

# **TASK FURNITURE IN EDUCATION: DESIGN, SCIENCE AND INDUSTRY CREATING SOLUTIONS TO SUPPORT 21<sup>ST</sup> CENTURY LEARNING**

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## **ABSTRACT**

This paper seeks to describe the methods and initial outputs generated by the Task Furniture in Education (TFE) project, a Marie Curie FP7 (IAPP) Industry-Academia Partnerships and Pathways funded programme. The project is coordinated and led by researchers in the National College of Art and Design (NCAD), Dublin in collaboration with academic and industry partners in Ireland, Germany, Portugal and the USA.

The four-year project commenced in November 2010, and received 1.33 million euro of EU Commission funding. The project emerged from ongoing and previous research undertaken within the Faculty of Design at the NCAD, through its graduate school GradCAM and its international collaborators in the area of school furniture design and analysis. While there is a wide range of student task furniture available on the market today, most of it is inadequate to meet the postural needs of pupil, particularly in the context of the accelerating introduction of advanced classroom information technology and advancements in pedagogy. This paper will outline the research findings and outputs generated so far, while discussing our user-centred design research methodology, public engagement and dissemination activities and future plans.

*Keywords: Education, furniture, user-centred design, research network, design methods*

## **1 INTRODUCTION**

This paper will attempt to outline the methods and process adopted and insights generated by the first 18 months of the Task Furniture in Education (TFE) project. 'Task Furniture' here refers to furniture, fixtures and equipment that support the task of learning. This includes seating, work surfaces, storage, display, lighting and acoustic solutions. The aim of the project is to exploit the opportunity for knowledge transfer and collaboration in order to inform guidelines for new product development within a consortium of complementary researchers working in the fields of design, task furniture manufacture, physiotherapy, architecture and ergonomics. Although the project takes inspiration from alternative educational models its focus is on public formalised education systems within primary (students aged 4 – 12) and secondary education (students aged 13 – 18), which conform to a set curriculum, examinations and assessment procedures.

Research and design in the area of task furniture for the learning environment is in its infancy when compared with the extensive body of research, government legislation and design solutions addressing adult users in the workplace. Although furniture designers have considered the comfort and scale of Task Furniture for Education on an intuitive level since the discipline's emergence, the widespread use of ergonomics was not established until the 1960s. Henry Dreyfuss published his seminal book *The Measure of Man* in 1960, establishing the industry-wide application of such data, with this work further enriched by Diffrient, Tilley & Bardagjy and their 1974 publication *Humanscale*. This invaluable tool for designers incorporated an extensive amount of human anthropometric data, and enabled designers to create ergonomically appropriate products. However despite the availability of such material, the sector is still producing un-ergonomic products, and arguably working to incomplete or flawed data sets and approaches. The majority of studies conducted to date have investigated the working postures of learners in a lecture-based classroom setting. [1] These studies focus on the forward and reclined postures associated with reading, writing and listening activities, and do not reflect the changes that are happening in education today and the reality of a learning

environment in the 21st century where there is a shift from teacher-centred practices of delivery of knowledge to student-centred acquisition of skills. [2]

Studies such as these, along with anthropometric data handbooks [3] have formed the basis for the design of task furniture in education. Guidelines for posture in the learning environment are based on the right-angled posture currently found in these publications, a posture which has evolved rather than being scientifically proven to be beneficial. “Safe Seats of Learning”, published in the UK in 2008 by the Furniture Industry Regulation Authority (FIRA) has called for a “transformation” in the way school furniture is designed. [4] However, often designers, architects and those procuring task furniture also do not fully understand learning, the learner and the learning environment.

