

# Multidisciplinary research and teaching platform and its role in the improvement of architecture and design education

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**ABSTRACT:** The aim of this article is to present a concept of multidisciplinary cooperation in the Body Conscious Design (BCD) laboratory. Design courses from universities around the world with a multidisciplinary and, at the same time, a human-centred approach to design courses are presented in this article. Also, the authors outline their approach to the same issue, which has led to the founding of a tangible platform - research and educational centre: the BCD laboratory, in the Faculty of Architecture at Slovak University of Technology in Bratislava. It focuses on exploring human responses to the built environment and its elements, and on emerging conscious design choices. For a better understanding of this interaction it is necessary to implement applied knowledge and to break down the borders between different scientific fields.

## INTRODUCTION

What is the product tertiary education - the graduate? Are the standard technical and creative skills gained sufficient? Contemporary society, facing many challenges concerning sustainability, needs to combine intelligence with *thinking outside the box* and to be able to find solutions even where they are not visible at first sight. The six years spent in a university is the period where the student personality is in progressive and rapid development and a value hierarchy created, while most of the time is spent fulfilling assignments defined by teachers. That is why it is reasonable to think about content.

How to raise and educate strong individuals able to work alone and, at the same time, able to work in teams and to listen to the needs of future users? It is also necessary to strengthen their soft skills, develop their emotional intelligence, flexibility, adaptability and also courage and strong-mindedness. Graduates of architecture and design studies have the advantage that they can fulfil the role of problem solvers, which is strategically required, especially, in contemporary project management.

To prepare the graduates for their professional life roles, several tools can be deployed; one of these is a multidisciplinary approach to the projects, along with experiential learning. In contemporary situations, it is necessary to be open to knowledge from other scientific branches and right from the beginning to direct the students' studio assignments towards multidisciplinary and transversality. This can help develop respect for all kinds of intelligence and assist in work that needs this skill in future professional projects.

## MULTIDISCIPLINARY AND HUMAN-CENTRED APPROACH TO DESIGN EDUCATION

There are many universities and academic institutions worldwide conducting design research within elective courses or compulsory studios where the students are fully involved. All of them combine primary research, including behavioural research and *hands-on* approaches. This is the best way in which to increase the scope of skills gained from the experience.

Two of these can be mentioned: the Rural Studio at Auburn University in Alabama (USA) and the Institute without Boundaries based in the School of Design at George Brown College in Toronto, Canada [1]. They define their vision as a collaborative design practice for a better world. The mission is to foster collaboration between disciplines in order to create innovative local solutions to 21st Century global challenges.

One organisation that creates space for sharing experiences and getting support for this kind of activities is called DESIS (Design for Social Innovation and Sustainability), based at Politecnico di Milano in Italy. Another organisation supporting the idea of multidisciplinary in design research is the Design Research Society.

Body conscious design is a good example of a multidisciplinary approach to design research. It involves medicine, experiential anatomy, neuro-ergonomics and the social sciences in the designing process. A couple of courses of body conscious design currently up and running should be mentioned: Domus Academy in Milano, Italy, taught by Jader Tolja, has always had a wide multidisciplinary approach to design research and teaching. The Body Conscious Design course consists of a study of the rules necessary to design products destined to interact with human beings, taking into consideration their proportions, their habits and movements, and seeking harmony between the body and the environment.

The Body Conscious Design (Arch 212) seminar at the College of Environmental Design, UC Berkeley, taught by well-known American sociologist Galen Cranz, prepares students to evaluate and design environments from the viewpoint of the way in which they interact with the human body. It does this through three mutually supportive activities: experiential learning, reading about how culture, especially material culture, shapes the body and designing.

The seminar supports the idea that designers today can help redefine and legitimise new attitudes toward supporting the human body, for example, by designing for a wide range of posture alternatives and the potential designing of new kinds of furniture. On the urban design scale, the senses of proprioception and kinaesthetic can be used to shape architecture and landscape architecture. The course heightens students' own consciousness, and others' physical perceptions through weekly experiential exercises. Students produce three design exercises: shoe, chair and room interior. Each week, students experience new somatic techniques for heightening their own consciousness and others' physical perceptions through experiential exercises in sensory awareness [2].

