
INTEROPERABILITY ISSUES AMONG CAD SYSTEMS: A BENCHMARKING STUDY OF 7 COMMERCIAL MCAD SOFTWARE

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In the actual design contest, where many different types of expertise need to be integrated in the design process, the interoperability among the used computer-aided tools is a requirement. With respect to 7 MCAD systems a quite complex model of an exhaust manifold has been created in each environment and translated to the other systems via IGES and STEP neutral files. Best practices have been adopted to improve translations, both by using internal repair tools or the manual ones. Thus, the authors analyze what healing tools are available and important to repair a CAD model, and how to use them, as well as how to prepare a model to ensure CAD interoperability and prevent failure in data exchange via neutral standard formats.

COOPERATIVE LEARNING AT A DISTANCE, FOR DESIGN STUDENTS

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This paper reports on a study of cooperative learning online within a Design Management subject at the University of Western Sydney, and contrasts the findings with the theory of Cooperative Learning proposed by Johnson and Johnson. Learning outcomes in the subject were achieved by incorporating into the learning design, Johnson and Johnson's five elements of successful cooperative learning, with the exception that interaction occurred in the online environment rather than face-to-face. Study results suggest that students perceived that the subject facilitated their learning, especially in the intended areas of virtual teamwork, distance communication and written communication skills.

THE DESIGN OF ELECTRONIC MEDIA-BASED ACTIVE LEARNING EXPERIENCES

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The tradition of classroom learning materials among Western cultures-structured sequentially and focused on the representation of theories and classification of concepts in the absence of direct experience-has been of particular benefit to reflective learners, who prefer to process information by thinking about observations. Unfortunately, this approach does not support the dominant preferences of active learners, who prefer to learn, and do so best, by using information in order to understand it. DO LEARN is a speculative electronic media-based system of monthly classroom supplements designed to support open-ended, activity-based learning experiences and deliver largely concrete information in order to address active learner preferences.

MULTIPLE PERSPECTIVE ASSESSMENT STRATEGIES FOR GROUP WORKWilliams A.P., Gajendran T. - *University of Newcastle (AUS)* 685

The assessment of group work has long been an issue for educators. The issues surrounding the assessment process for groups include assessing individual student's input or contribution to a group activity. Considered in conjunction with the issue of providing comprehensive formative feedback, to students involved in group-work, the complexity of the assessment process is clear. This paper outlines the processes used to address the issues associated with assessing students involved in groups or teams. The assessment strategy uses meeting logs as well as peer and student self-assessment to provide multiple perspective assessment as well as providing comprehensive formative feedback on student participation as a team member.

A MODEL FOR PROJECT-BASED EDUCATION IN MANUFACTURING SYSTEM DESIGN AND ITS APPLICATION ON TESTING RESEARCH RESULTSAganovic D., Bjelkemyr M. - *KTH - Royal Institute of Technology (SWE)* 585

In this paper, a method for project-based education in engineering design methodology, focused on manufacturing system development, in collaboration with industrial partners is presented. This method can also be used as a framework for conducting the engineering design research and testing the research results within the context of undergraduate engineering projects. In addition, this paper presents a case study where a manufacturing system concept for an electromechanical product used for chemical analysis (e.g. in development of pharmaceuticals) is developed in a student project that, in its turn, is used for validating a subset of a novel manufacturing system development methodology.

MODULARIZED LEARNING DOCUMENTS FOR PRODUCT DEVELOPMENT IN EDUCATION AT THE DARMSTADT UNIVERSITY OF TECHNOLOGYBirkhofer H., Weiss S., Berger B. - *University of Technology (DEU)* 599

At the Darmstadt University of Technology a reworking of educational documents is actually in progress concerning the product development courses of our department product development and machine elements. Scripts and exercise documents are actualized and improved concerning contents and structure. Relating to this, newest results concerning modularization of contents in product development are applied. This paper points out the derivation of a lecture and a practice course concerning a well defined topic (variant management), based on a modularization approach including all required documents. Out of one database containing modular contents with no own semantic meaning documents were derived in a special edited way.