Existing ergonomic research indicates serious long-term health problems being inflicted on children in our schools - European studies have found that 60% of school pupils experience back problems by the age of 16. [5] There is an increased awareness of the damaging effect of prolonged sitting which cannot be offset by sporadic exercise, and it’s effect on childhood obesity and health problems such as back pain. Several studies have been carried out in “active permissive” or “movement ergonomic” learning environments. [6] In these studies a range of postures have been made accessible to the learners – standing, lying and active-dynamic sitting. The teaching methods have also been modified to provide more movement and activity opportunities for the learners. This is in accordance with WHO guidelines on physical activity, which recommend that children aged 5 –17, should engage in at least 1 hour of intense physical activity daily. [7] This evidence only serves to highlight the corresponding deficit in design research that would examine creatively the potential for user-oriented, innovative, tested and proven furniture.

The Faculty of Design at the National College of Art and Design, Dublin has, in previous work, explored the area of innovative task seating for primary school children and musicians through a number of postgraduate and undergraduate projects. [8][9] Building on this previous work, it is envisaged that the project will generate advances and new approaches in the field of design practice in this subject area by the gathering of experts from a diverse range of fields such as architecture, sports science, physiotherapy and ergonomics and ensuring that the knowledge and expertise of these collaborators is translated into tangible solutions which communicate a vision of what the learning environment could be.

## **2 PROCESS & METHODOLOGY**

The User First Design Group within NCAD consists of staff members, undergraduate and postgraduate students who are working and researching under the umbrella and philosophy of user first design methods. The research team has adopted a user-first and inclusive design methodology, designing ‘with’ rather than ‘for’ users. While the team has extensive experience, and is drawn from range of disciplines, cultures and ages, we are obviously not representative users and as such we have sought to involve an appropriate mix of people to input into all stages of the design research process - asking, observing and participating. In order to help structure our research we have tried to gain useful feedback from a diverse range of representative users to reduce biases in the sample user’s and stakeholder’s responses and observations.

Within the scope of this project it was important for the team to be aware that children and young adults are distinct user groups with a variety of physiological, psychological and sensory needs - they are not miniature versions of adults. It was also important to be aware of the other stakeholders in the educational sphere, for example, educators, policy makers and parents. With this in mind the team decided to adopt the following research and design approach for the duration of the project:

- Start with understanding the learning
- Design should be user first
- Design should consider external factors
- The design process should be participatory
- Employ a research focused and experimental design process
- Change for now.

The team simplified the process outlined in the EU proposal to a four stage, iterative process: Learn - Ideate - Make - Test. This paper will deal primarily with the Learn phase although ideation, making and testing also formed part of this initial phase. The overall aim of the Learn phase was to use primary and secondary qualitative and quantitative research methods to immerse, understand, see,

interact, analyse, broadly explore and understand the current landscape of design for learning. Within this the researchers would review, test and observe current and new task furniture solutions and traditional and progressive pedagogies. The lenses of Pedagogy, Wellbeing, Technology and Space were used to focus the efforts of the individual researchers, although cross-pollination between these fields naturally occurred. The Learn phase ran for the first 18 months of the project and was divided into three phases: groundwork, fieldwork and analysis. The activities and outputs of these phases are illustrated in Figure 1 and will be explored in greater detail in the remainder of this paper.

