

Project Oriented Learning Environment
University of Applied Sciences Aargau, Switzerland

**An Interdisciplinary Learning Platform
for Students of European Universities
Using Modern Information and
Collaboration Technologies**

**POLE
EUROPE
2K'3**

SnowDive®

winterterm program 2003

for students from the fields of
mechanical engineering, plastics technology
light weight design, industrial design, economics
law, marketing and process management

Organisation POLE Europe



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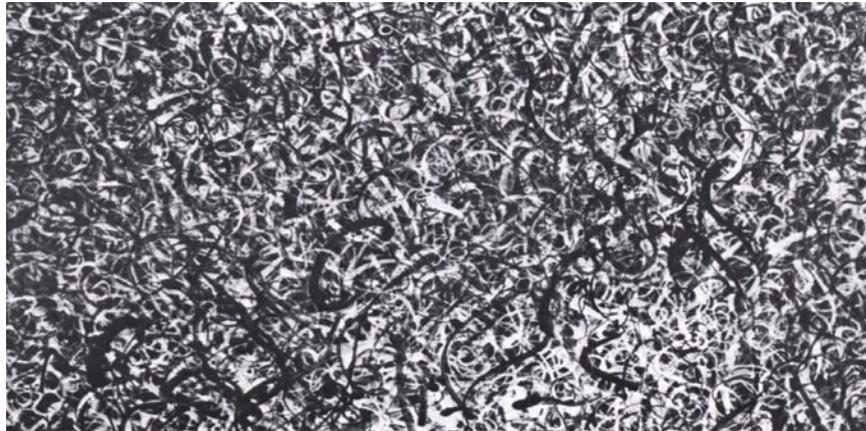
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Introduction: POLE Europe - A Platform for Learning and Teaching

University students are nowadays increasingly challenged within their specific core disciplines; in addition however, they are also supposed to develop skills in order to apply this particular knowledge in practice. This ideally goes hand in hand with a sense of maturity of the individuals' characters vis-à-vis the social, cultural, and economical environment. The practical application of theoretical knowledge can thus only be implemented successfully if these three basic elements are taken into account.

In addition to university 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 realisation has led to universities becoming more proactive with regards to networking and offering joint courses, which is where POLE Europe (Project Oriented Learning Environment) is actively involved in. In the course of this new collaboration, it has become apparent that the complementary aspect has gained in importance. An example for this is the liaising between strongly research-oriented and more



practically oriented universities with the common goal of being able to implement the according results as soon as possible. Apart from contributing to more comprehensive and efficient process work, the POLE courses lay particular emphasis on improved cultural know-how. In order to do this, students are encouraged to contribute their experiences within international teams, regardless of geographical and language barriers.

POLE Europe sees itself as a learning system cooperating with other European or foreign universities. 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 methods. The students are at the core of this concept, and are given the option to develop process-oriented expert knowledge through interdisciplinary teamwork. Simultaneously, they learn to work independently and to deal with current problem cases through the use of modern information and communication tools.

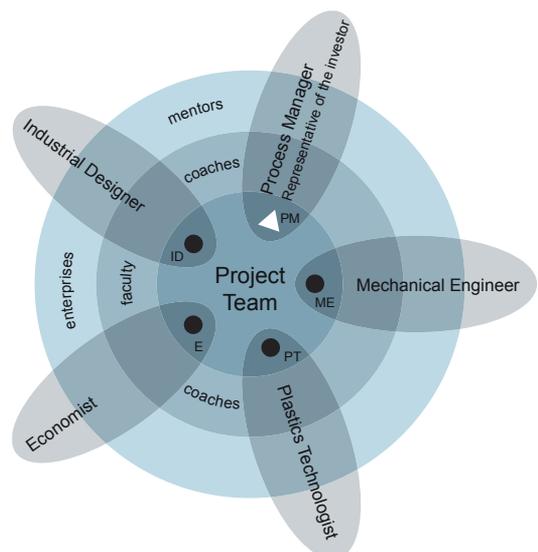
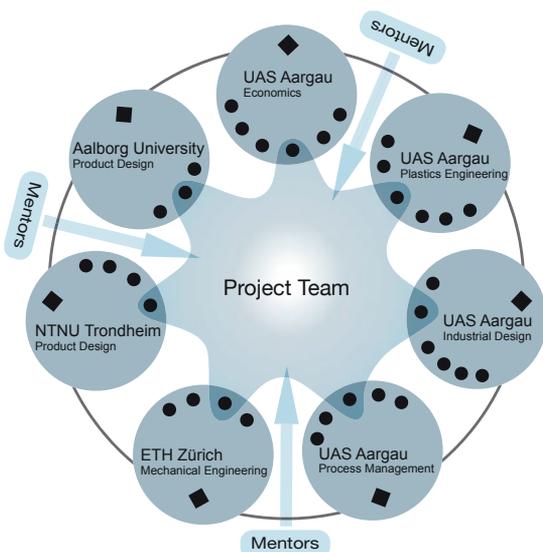
Processes within POLE Europe are largely organised within the individual teams themselves. The according goals are set and committed to within the teams; in case of resulting conflicts, weight is given to iterative processes in order to find solutions. A further characteristic of POLE Europe is an increasing tendency for the overlapping, or even amalgamation, of various lines of work in order to give way to new, holistic, and interdisciplinary perspectives. POLE Europe 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 Europe in providing the multi-disciplinary teams with learning facilities that are based on experimental and interactive technologies.

