Tallinn 2006 – Report of the Working Groups

Robert Ruprecht, Coordinator of Working Groups

1 Introduction

In IGIP tradition, the working groups have led a modest life. They represented loosely organised points of interest in the context of engineering education, and there was not much activity of these groups between the symposia. They orally presented their findings to the board in the usually low frequented closing ceremonies without any hope for consequences.

This has changed since the change in the IGIP presidency four years ago. Enhancing the role of the working groups has been one of the goals Federico Flueckiger successfully aimed at. There had been pressure in this direction, however: The *Technical Teacher Training* working group headed by Vera Ziroff Gut and Bend Luebben had already been busy with the reform of the IGIP curriculum for some time and thus raised the attractiveness of their group. This initiative showed first results at the Freiburg symposium. Traditionally the working groups pursued their aims in parallel, now members of most groups converged to form a task force that met in February 2005 in Biel where the base for the final redaction of the new curriculum was laid. In March 2006 an IGIP regional conference was held in Hamburg. There, the goal of the curriculum task force was further pursued, combined with a new accent: to provide the IGIP with a regional foothold. A third conference to continue this tradition is planned in Wuppertal in March 2007 (8-10 March). Respective Information is to be found from mid November on under www.mtech.uni-wuppertal.de:8080/IGIP. The Initiative for the Hamburg and the Wuppertal Conference came from Gudrun Kammasch, realisators are Joseph Schlattmann (for Hamburg) and Hans-Bernhard Woyand (for Wuppertal).

This shows that beside the 'classic' activities of the working groups new units have risen that develop the working group concept like a matrix. They indicate that the impetus IGIP activities have reached under Federico Flueckiger gains momentum.

In the respective working groups some changes are to be reported:

- Christian Dorninger had already announced that he was to step down from the co-chairmanship of the group *Knowledge Management and Computer aided Technologies.* Martin Bilek of the University Hradec Kralove (Cz) has accepted to be his successor.
- Leo Gros (Mathematics and Natural Science) would like to have a co-chairman. He proposed Stefan Stankowski (Biel, CH) for this function. His group has approved this change.
- Gudrun Kammasch (Women in Technical Careers) has found a co-chairwoman in the person of Gül Gürer (Istanbul)

Surprisingly, Achim Hoefele (ZHW, Winterthur, CH) announced his withdrawal from all IGIP activities on the last day of the symposium. Achim Hoefele has lead the group *Man and Technology* for many a year. He has also been one of the central persons in the development of the new IGIP curriculum. This and his engagement in questions of ethics, university politics and -patent law, just to name a few ones, represent high value for IGIP, and, it is to be hoped, sustainability. Achim Hoefele also technically contributed to the success of the Biel, Freiburg and Tallinn symposia by providing them with a translation service for which he could motivate students of his. It will not be easy to find somebody of his stature as a replacement. This question remains open for the time being.

During the last few years some of the groups more or less retained their level, some have grown; other groups have decreased a little. Among the growing ones are the groups *Knowledge Management, Technical Teacher Training,* and *International Aspects.* The group *Postgraduate Training* and *Man and Technology* have lost attendance, while others like *Curriculum Development* and *Working with Projects* could retain it more or less. Stable are *Languages and Humanities, Mathematics and Natural Science,* and, on a low level, *Women in Technical Careers.* The shifts may be explained in different ways, some may be due to the concentration on curriculum questions; in the case of *Postgraduate Training* a change of concept may be indicated. Its chairman, Sorin Zaharia is very active in this field and looks forward to bringing in new impetus.

Inside the group of chairpersons there is motion, too. The working groups are not very clearly anchored in the IGIP statute. The task of the coordinator (or speaker) dates only back to the presidency of Federico Flueckiger. The first coordinator was not elected but rather spontaneously named. His right to attend the meetings of the executive committee was also established just four years ago. As regular elections for the board were held for the first time in IGIP history in Tallinn, and, as the chairpersons of the working groups are to be elected by the members (in principle), it is nothing but reasonable to elect the coordinator of the working groups in a regular way. Beside this, some questions as to the role of the coordinator have risen, like: is he/she a programmable voice representing some special interest groups or somebody just charged with organisational questions, or: must he coordinate giving all groups the same level of weight?

The discussions in Tallinn led to the conclusion that it will be practical to establish a statute of the working groups. This statute should regulate the above mentioned questions and others. Yet nobody has been charged with this task so far. Independently from this, there will be elections in Miskolc to find a successor of the present coordinator.