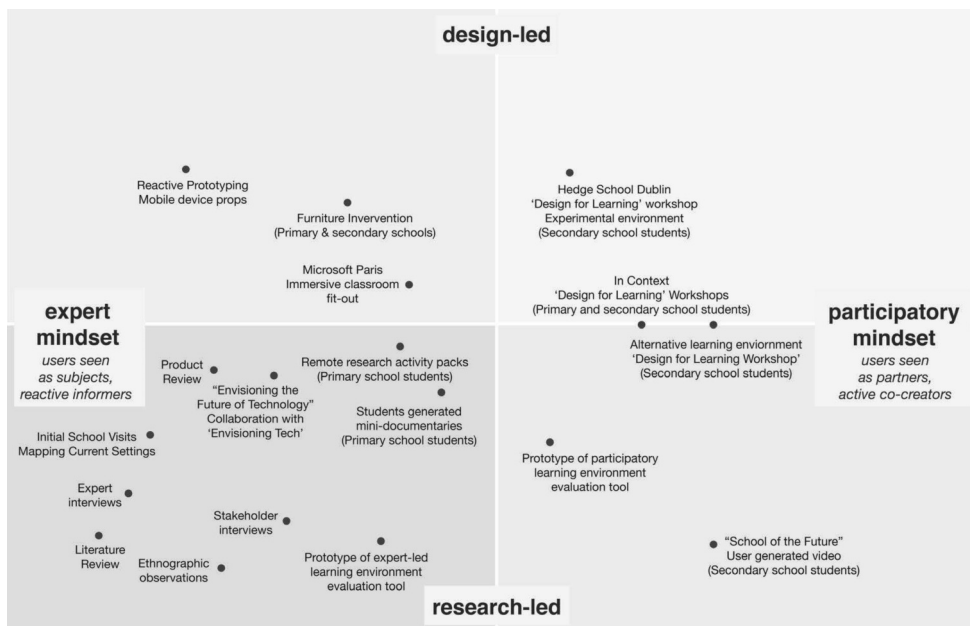


Figure 1. TFE research activities during Learn Phase, plotted on Liz Sanders' map of design practice and design research [10]

### 3 GROUNDWORK

The aim of the Groundwork phase was to familiarise the researchers with the subject area through a range of bottom-up and top-down research approaches by conducting a literature review, expert interviews and initial field visits. The literature reviews took the form of academic reports on the topics of Pedagogy, Space and Physical and Mental Well-being. A database of current task furniture solutions was also created. Expert interviews were conducted in person if possible and online using voice over Internet protocols. Interviewees were recruited from the fields of ergonomics, pedagogy, sociology, learning space design and task furniture design. The team used these interviews to gauge the current perception of task furniture in education. Between March and June of 2011 thirty initial visits and semi-structured interviews were carried out in current learning environments in Ireland, Portugal, Germany and the US were carried out in order to acquaint the researchers with the school environment and the reality of the learning experience, build relationships with educators and begin the process of identifying potential real-life learning environments for testing. A wide range of schools were visited - older schools and newly built schools, public schools and schools outside the mainstream education system. Schools were also selected on the basis of their focus on relevant research areas in the project, for example their unique approach to technology or physical activity.

A collaborative document was created which the researchers populated with information regarding the school history and philosophy and elements of space, technology, posture and learning within the school. Following the completion of the visits the researchers extracted their top 3 insights from each visit to assist collaborative working. A Knowledge Sharing workshop was held and the researchers presented their visits to the rest of the team. The team recorded significant points on post-its. These

were then clustered and allocated theme names using a process based on Grounded Theory analysis. A number of themes emerged which formed the basis for further research (including design for the learning experience, school, nature and the community, the integration of technology and stakeholders needs including those of extreme users) with the intention of promoting awareness of promoting awareness of space, well-being, learning and technology

#### 4 FIELDWORK

Following the initial engagement, several sites were selected for further observations and research activities, with activities including:

- Ethnographic observations of a standard school day in primary schools, secondary schools and alternative learning spaces and the current use of the learning environment.
- In-context interviews with educators and students regarding their experience of the task furniture in their learning environment.
- Observation and documentation of the reaction of students and teachers to the introduction of an alternative primary school furniture solution – the Perch chair and desk. [9]
- The creation of mini-documentaries by 18 primary school students aged 9 – 11, using Flip cameras to interview each other and give their views of their classroom and individual learning spaces (Figure 2).