Another interesting course is being taught at the University of Auckland, Faculty of Architecture, a studio called *bodies+spaces*. The underlying principle of the *bodies+spaces* studio for first year architecture students is that the primary concern of architecture, and other design disciplines, is the relation between bodies and spaces. The studio sought to bring this to the surface and, through a sequence of projects, to allow the students to explore this relation and to transpire and discuss the positions on bodies and spaces that emerged [3].

#### BCD AT THE FACULTY OF ARCHITECTURE IN BRATISLAVA

For a better understanding of the interaction between the human and their built-environment, it is necessary to implement applied knowledge and to open borders between different scientific fields. To create a platform for multidisciplinary research, it has been necessary to explore and analyse many literature resources from the social and health-care sciences and to summarise the most important and relevant knowledge database. The biggest challenge is transforming the special scientific information databases that use completely different terminologies into understandable knowledge for designers and architects.

One of the first issues was the summarisation of research methods useful for exploring human behaviour and physiological responses to certain environmental stimuli. First of all, it is necessary to manage/master the methods of behavioural research used for quantitative and qualitative research in social sciences (psychology, sociology, anthropology, pedagogy, etc), which include observation, mapping, interview, questionnaire, experiments, simulations, case study, etc [4]. Within the simulation method, the more sophisticated research tools are ergonomic simulators like the Age Explorer, constructed with the aim to increase the empathy and awareness of young designers towards the third age or handicapped users.

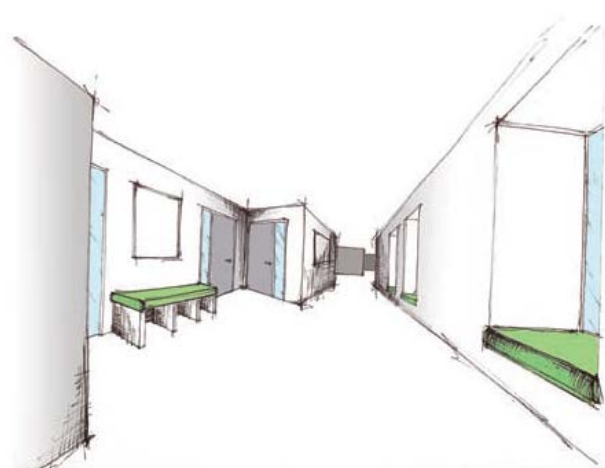
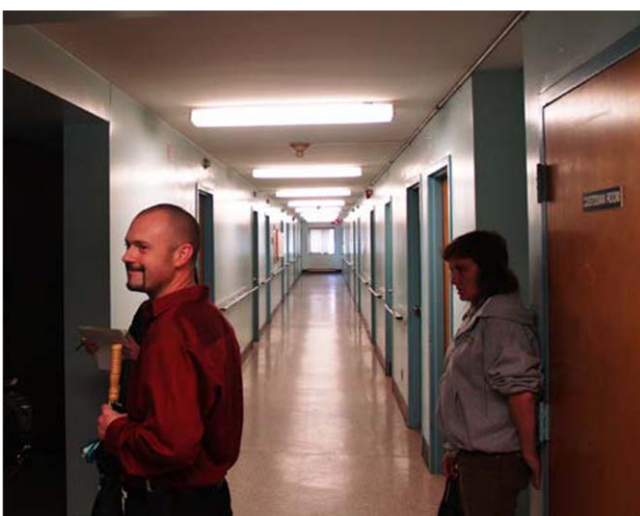


Figure 1: Project Windsor Essex Community Housing, Chateau Masson, Institute without Boundaries, where students together with occupants have designed social-housing improvements, especially, to support communication and socialisation [1].