The teamwork in the POLE Europe 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 analyse their styles of communication. Through practical examples, students are given the opportunity to 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 Europe 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 wield substantial influence concerning decision-making and the creation of practical work processes. 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.

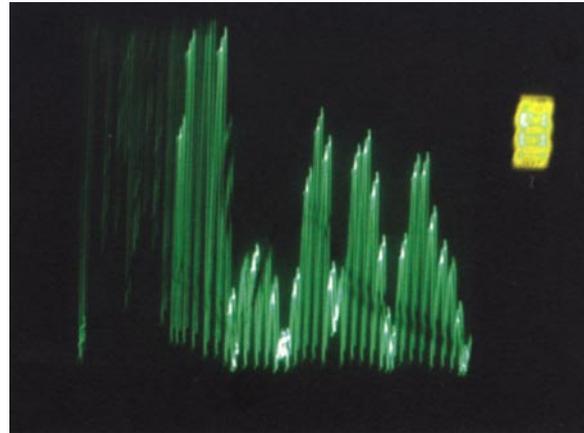
Further POLE research issues include for example the creation of knowledge databases, which will serve as a tool for more rapid evaluation of solutions and decision-making processes in the future. These efforts are based on the knowledge that a large part of creational, construction, and design processes are substantially shaped by re-design.

The initial POLE courses have been launched as a result of the ever increasing demands in the current building trade, which is of a highly complex, segmented, and competitive nature. Experts from the fields of architecture, civil engineering, and construction management are clearly demanding a broader education, along with more diversified core skills for engineering students. The POLE learning environment and its associated methodology allow students to apply their theoretical knowledge in practical cases. Through collaboration in interdisciplinary teams guided by process management students, students from fields such as architecture, urban planning, civil engineering, interior design, and economics were given the opportunity to understand the individual processes involved and acknowledge their relation to the social, economical, and political dimensions.

The present POLE Europe course offered during the winter semester 2003/04 will bring together the disciplines of mechanical engineering, plastics engineering, product design, industrial design as well as economics with students and faculty from University of Applied Sciences Aargau and Federal Institute of Technology ETH Zürich, Switzerland, NTNU Trondheim, Norway, and Aalborg University, Denmark.

Responsibilities of POLE Europe and its Partner Universities

POLE Europe considers itself as a learning platform which enables and facilitates interdisciplinary processes. It has also proven to offer a 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 Europe 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 Europe 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 Europe demands that team decisions be respected what the approach and the agreed objectives is concerned; POLE leaders are convinced that within this frame work 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 Europe. 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 Europe.

Assessment

POLE Europe 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 Europe design activities. POLE has cooperated in this field of evaluation and assessment 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.

Design Task

Snow sports have gained a strong stimulus when the traditional skis were supplemented by snow boards. The SnowDive® sports gear is a novel idea for a further development. It reminds of a scooter on snow; it is far different to handle though: Its balance is excellent, it allows beginners to rapidly develop their skills and move down relatively steep slopes



- even in deep snow fields. With SnowDive® one can perform narrow and even rapid turns as well as achieve high speeds. It is very comfortable since one can ride it wearing hiking boots. SnowDive® can be used easily on any up-hill transportation means in ski areas. Its parts can be disassembled easily and therefore SnowDive® can be carried in a sports bag. SnowDive® is a competitive product to similar sporting gears like Snow Scoot, a French innovation

The prototype has proven its potential as an excellent snow sports equipment. It is assumed that it can also be used on sand surfaces or even water with minor modifications. In order to evaluate and realize this potential, additional work is necessary. This further development is the topic and task of the POLE Europe project 2K'3.