LESSONS LEARNED FROM DESIGN-BUILD-TEST-BASED PROJECT COURSESMalmqvist J., Young P. Y., Hallström S., Kutteneuler J., Svensson T. - *Chalmers University of Technology (SWE)* 665

Projects in which students design, build and test a device are increasingly being used in education. In this paper, a number of design-build-test-based project courses are analyzed. Findings indicate that these experiences do not only train design skills but also effectively motivate students, integrate disciplinary subjects, and provide a platform for teaching non-technical skills such as communication. These learning events further receive very positive evaluations from students, faculty and industry. However, design-build-test tasks also require careful planning, different faculty competence and re-designed learning environments. The paper suggests a set of guidelines that help address these challenges in a course development process.

TEACHING DESIGN THEORY AND PRACTICE: A PARTICIPATORY JOURNEYLoi D. - *RMIT University (AUS)* 659

This paper discusses through a case study the use of Participatory Design and Cultural Probes in teaching and learning activities. The paper is divided in four sections. The first provides a background to my teaching methodology and defines Participatory Design and Cultural Probes. The second overviews the case study. The third analyses the case study, discussing results and reflections and emphasising its role in unfolding a discourse on the identity of learned and taught methods and tools. The fourth provides key conclusions and an outline of future developments. This paper argues that the core value of the discussed activity is placed on the process (of learning, teaching and designing) rather than the specific outcome.

SOME CONSIDERATION ABOUT THE PROFESSIONAL DEONTOLOGY OF DESIGNERS

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The steps to a professional deontology are as follows: a) determination of the “terminal behaviour” (professional ability of the designer that shall be described carefully and completely) b) choice and individuation of the considered deontology (complex of principles and criteria to guide the actions of the human being determined in relation to a given ideology) The reference point is the “civil ideology”, a general respect for the human being and good expressed by the “four questions” of the Rotary International: it is true? It is right? It is an amelioration of the relations between human beings? it is an advantage for all other persons. C) comparison between steps a) and b): the ethic action of the designer could be deducted.

THE GAP BETWEEN LEARNING AND APPLYING DESIGN METHODS

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Teaching design methods with the result of producing competent designers is a complex challenge. It is important to impart the aims of a design method, which consist of the effects of the design method itself and their role within the design process. Students need to understand these aspects in order to purposefully apply them. Design students should be educated with regard to these requirements to become competent in applying design methods at the university as well in industry. In order to achieve this, the relevant questions must be considered: What problems do students encounter when learning design methods? How are these problems caused? What changes have to be made to design education in order to ensure this competence?

ACHIEVING FIRST DESIGN EXPERIENCES

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Design students often do not have the chance to gain the first project experiences at university. They learn about design methods, project management and many other engineering subjects. However, they rarely get the chance to bring all the knowledge in a first design project together. In order to support this linking process, the department product development and machine elements at Darmstadt University of Technology conduct an International Design Contest. During this contest students get the chance to work within teams at a complete design task from the first idea to the real product. The authors organized the IDC at Darmstadt University of Technology in 2003 and participated as tutors at the international contest in Nagoya (Japan).

TEACHING MECHATRONICS IN INDUSTRIAL DESIGN ENGINEERING

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In recent years, the number of consumer products incorporating a combination of mechanical and electronic systems has increased enormously. Because of this development we decided to start a course called ‘Mechatronics in product design’ (Faculty of Industrial Design Engineering at Delft University of Technology). The paper describes the course (lectures, practical exercises and assessment) in detail. What we learned is; course books on mechatronics in product design are not available, control engineering is tuff stuff for IDE students, hands-on exercises (or using simulation software) is very helpful and the more integration between mechanical and electrical engineering the better.

