-> allows tabs to be in range

jet of water spread out, wide

-> compensates trembling hands

The Japanese group worked independent of the author under the supervision of Dr Sato at the Asia Gakuen University Sapporo. A lecture was given by the author prior to the Japanese student's commencement of the project outlining how the other workshops were undertaking the project and the processes they were being asked to follow. No evaluation task was undertaken by the Japanese students of their work using the Universal Design guidelines. However, a discussion as to the relative merits of each design according to the UD guidelines was undertaken by the ID instructors in Canada. This remote evaluation without knowledge of the decision making progress through or individual group discussions of the projects left the reviewers to apply the guidelines and apply their own hierarchical importance of the Universal design principles.



University of N.S.W. Australia.
Tim Walker, Soufi Mirian

Australian students along with their design solutions prepared a report on the ergonomic relevance of the designs and how they had satisfied the Universal Design guidelines. In this approach the students reviewed at the end of the design process how their designs in anyway aligned with any of the guidelines from a post mortem method, this relied more on chance recollection of the relevance of a particular guideline than actual conscious application through the stages of the project structure.

Jorge Frascara (3) pg.119 “When talking about “what a design should do” in the context of the operational objectives of a design project, one has to put that in a cultural context, a value system and a humane view of life. Then there is more hope for design quality to be connected to the quality of life.”

This statement points to the very essence of the required outcome of these projects, the combination of user-centered design methodology and Universal Design Principles. How we direct an evaluation process and integrate into the student learning to achieve design quality has been the underlying task for the various workshops. Amongst many of the readings that our students are required to undertake is “Designing Pleasurable Products” by Patrick Jordon (6), his analysis and the recognition of four categories of product pleasure fits well with Frascara’s premise of what defines design quality. Jordon is also looking at “beyond usability” and challenges designers to do more than just evaluating the design from a physiological viewpoint.

The various workshops and the project approaches from instructors along with discussions with students has led to a realization that the students need an evaluation method as part of the project process. The three step approach of 1. Problem Identifier, 2. Problem Solver, 3. Problem Reducer, has evolved as a workable method for the integration of the two disciplines, Industrial Design and Occupational Therapy, into working project teams. For this upcoming Fall 2007 academic year an evaluation method is being introduced that we feel will allow the students not only to have a reference for decision making but allow them the opportunity to monitor the challenges and goals for their individual designs. The evaluation process will be a modified version of the “Universal Design: Product Evaluation Countdown” 2002 The Center for Universal Design, N.C. State U. Into this under each of the principles will be listed the four product pleasure concerns that Patrick Jordon identified. The six evaluative scores for each point within this system ranging from “not important” to “strongly agree” will have a numeric score (1-6). Rather than allow all the principles of evaluation and their individual points have all the same weighting each point needs to have a weighted multiplier applied as a way of ensuring that the points most in need of consideration for the proposed design outcomes is given the appropriate attention. The application of this multiplier will be done by the student groups at the end of step 1., Problem Identifier stage as this is when they present their design briefs with their planned outcomes and challenges. In order to avoid the students weighting in such a way as to minimize some issues to the point of being irrelevant the multiplier scale shall consist of three values (0.5,1.0,1.5). The thought is that by allowing the students to set the values they will have evaluated and related the relative importance of various issues identified in their research and design brief criteria. The final evaluation will be conducted during the presentations by students and other professional participants on sheets for each group presentation minus the knowledge that each groups individual multiplier score, this will be added and calculated after all the sheets have been collected. The final averaging of scoring from all the evaluation sheets can then be compared with the optimum score and a measure of how successful a design and or specific design elements can be derived. With closer examination of specific points the scoring is able to identify where individual designs had faltered in delivering the desired outcomes. The following is a draft of how this evaluation scale might appear for a particular Universal Design Principle and or feature of the design.

Principle 6. Low Physical Effort	Not important 1	Strongly disagree 2	Disagree 3	Neutral 4	Agree 5	Strongly agree 6	Wt. 0.5 1.0 1.5	Total
6a. I can use this product comfortably								
6b. I can use this product without over-exerting myself								
6c. I can use this product without having to repeat any motion to cause fatigue or pain								
6d. I don't have to rest after using this product								
6e. Physio-pleasure								
6f. Socio-pleasure								
6g. Psycho-pleasure								
6h. Ideo-pleasure								

For the future the results from this student evaluation and the instructors observation will assist in better understanding and identifying the areas in which the instructors need to provide more information for the students. Similarly it may require us to allow the students greater time to develop their own working knowledge of specific design issues.

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