The following goals have been identified by the investor:

- The future SnowDive® must be lighter. A weight of 6 kg to 8 kg (possibly depending on the weight of the driver and his/her skills) is a target. For its

design dynamic forces occurring during jumps must be anticipated!

- SnowDive® shall be foldable in order to be easily carried or transported.
- It is expected that at least 2 versions are developed: one for adults and one for children (10 years and up).
- SnowDive® shall sustain temperatures between -20°C and $+40^{\circ}\text{C}$. The -20°C boundary condition has the use in snow in mind; the $+40^{\circ}\text{C}$ version is the SnowDive® for rides on sand dunes. (The possibility of interchangeable surfaces has to be evaluated.)
- SnowDive® must be more cost effective. As a goal CHF 300.00 to CHF 500.00 production cost/equipment shall serve as guideline for an inexpensive version. A luxurious version may be budgeted at twice as much.
- A focus shall be set on safety aspects. Especially crashes with and falls onto SnowDive® must be considered and safety measures implemented, e.g. like the one's in traditional skiing gears.
- A production method shall be developed for medium sized series (10'000 pieces/year) with adaptable tooling, flexible enough to integrate future adaptations. (In order to stay in the market, new types of sporting gears need to be developed at frequent intervals.)
- Challenges exist in its design which must be flexible due to the ever changing expectations and fluctuations of the sports market. It is expected that not only a piece of equipment is proposed by the POLE Europe teams, but a 'SnowDive® concept' is developed which includes life-style aspects as well as additional accessories.
- Apart from the mechanical and design efforts quite a significant part of the work consists in the marketing aspect of SnowDive®. It can be assumed that SnowDive® will at least have good appeal and market potential in Europe, but probably also the Near East, Asia and the USA. Activities have to be planned and launched dealing with this part of the

development efforts. This includes the evaluation of legal aspects – e.g. with respect to business competitors and/or patent rights of specific design details.

- Legal aspects in the context of protection by international patents have to be evaluated.
- Finally, the task includes the design and edition of an instruction manual for potential users.



In summary: The SnowDive® project of POLE Europe has a complex scope which can only be solved in teams of graduate students who integrate knowledge from their faculties of mechanical engineering, plastics technology; light weight design; economics; law; marketing; industrial design and process management.

Process Design

POLE Europe 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.

At the end of the kick-off week:

- Written statement of the objective(s)
- Concept of the information management (using ICT) by each team
- Description of the anticipated contributions of each student as a member of her/his team
- Commitment of each team member on a (preliminary) milestone structure

At the first review (duration 30 minutes/team):

- Verification of team's collaboration strategy
- Clarification of contributions of each team member (written document); reflection about changes or confirmation of one's own role within the team
- Intermediary results, presented (2 days prior to the review) on the intranet (team web page)
- Documents of work in progress (log book)
- Refined sketches of envisioned product
- Declaration of system specifications; incl. subdivisions of task

At the second review (duration 30 minutes/team):

- Intermediary results, presented (2 days prior to the review) on the intranet (team web page)
- Verification of roles
- 1st versions of all deliverables due at the final presentation
- Scaled model of sporting gear
- Clear concept of final prototype
- Definition of milestones for production process (segmentation; who does what?)

Final presentation:

(before: Assembly of parts (possibly produced at different sites) to final prototype)

(by February 15, 12:00 noon: Presentation of all relevant results in team web page on POLE Europe intranet portal. Note: Inputs will be blocked thereafter.)

