POLE POLE IN COOPERATION WITH ACTISMILE

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Table of Contents

POLE – A Platform for Learning and Teaching	1
Responsibilities of POLE and its Partner Universities	4
Assessment	4
MOVE ! Project Task	5
Process Design	5
Deliverables	5
Information and Collaboration Technologies ICT	6
Team Composition	7
Evaluation Criteria	7
Confidentiality Agreement	7
Budget for production costs	7
Cost of living and accommodation	7
Insurance	7
Project Agenda	8
Applications	8



POLE - A Platform for Learning and Teaching

Nowadays, students are not only increasingly challenged within their specific core disciplines, they are also supposed to develop the necessary skills to apply this particular knowledge in practice. Ideally, this goes hand in hand with mature understanding displayed by the individual of a social, cultural, and economic environment. The practical application of theoretical knowledge can, thus, only be implemented successfully, if these three basic elements are taken into account. It is in this field where the Project Oriented Learning Environment (POLE) has its position, i.e. where knowledge and skills are combined to accumulate professional competence.

There have been many attempts to establish the theory of design education. But nonetheless, we recognize a pluralist paradigm in this field. One such paradigm is the "distributed trans-disciplinary project-based design methodology" that is gaining growing acceptance. Moreover, when project-based learning is performed in teams, it mirrors professional design practice more closely, and offers an attractive proposition to educational institutions to produce highly employable graduates. Therefore, most state of the art design curricula employ project-based learning principles by organizing student teams in such a way that the different functions associated with key disciplines of design projects are represented. However, the reality is that the majority of students usually belong to a single educational discipline, and some are simply asked to "wear" another discipline's hat for the duration of projects. There have been very few consistent attempts at recruiting students who actually belong to different educational disciplines so that a true trans-disciplinary make-up is achieved.

In addition to students' disciplinary knowledge, the ability to work efficiently within multicultural environments has become increasingly important. Universities are, therefore, looking to expand and deepen this particular aspect in order to provide the necessary expertise in this field. This has led universities to becoming more proactive with regards to networking and offering collaborative courses.

POLE is a learning system developed in cooperation with several international universities, such as University of Applied Sciences Northwestern Switzerland, ETH Zürich, EPF Lausanne, Aalborg University, Tecnológico de Monterrey, NTNU Trondheim, TU Delft, Politecnico di Milano, Olin College Boston and Stanford University.

POLE sees itself as a learning system cooperating within this network of universities and industry partners. It does so within a reflexive context, taking into account the various cultures involved in order to create new methods of resolution regarding teaching and learning. The



students are at the core of this concept, and are given the option to develop process-oriented expert knowledge through trans-disciplinary teamwork. Simultaneously, they learn to work independently and to deal with current problem cases through the use of modern information and communication tools. In the course of this joint activity, it has become apparent that this complementary aspect has gained in importance.

The rapid technological development and the need to cope with an increasing amount of information generate a challenging situation for both: professional courses at universities and industry. University teachers and researchers have to constantly update their knowledge on newly available technologies and products. The same happens to professionals working in industry. The research done at universities increasingly necessitates the support of industry, not just financially, but also to test ideas in practice. Conversely, industries can also benefit from receiving creative concepts originating from unbiased out-of-the-box ideas and having the opportunity to present their strategies to students, who will be future professional employees and probably work in their design teams. Therefore, the potential which a collaborative networked learning environment can offer to both, universities and industry is obvious.

Design innovation, which essentially means the definition, development and creation of new concepts and their successful launching to the market, is the driving factor for a powerful, competitive economy and the prosperity of society. Therefore, the education of creative individuals at universities and the continuous professional development of architects, engineers, industrial designers, etc. in the wide field of design innovation are of central importance. POLE's philosophy is committed to fostering trans-disciplinary design thinking and creating awareness for sustainable solutions that are not only economically viable, environmentally sound and socially equitable today, but also allow future generations to do the same.

Processes within POLE are largely organized within the individual teams themselves. The according goals are set and committed to within the teams; in case of resulting conflicts, weight is given to iterative processes in order to find solutions. A further characteristic of POLE is an increasing tendency for the overlapping, or even amalgamation, of various lines of work in order to give way to new, holistic, and interdisciplinary perspectives. POLE is a comprehensive platform which gives students the opportunity to contribute their full potential. Each individual's attitudes, characteristics, and abilities are taken into account as a whole in order to allow as much space as possible for independent development of students'





responsibilities and skills. A contribution to the concept of 'Campus in Mind' is made by POLE in providing the teams with learning facilities that are based on experimental and interactive technologies.