RE-DESIGNING ARCHITECTURAL ARTEFACTS: A BUILDING'S LEARNING PROCESS

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The relevance and use of a taxonomic design method in architectural education is discussed. Based on and nourished by the (architectural) (re-)design process, which is considered a complex interaction of different activities (cognitive, motorial and social), the first ideas for this method are given. An architectural redesign assignment was set up specifically to test the advantages a steering method can evoke in a group of third year architecture students. First the setup of the assignment is confronted with a set of concepts elaborated by the authors. Next a discussion is started on how these concepts are or are not supported by the proposed method of teaching redesign in architecture.

CREATIVE FORMATION. STRUCTURE AND SOME RESULTS OF THIS COURSE FOR PRODUCT AND SERVICE INNOVATION

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The essence of all innovation is a new idea. The course of Creative Formation targets to increase the possibilities to reach new ideas in the ideation phase of a design. The creativity has an important role in engineering design. Explained are the: objectives, syllabus, methodology and some results of this postgraduate/doctoral course in its seventh year unning. The student is trained to increase performance in the creative phase, by employing several creative techniques, the knowledge of mechanism of best mental performance and a good ambience. Also a patent general view is given. The course has four modules each with a different lecturer: Creativity Techniques; Thinking EngineerInvention The ory; Inventions and patent system.

BELIEFS, DESIGN AND ARTS: ENHANCING CREATIVITY IN EDUCATION AND ORGANIZATIONS.

Pons P.L., Gómez C.M. - *UPC Universitat Politècnica de Catalunya (ESP)* 673

The paper describes a process of language integration with beliefs applied to generate creativity. Beliefs terminology includes the combination of ideas, values, feelings and life histories. Participants receive the right and minimum set of instructions described in the paper, can develop imaginative creativity and use symbolic ideas. Finally they prepare their own original expressions. Intelligent or learning organizations may miss the potential of every unique individual or employee. As a solution, we describe how we can help individual persons to find situations that the individual could make interesting. The use of the principles and examples explained could be a basis for impressive design results.

TECHNOLOGICAL KNOWLEDGE EMBEDDED IN A FEATURE-BASED CAD MODEL

Rohde D., Herold Z., BojètiæN., MarjanoviæD. - *University of Zagreb, FMENA (HRV)* 889

The paper presents the research pertaining to knowledge management and the design of an information system in order to obtain the computer-based support for product embodiment phase in engineering design and in order to improve the CAD system. The model whose structure has been presented and partially described is intended to enable the designer to access the knowledge on technological shape giving (forming) during the process of product embodiment using the existing CAD systems. In order to present the flow of knowledge and information during the product embodiment phase, a structure of the process of product modelling has been developed.

SOME CONSIDERATIONS ABOUT DESIGN EDUCATION

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On the basis of the great attention paid by companies' research centres and public bodies' research departments to Design Science in recent years, it is becoming a fundamental topic in university and in post graduate courses. The research work carried out, based on the experiences made both at the University of Rome "La Sapienza" and at the Polytechnic of Milan, highlighted the following topics as further developments in the field of Design Education: the idea of a possible "terminal behaviour" of the designer; the distribution of the contents corresponding to such terminal behaviour in two or more courses in the engineering curriculum; the importance of updating such terminal behaviour by the Continuing Design Education.

CREATIVITY DEVELOPMENT BY UTILIZING DIGITAL ENGINEERING

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The Faculty of Engineering, Tohoku University, Japan is carrying out the Creativity Development Course (CDC) as one of the curriculum since 1996. This is a practice education and a training for a first grade (freshman) to experience an interest of research. The project "Digital design by 3D-CAD/CAE" has been managed as one of the CDC since 2001 using the Digital Prototype Lab which has the equipment utilizing newest digital engineering. Even if they don't know the concept of the bending of beam or the concentration of stress, visualization by CAE software makes possible to understand them intuitively. Moreover, the experience that actual product designed by oneself is broken actually helps to understand the effective use of a simulation.