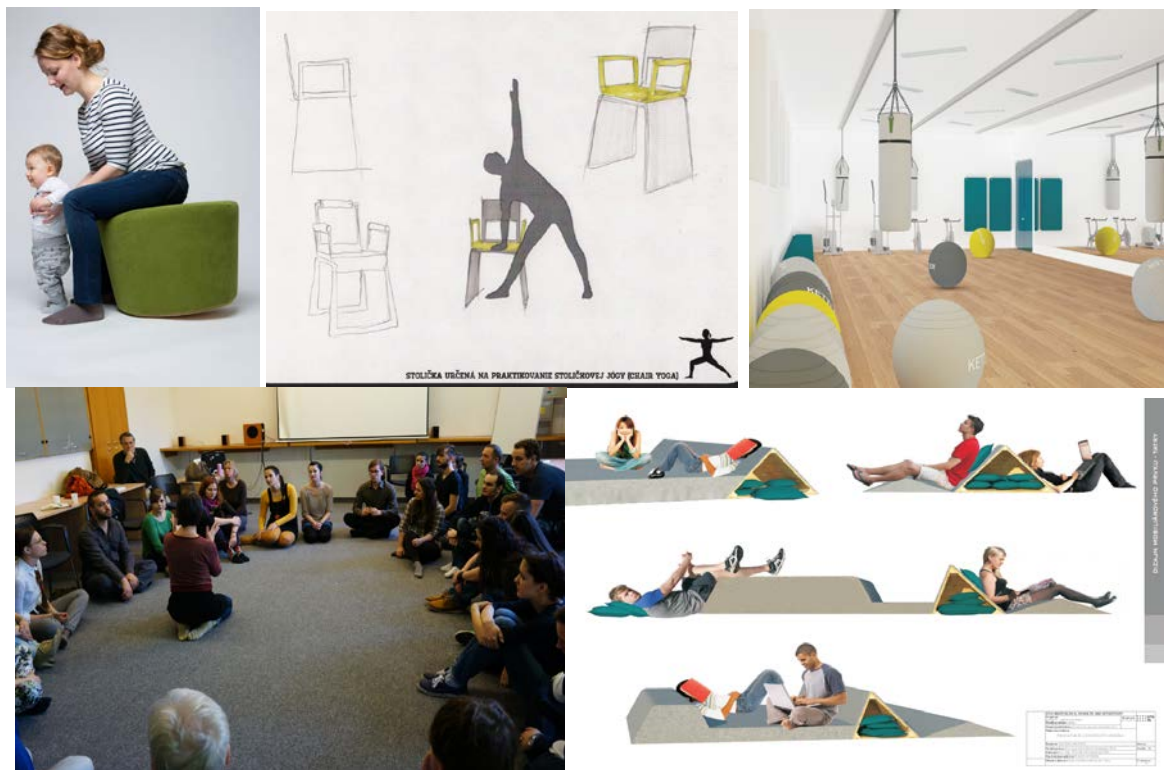


Figure 2: Products as the output of the research and experiential learning process in the platform of the BCD laboratory.

This knowledge and approach is also implemented into the teaching process at the Faculty of Architecture, within elective courses and also within the studio assignment.

Since 2009, at the Master's level, there has been an elective course named Humanisation of Microenvironment - Body Conscious Design at the Faculty of Architecture in Bratislava, taught by Veronika Kotradyová and Jader Tolja. Students here gain basic knowledge from environmental psychology, anthropology, neuro-ergonomics, medicine, methods of behavioural research, which they then apply to the environmental and product designing process. Also, participating are invited external specialists from these fields and experiential workshops and seminars are organised. As part of their assignment, students prepare their own behavioural studies, using quantitative and qualitative research methods. The main goal is to get them to understand and feel the relation between body - mind and space and to be aware of the impact of built environments on human behaviour, well-being and, by long-term interaction, also health. It has been necessary and useful to transform knowledge from other sciences into an understandable language; moreover, for deeper understanding and building one's own opinion, it is useful to trace back to original references.

The contemporary vision, creating a tangible meeting point, is a vision that is slowly coming true - to have the facilities for a research centre that would also be a creative laboratory/studio - Body Conscious Design laboratory - BCD laboratory. Within the laboratory, it is possible to experience a working environment that was created with the aim to increase well-being and to reduce environmental stress and, at the same time, to use body storming to explore personal reactions to different kinds of environmental settings.

Master's students and particularly PhD students in the study field of interior design and architecture were already involved in the research process; and this article shows the first examples and applied research outcomes within two projects - Interior Design and its Relation to Civilisation Diseases, and Interaction of Human and Wood. The first pilot experiments have already demonstrated that not only are research outcomes important, but also the knowledge and skills gained during the process of this multidisciplinary cooperation.

It is not easy to incorporate research into creative artistic disciplines. In the school year 2013/2014, a research topic was set into the studio assignment of 1st year and 2nd year (diploma project) of the Master's study for students of interior design, whereby they had to implement into their projects and produce some smart solution on how to include movement in a healthy way and to prevent stressful environmental settings. This was a part of the research project APVV 0469-11 interior design as a tool of prevention and treatment of civilisation diseases; they implemented their ideas into a project of the Seniors Club in Nove Mesto Bratislava, carried out on the Faculty premises.