The teamwork in the POLE courses allows the students to further expand their specific professional skills; on the other hand, it also gives them the opportunity to develop more generic competences, which nowadays is one of the key qualifications in order to be able to adapt to a continuously changing environment. The course also enables students to evaluate their ability to function in a team and to analyze their styles of communication. Through practical examples, students can explore how well they are able to work in a team, and to what degree they are flexible to accept members' concerns from other disciplines, i.e. how they can integrate these into their own work and patterns of thinking.

Experts and mentors which do not form part of the university, but are active members of businesses and the industry in general, are an essential part of POLE courses. Their participation contributes a high degree of practical knowledge to the projects, pointing out the actual 'state of the art'. In this manner, POLE manages to link academic education and professional practice. The intensive interaction between these two elements guarantees a rapid transfer of technology, while at the same time ensuring that the students involved are motivated to a high degree. POLE is not only about to significantly remould the landscape of teaching and learning at universities, but it also intends to yield substantial influence concerning decisionmaking and the creation of work processes in practice. In association with university teaching staff, the mentors are instrumental in contributing expert knowledge and regular feedbacks to the teams, while they are also actively involved concerning the evaluation of processes and related products. The latter will be of increasing importance in the future, as scientific research has been initiated in connection with reflections of certain POLE processes. It is the intention of this kind of research to support students with regards to the awareness of their personal learning styles. The findings will then be made accessible for future work in a broader context. Further POLE research issues include for example the creation of knowledge databases, which will serve as a tool for more rapid evaluation of solutions and decision making processes. These efforts are based on the understanding that a large part of creational, construction, and design processes are substantially shaped by re-design.

Since 2001, twenty projects, all originating from and funded by industry or government partners, have been completed using the POLE platform. To name a few examples:

- "SnowDive": Design of Novel Sports Equipment for Use in Snow and Sand
- "Architecture and the Body": Planning of a Sports Facility in a Historical Heritage Sensitive Area
- "CanPlus": Novel Packaging Systems (Nestlé)



- "Driven Driver": Navigation System for the Car of the Future (Volkswagen)
- "High Light": Controllable Head Torch for Mountaineers
 (Mammut Sports)

The assessment methodology that was used to monitor and measure key aspects of students' experience revealed the following key findings:

- Throughout the course, students appreciated the interdisciplinary and international nature of the teamwork.
- Students' appreciation of the realistic nature of projects increased even more after the projects ended.
- Communication and interdisciplinary teamwork were clearly perceived to be two major learning outcomes.
- Re-evaluation of video-taped team and/or review sessions proved to be a welcome source for a better process understanding and for personal awareness.

Responsibilities of POLE and its Partner Universities

POLE considers itself as a learning platform which enables and facilitates interdisciplinary processes. It has also proven to offer an excellent test bed for research in the field of modern teaching and learning as well as in the field of evaluation of novel learning spaces. At the same time it is important to put on record that the responsibility for the disciplinary supervision of the students remains with the sending home universities. This relates also to the grading of the students' contribution. POLE on the other hand will provide a qualification on the team processes and on their interaction patterns. (It is suggested that students who successfully participate in POLE projects receive academic credits based on the ECTS.)

The experience during the previous POLE courses has revealed that this double responsibility of the student towards his/her POLE team and towards the home university and professors, respectively, may also bear conflicts. POLE demands that team decisions be respected what the approach and the agreed objectives is concerned. POLE leaders are convinced that within this framework there is still ample tether to adhere to high academic standards in the disciplinary work.

Saying this makes it obvious that a close accompaniment and monitoring of the project by the faculty of the partner universities is essential and highly welcomed by POLE. The involved faculty will receive full access to all documents of the POLE project. Their participation during the kick-off events, the reviews and the final presentations will add to the interdisciplinary depth and thus to the quality of the project and to further developments of POLE.

Assessment

POLE has the ambition to continuously improve its learning and teaching platform. One step to do so is by integrating an external assessor into the process, who will participate in as many of the POLE design activities. POLE has cooperated in this field of evaluation and assessment with the Department of Education of the University of Applied Sciences Northwestern Switzerland and with Stanford University since the very beginning in the year 2000. The participatory assessment will focus on the effectiveness of the design processes and the adequate use of collaborative communication technologies.