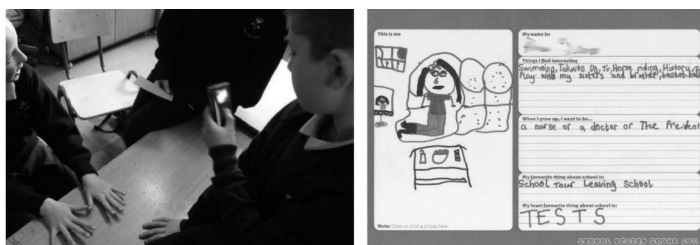


Figure 2. Mini-documentaries & Remote research activity pack, May 2011, Kilbrin, Cork

- A remote research activity pack, similar to a cultural probe, which was given to the same group of students to record personal information, daily activities and their world outside school (Figure 2). The students brought a video camera home to record their home study environments and personal spaces.

This stage produced a large bank of raw data from the field for analysis. This included photographs, videos, student’s drawings, interview transcripts and the researcher’s own ethnographic field notes. This data enabled a comparison of primary sources generated in Fieldwork with secondary sources collected in the Groundwork. The key insight from this phase, having observed current learning environments, was the impact of the attitude and knowledge of the educator and the type of pedagogy employed on the dynamics of the learning environment. Following initial fieldwork the team moved beyond asking ‘what is’ to ‘what could be’ and began to engage at a deeper level with stakeholders. Activities included participatory workshops in primary schools, secondary schools and third level institutions. The challenge given to participants was “Designing for 21<sup>st</sup> century learning”. The majority of the workshops were carried out in current learning environments. In November 2011, a two-week workshop, Hedge School Dublin, was carried out with twenty-six Transition Year students in an experimental learning environment, which was created in the NCAD Gallery, Dublin (Figure 3).



Figure 3. Hedge School Dublin Process & Outputs, November 2011, NCAD, Dublin.

These workshops gave researchers the opportunity to engage with stakeholders, gauge their views on the current learning environment and use a creative process to explore their aspirations for the learning through idea generation and prototype creation. The workshops which were held in existing learning environments also provided the researchers with an opportunity to ‘bodystorm’ [11] and experience for themselves the constraints of conducting activities such as brainstorming and group work in a traditional learning space.

## 5 ANALYSIS AND HANDOVER

The research activities described above provided a clear set of results and guidelines for the project, which were documented in a milestone document, containing implications for design and directives for subsequent research and development within the TFE project.

## 6 CONCLUSION

Following the first Learn phase of the project the key insights were that the chair and desk should no longer be at the core of design for learning, there is no such thing as one ideal posture, TFE should aim to challenge the traditional “sit up straight and pay attention” mindset and that movement and activity should not be an “add-on” but integrated seamlessly throughout the school day. The research focused on the needs of users in both primary and secondary level learning environments, however, the insights generated during the Learn phase and through participatory workshops with third level students have implications for the design of learning environments at university level, which should adopt the same key principles to support student and educator well-being, 21<sup>st</sup> century learning methods and the student-centred acquisition of key skills and competencies.

## 7 FURTHER WORK

The next stage of the research is for the TFE team to provide educators, students and relevant stakeholders with a resource that will raise awareness of the impact of movement in the learning environment, and help facilitate improvements to student’s physical and mental well-being and their academic performance. The working title ‘Moving Education’ has been chosen for the resource, and the team will aim to work closely with experts, educators and students, employing a range of qualitative and quantitative design and science based methods in order to collect and curate a knowledge bank on the topic of movement and education. It involves the use of design methodology to translate research findings into tangible solutions, critical provocations and to bridge the gap between academia & industry, research & practice and designers & stakeholders. The project will comprise of four stages: **Collect** - undertaking a comprehensive literature and design review, **Curate** - critiquing the field and selecting exemplars of best practice, **Create** - producing participatory methods, design guidelines, tangible solutions and speculative prototypes and **Communicate** - disseminating the findings through publications, exhibitions and a website.

TFE have now created a crowd sourcing site to engage a broad range of participants, and through dissemination activities such as this paper, we seek to invite fellow researchers from the E&PDE

community and beyond to actively engage in the next stage of the project, and help facilitate change within Task Furniture for Education.

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