Supporting events include seminars, colloquiums, conferences and workshops that are organised thanks to funding from a range of grant schemes that are the best platform for multidisciplinary meetings and creating vivid interfaces between the study branches.

From among the many, the Active vs. Passive Colloquium can be mentioned. It dealt with the topic of movement in space, was organised in April 2014, and the biennial conference Interior, occasionally in fusion with the Healthy Houses conference. All professional and study participants broadened their perspectives into other scientific branches and gained a broader overview, and new thinking in human relations and educational results as the main goal of university studies. The goal is to attract students from different branches, and also to open the courses to students of other faculties or maybe other universities in Slovakia, as well as universities elsewhere in the world.

Based on their own experience, specialists from other scientific branches greatly appreciate the multidisciplinary cooperation and find the field of design research appealing to them. This is the future of design research.

### SEARCHING FOR A METHODOLOGY

Another appealing part of BCD is the *manipulation* with the state of mind and body in relation to space. According to Cranz and Chiesi, humans can deliberately activate different parts of the brain to stimulate different kinds of creativity in drawing and design [5]. While most pedagogy has focused on right brain/left brain differences, for this research, different levels of the brain were stimulated - the cortical and the subcortical. Experiential anatomy, semantics and neuroscience provided the theoretical framework for their study. This quasi-experimental research compares and contrasts sets of drawings of handles and lamps produced by 136 subjects in eight trials. Each set included one drawing produced after stimulating the neocortex and one drawing produced after stimulating subcortical parts of the brain. The two different cognitive states produced design differences as predicted: small, straight, two-dimensional drawings morphed into large, curvilinear, three dimensional drawings of the same objects [5].

The goal was to transform the BCD laboratory into an ergonomic simulator or environmental simulator for creating inner spaces that will help understand and improve the empathy of designers for future users of their products and environmental settings.



Figure 3: First pilot tests of physiological responses to different body working positions in the BCD laboratory.

To generate quantitative research outcomes, it was necessary to set a smart methodology. In this article, the process of searching for a methodology that includes measurement of objective and subjective parameters to gain relevant body and mind responses to build environments is described. The participation of different specialists in this process was crucial. The cooperation includes specialists from the fields of cognitive and applied psychology, physiotherapy, neuroergonomy, psychosomatic medicine, sport kinanthropology, human factors and bio-engineering. To find ways of efficient communication, it is necessary to understand their language and way of thinking.

Colloquiums and discussions around a round table have been organised with experts from bio-engineering, medicine (physiotherapy, orthopaedic, kinanthropology and physical anthropology) with the aim of finding answers on how to measure human responses to stimuli from the environment. Regarding using the human body properly, many possible parameters were discussed, like the state of posture stability (measured by a stabilometer), EMG and curvature of spine, and stress related parameters like EKG/heart rate and skin impedance, and also the activity of the left brain and the right brain.

First pilot tests were done, exploring the relation between body position and work efficiency, and creativity. Five locations were set up in the laboratory with different body position predestinations, and respondents carried out tests of attention and efficiency as used in the field of human resources management in the first session in January 2015. A second session in April 2015 related to executive tests used in cognitive psychology. During both rounds, the

physiological responses related to stress or well-being were also measured (Figure 3). Virtual reality also has great potential, thus, the neural response is mostly the same as in actual environmental settings.

Here, the critical event is dividing of the influence of other factors from environmental factors through the evaluation of body responses. Accordingly, the study is still in the phase of optimising the methodology, but the first results will be published in future research articles. This methodology is crucial for all future research and teaching done in the laboratory.

## CONCLUSIONS

One big question is the extent to which it is good to be open to the knowledge of other branches and to what extent it is convenient to be strong in the skills related to our original profession, in order to be aware and at the same time not to be shallow with respect to understanding. Design and architecture professionals have to be skilled, focused and specialised in technical and creative disciplines, but at the same time they must be competitive on the labour market. Practitioners have to be able to be members of a team, to be capable of cooperation and collaboration, and also to be leaders, with feedback from different branches and have the ability to think in the context of relationships [6].

Every research or technical team can benefit from the inclusion of a designer or architect who is able to communicate new ideas, and to cooperate with knowledgeable individuals from other branches. And, this is the challenge, to prepare graduates for this type of cooperation.

## ACKNOWLEDGMENT

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