The Task: MOVE! - Creating a Personal Motion Coach

Health is one of our most precious treasures. However, the knowledge to preserve it is often missing or repressed. It is a proven fact that physical activity helps to remain well and fit and is a warrantor for a longer life. Physical activity should start at young age with children and then become a indispensible regularity. Medical surveys, however, show that there is a growing passivity in children and young adolescents in the USA and Europe as well.



The POLE Project "MOVE!" intends to create a tool to overcome this phlegm and make sports an object of daily desire. Scientific studies show that individual feedbacks can help to make a person more aware of her/his activity and often become a motivator for conscious sports activity. The product of "MOVE!" will, therefore, measure the individual motion of a person, filter it in a person-related (age, height, weight, etc.) manner and allow the display of the results on the device itself, on a smart phone or a computer by an easy to handle data transfer system.

The above description shows that the design of such a device necessitates the cooperation of many disciplines. There are psychological factors involved to understand children's behavior and expectations about the "looks" of such a device; there are mechanical and materials questions to be answered to make a tool haptically attractive and resistant to sweat, water, rain, etc.; the integration of miniaturized accelerometers, data storage components and filter algorithms on a microelectronic chip will challenge both mechatronics and electrical engineers as well as computer science experts; finally, the visual appearance and the ergonomic qualities of the tool will be crucial for the decision of a child whether or not "MOVE!" will become a "must-have" gadget like the Tamagotchi egg in the 1990's.

Process Design

POLE as a platform for learning and teaching not only focuses on the product but puts strong emphasis on the

structuring of the design process. The following list of deliverables shall facilitate the work process for the teams as a back bone.

Deliverables

At the end of the physical kick-off week February 25, 2012

- Written statement of team objective(s)
- Distributed collaboration and information management framework
- Description of the expected contributions of each team member

Stopover One, March 24, 2012

Detailed list of prioritized product requirements, complete with requirement categories, rationale, metrics, and target ranges for each requirement (draft version); must be uploaded to the team's intranet platform.

Design Review I by Videoconference, March 27th, 2012 (duration of presentations 20 minutes/team; discussion 30

minutes)

- Discussion of product requirements
- Discussion of initial product concepts (guided by the product requirements)
- Discussion of ideation process
- Reflection on distributed collaboration and information management framework (including the role of each team member)
- · Project timeline and milestone check

Note: FINAL versions of all of the materials that will be used in the design review presentation (PowerPoint presentations, spreadsheets, sketches, etc.) must be uploaded to the team's intranet platform 1 day prior to the review to make sure that all sites have access to them.

Stopover Two, April 7th, 2012

Detailed list of prioritized product requirements, complete with requirement categories, rationale, metrics, and target ranges for each requirement (final version); must be uploaded to the team's intranet platform.

Design Review II by Videoconference, May 2nd, 2012

(duration 20 minutes/team plus 30 minutes discussion)

- Discussion of 2 to 3 down-selected product concepts (in accordance with the product requirements)
- Discussion of final product concept (if one has been selected)
- · Discussion of decision-making process
- Reflection on distributed collaboration and information management framework (including the role of each team member)
- Project timeline and milestone check (including identification of remaining tasks and deliverables for project completion)

Note: FINAL versions of all of the materials that will be used in the design review presentation must be uploaded to the team's intranet platform 1 day prior to the review.

Final presentation, June 5th, 2012

All relevant final deliverables must be uploaded to POLE's MOVE! Project intranet portal. (by June 3, midnight CET)

- Oral presentation of project outcomes for colleagues, faculty and jury. (duration: 30 minutes/team)
- Proof of concept demonstration. (functional and visual via "works-like" and "looks-like" prototypes)



- Discussion of why and to what extent the proposed design fulfils product requirements
- Discussion of potential for future research and development of MOVE!
- Reflection on distributed collaboration and information management framework (including the role of each team member)
- · Discussion of individual learning insights
- Oral presentation of an executive summary for a delegation of Actismile. (duration: 7 minutes/team)

Physical deliverables (due at final presentation)

- · Physical prototypes of proposed design
- PR Material to promote the product (movie, brochure and/or leporello, etc.)
- · Copies of 3D renderings of proposed design.
- Five copies of a comprehensive final project report, which should include the following sections:
 - Executive Summary clearly outlining the key points of the proposed design and why Actismile should pursue it.
 Background Research section documenting any relevant background research that was conducted.