- Raceable sporting gear, ready to be tested on February 17, 2004
- Oral presentation (duration: 45 minutes/team) for colleagues, faculty and jury – using the team's web page as primary and central means of information and visualisation; including: Comprehensive documentation of product, production method(s), and marketing concept
- Presentation for the investor (15 minutes/team) with a clear focus on the product
- Potential for future research and development of SnowDive® follow-ups
- Detailed evaluation of individual learning and insights
- Comments on success factors and/or pitfalls of interdisciplinary design teams
- Suggestions for future POLE Europe projects

Deliverables (hard copy)

At the end of the kick-off week:

- Written statement of the objective(s)
- Concept of the information management (using ICT) by each team

At the first review:

- Team web page
- Refined sketches of envisioned product



At the second review:

- Scaled model of sporting gear
- Process plan (milestones) for production

Final presentation:

- Raceable sporting gear
- Comprehensive documentation on (1) the team's web page, as well as (2) through physical documents (e.g. scaled plans according to production standards) of
 - product
 - production method(s)
 - marketing concept
- Convincing sales brochure of product
- Process handbook in English (10 copies of the printed version and on CD-ROM)

Information and Collaboration Technologies ICT

With its interactive 'i-room' POLE Europe is offering a modern infrastructure with respect to information and communication technologies (ICT). POLE Europe 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. During the kick-off sessions POLE Europe will provide instruction in the use of data transfer tools for the sharing of disciplinary applications. In cyber lectures and discussion forums POLE will be offering also support with respect to information exchange and protocols. Restriction: It must be noted that for *simultaneous* communication there is only support provided by POLE for operating systems Windows 2000 (and higher). The POLE Europe ICT experts will also assist the teams in terms of security of internet interactions in the confidentiality context.

Team Composition

The POLE Europe SnowDive® course is based on the partnership of University of Applied Sciences Aargau (with its faculties of economics, industrial design, plastics engineering and process management), Aalborg University (department of production and institute for architecture & design), ETH Zürich (institute for mechanical systems) and NTNU Trondheim (institute for innovation & product development). 40 students in 5 interdisciplinary teams will work on the design and development of a novel sporting gear for snow, sand and eventually water under the guidance and supervision of 14 faculty members.

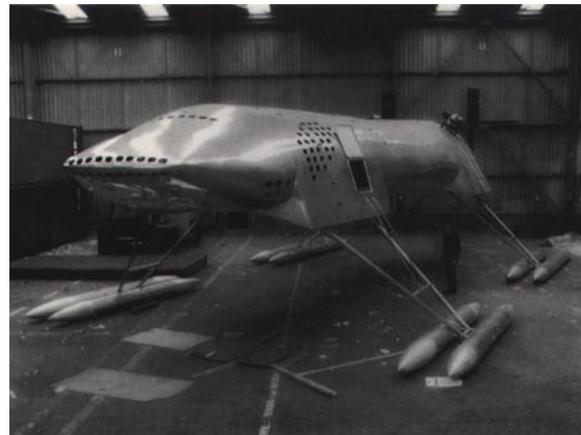
Evaluation Criteria

The evaluation of the project results will be in the duty of a jury. It will consist of one member of each discipline and two members of the POLE Europe directorate. Each team will receive a report with an acknowledgement of the contributions according to the following criteria: (1) technical functionality of product, (2) economic efficiency and feasibility, (3)

innovation of solution(s), (4) suggested production methods, (5) presentation of product on web site, (6) fulfilment of given requirements, (7) general impressions.

Confidentiality Agreement

Due to the high potential of such a novel product in the sporting sector, POLE Europe was able to find



an investor/producer for the resulting equipment. In order to protect POLE's and the investor's legal rights a confidentiality agreement has to be signed by all partners involved in the project. Individual copies for each participant will be ready for signature at the kick-off event.

Budget for production costs

Each team is granted a budget of max. CHF 4'000.00 for materials and production expenses. Payments can only be made by POLE Europe against bills or (signed) receipts.

Cost of living and accommodation

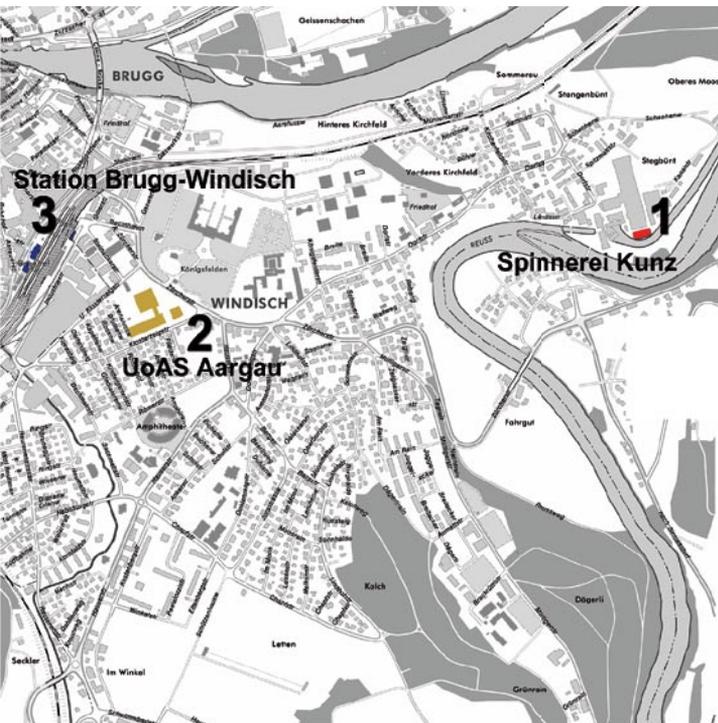
Thanks to the financial support of sponsors and the industry partner, POLE is able to partially subsidize the cost of living, transportation and those for the documentations and hand-outs for the participating students. Nevertheless, a contribution of 100 Euro for the kick-off week and again for the final presentation events are necessary for each student.

Program 2K'3 Winter

Kick-off	Event		
22.10.03 Wednesday	Welcome	POLE Europe Building Windisch (see #1 on map, Spinnerei Kunz)	
	14.00-15.30		
	Introduction POLE Europe		
	15.30-16.30		
	Task of the Course		
16.30-17.00			
Programme of Course			
17.00-19.00			
Team Formation and Analysis of the Tasks	21.30		
23.10.03 Thursday	Depart. for Engelberg	07.30	
	Arrival Titlis Mountain	10.00	
	Experimenting with Snow Dive	10.00-16.00	
	Input 'Biomechanics'		Prof. Dr. Peter Niederer, ETHZ
	Input 'Safety Aspects'		Mauritius Bollier, SUVA
	Presentation by Fam. Barth	20.00-21.00	Visit of KKL Lucerne
	Return to Dormitories after 21.00		by Bus or individually
24.10.03 Friday	Input Block 1		
	'Mechanics'	08.30-09.30	Prof. Dr. Wilfried Elspass
	'Plastics Eng.'	09.45-10.45	Clemens Dransfeld
	'Industrial Design'	11.00-12.00	Prof. Sebastian Stroschein
	Reflection in Teams	13.30-15.00	
	Input Block 2		
	'Plastics Eng.'	15.00-16.00	Prof. Dr. Jochen Müller
	'Marketing.'	16.15-17.15	Dr. Jürg P. Marx
	'Materials'	17.30-18.30	Prof. Dr. Werner Schmid
	Formulation of Goals in Teams	20.30-22.00	
25.10.03 Saturday	Introduction Process Design	09.00-13.00	
	Introduction Process Design	14.30-19.00	ICT Introductions
26.10.03 Sunday	Process Design Analysis of the Task	09.00-13.00	
	Process Design Analysis of the Task	14.30-19.00	ICT Introductions
27.10.03 Monday	Preparation of Presentations	08.00-09.00	
	Presentations one hour/team	09.00-14.00	With feedbacks by all faculty and mentors
	Redesign in Teams	14.00-18.00	
	Closing Event	after 21.00	
28.10.03 Tuesday	Departure		

Course Dates	Windisch	Home University
22.10.03 Wednesday to 27.10.03 Monday	Kick-Off	
Week 44 to Week 49		Teamwork / Teammeeting
10.12.03 Wednesday	Review I Participation over Internet	Review I Participation over Internet
Week 51 to Week 02		Teamwork / Teammeeting
14.01.04 Wednesday	Review II Participation over Internet	Review II Participation over Internet
Week 04 to Week 07		Teamwork / Teammeeting
14.02.04 Saturday to 16.02.04 Monday	Preparation of Final Presentation Due Date for Documents 22.00	
17.02.04 Tuesday to 18.02.04 Wednesday	Final Presentation	
17.02.04 Tuesday	Competitive Race of 5 Prototypes	

Map of Brugg/Windisch



www.pole-europe.ch

Illustration List

- p. 3: Peter Erni, Martin Huwiler, Christoph Marchand
Transfer, 1999, ISBN 3-907044-92-4
- p. 5: Tracés 06, 19.03.03
Genre de Signal Ultrasons (AScan) interpréter par
l'opérateur
- p. 7: Peter Erni, Angstrom's Script, Figure/Images, 1996
ISBN 3-906700-98-4
- p. 9: Scotch Ganhit, 1999, Panamerenکو

Imprint

Publisher

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October 2003
Print 200