3. Requirements section documenting the final list of design requirement the team generated and the key stakeholders the requirements target.

4. Design Development section documenting the different ideas that were generated and the decision making process that was used to select the final concept (with rationale).

5. Design Specification section documenting the specifications of the proposed design (detailed engineering drawings, including materials information should be placed here).

6. Design Process section documenting the overall design development and interdisciplinary processes that were used by the team (including reflection on the multi-cultural and interdisciplinary aspects of the project).

 Three DVDs table of content, the project report, PR material, movies, pictures, appendices, etc.

Information and Collaboration Technologies ICT

POLE is offering a modern infrastructure with respect to information and communication technologies (ICT). POLE encourages the partner universities to support their students with respect to ICT as much as possible, in particular granting them access to their own information technologies. The following list of ICT tools characterizes the minimum and necessary standards:

- 24 hours per day access to work stations, so students can work on their tasks and are able to communicate at all times.
- Access to telephones with international access for conference calls
- Video conferencing facilities (available at least 2 hours per week and team)
- · Suitable IT support (firewalls, basic support)
- · Broad band internet access
- MS-Office including PowerPoint, Acrobat Reader, ZIP and FTP programmes

During the kick-off sessions POLE will provide instruction in the use of data transfer tools for the sharing of the use of video conferencing as well as in disciplinary applications. Restriction: It must be noted that for synchronous communication there is only support provided by POLE for operating systems Windows 2000 (and higher). The POLE ICT experts will also assist the teams in terms of security of internet interactions in the confidentiality context.

Team Composition

The POLE MOVE! course 2012 is based on the partnership of University of Applied Sciences Northwestern Switzerland; Tecnológico de Monterrey, Guadalajara, Mexico; Windesheim University, Zwolle, and TU Delft, The Netherlands; Universidad Politecnica de Madrid, Spain; and potentially other institutions. The students will bring backgrounds in industrial and product design, computer science, mechatronics, microelectronics, electrical, mechanical and polymer engineering, systems engineering as well as sports, sociology and process management to the project. Approximately 30 students in five (evtl. six) trans-disciplinary teams will work on the design and development of a novel concept for an "Acceleration and Sports Activity Sensor" under the guidance and supervision of more than 10 faculty members.

Evaluation Criteria

The evaluation of the project results will be in the duty of an international jury. It will consist of one member of each discipline and two members of the POLE directorate as well as of members of Actismile Incorporated. Each team will receive a report with an acknowledgement of the contributions according to the following criteria:

(1) fulfilment of Actismile's requirements (a list of specifications will be handed out during the kick-off week by the patron), (2) usability, (3) innovative potential of solutions,
 (4) presentation of product, (5) general impressions.



Confidentiality Agreement

Due to the high potential of such a novel product Actismile and POLE have agreed to respect a confidentiality agreement which in turn has to be signed by all partners involved in the project. Individual copies for each participant will be sent to the selected students in advance and shall be ready for signature at the kick-off event.

Budget for production costs

Each team is granted a budget of max. CHF 1'000 for material and production expenses. Payments can only be made by POLE against bills or (signed) receipts.

Cost of living and accommodation

Thanks to the financial support of sponsors and the industry partner Actismile, POLE is able to partially subsidize the cost of living and travel expenses and those for the documentations and hand-outs for the participating students.

Insurance

Note: Each participant is responsible for her/his own insurance matters.



Project Agenda Virtual Kick-Off I February 14, 2012 by Videoconference from Home Universities

Physical Kick-Off I February 19 – 25, 2012 at University of Applied Sciences Northwestern Switzerland, Campus Brugg/Windisch.

Review 1 I March 27, 2012 by Videoconference from Home Universities.

Review 2 I May 2, 2012 by Videoconference from Home Universities.

Final Presentations, June 5, 2012 in Windisch, Switzerland. All teams, faculty, jury, industry partners. Arrival of the students in Windisch, Switzerland based on teams' decisions, end of May/beginning of June

Applications

Students of a Master's (or advanced Bachelor's) Program interested in participating in this POLE Project MOVE! are invited to apply by sending a Curriculum Vitae and a Letter of Motivation to Prof. Dr. Christoph Holliger no later than January 20th, 2012. (e-mail: christoph.holliger@fhnw.ch).

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