The enhanced role of the working groups has lead to significant improvements in the programs and the function of the last symposia. All group chairpersons are involved in the reviewing process and in the final draft of the program. Of course, there are no one-to-one solutions: Not all the accepted abstracts are followed by a paper; and personal restraints are always likely to disturb plans. Yet, selection and financial pressure (no papers are accepted if they are not paid in time) contributed to a much better discipline. Unfortunately, in Tallinn there has been a setback. The local organiser has been quite strict; nevertheless there have been unexplained voids. We will have to go on pursuing the problem.

Some attendants of the Tallinn symposium have been disappointed that there were no printed proceedings. The abstract book was not really handy. There, the local organisation committee managed to impose their view with respect to printed proceedings against the resistance of the president and the program chair. Clearly, an argument in their favour is that CD proceedings are more or less standard nowadays.

The next symposium will be held as a common SEFI-IGIP conference in Miskolc in Hungary. There, the rules will be different. Instead of the traditional parallel sessions of IGIP working groups there will be theme groups with mixed SEFI IGIP contributions. Yet there will be the opportunity of organising workshops where working groups can meet. The chairpersons of the working groups will be the IGIP representatives in the program committee and responsible for the reviewing of abstracts. An equal number of SEFI administrative council members will also join this committee. The abstracts will be quite extensive: Two pages A4 with full references. This requirement may be a tool to enhance the discipline of the contributors.

According to tradition, this report ends with the individual reports of the working group chairpersons. They are listed here in the order of their arrival. Missing reports shall be published in the summer edition of the Report. From mid November on short reports shall be found on the IGIP homepage www.igip.org.

Last but not least I would like to thank my colleagues for their engagement and the support they have given to my efforts.

2 Reports of the individual groups

2.1 Curriculum Development

2.1.1 General remarks

The working group „Curriculum Development " exists at IGIP since many years. In the past at any congress we had many parallel sessions in this working group in the domain of curriculum development. This year again nine presentations were given in our working group at the conference in Tallinn.

2.1.2 Organization

At this year conference a first series of three presentations were planned for Monday, 19.9.2006 afternoon. The other presentations were announced for Tuesday, 20.9.2006. For all presentations the same time slot of 20 minutes was given. So 10-15 minutes were reserved for the presentation and after 5-10 minutes for discussion, asking and answering questions.

2.1.3 Topics

At this year conference we had the following main topics:
Practically all European countries are still involved in the Bologna declaration and the Bologna process. Many universities are right in the process of adapting their programs to the Bologna process. for these reasons as the year before in Istanbul we have again several presentations concerning the Bologna process.
In a second also important domain didactical questions and aspects are in the centre.
A third domain treats more fundamental questions about curriculum development in general.

.2.1.4 Results

2.1.4.1 General aspects

Generally working in our group was excellent. The working atmosphere was very good, the discussions were stimulating and genuine. It was never necessary to ask questions just to be polite! In any session we also had between 7 and 12 spectators. The embarrassing situation of a speaker without spectators never occurred!

Nevertheless and unfortunately I have to mention a negative point. The first session on Monday began with an awkward situation.
From all the three speakers announced in the program no one showed up and there was no excuse, no message at all. This situation was especially embarrassing, because right that day at the start of the sessions a guest from SEFI, Mr. Frederick de Graaf was present in our group.
Mr. Frederick de Graaf as vice president of SEFI and chairman of the SEFI working group "Curriculum development "was our guest. We managed this bad situation by an interesting and stimulating discussion in the foyer. So finally all the participants were satisfied about the motivating discussion we had.
Anyway: situations like this may never happen again.

- it gives a very bad reputation of IGIP as an organization
- it is very embarrassing for the organizer
- it gives a very bad impression to young, new members of IGIP

- it is very impolite to other participants or presenters
- it is extremely embarrassing, a catastrophe if you have guests from other organizations

The situation the next day was much better, but again there were two speakers missed without any excuse or message.
Realizing that other working groups had similar situations, we do all agree that the IGIP organization should find measures fort his problem.

2.1.4.2 Results of the presentations
Let's come now to the positive side of the conference. As mentioned already we had many interesting and stimulating presentations. All presentations which took place were of excellent quality and adequate to the domain of our working group. Also the discipline in respecting the time slots was excellent. As a chairman I never had the unpleasant duty of interrupting endless presentations!
1. We started with a presentation: „Developing ICT Supported Educational Modules for Environmental Problems" von Inci & Orhan Morgil, Ankara, Turkey
These modules are used to increase the students knowledge and awareness to environmental problems and aspects. In these modules the students were working in groups of three, treating a target question
2. The second presentation concerned the topic „Bologna: Struggling with ECTS" by Jean Pierre Steger, Bern , Switzerland.
This paper discussed interesting aspects and implications by adopting ECTS credits. How do we distribute ECTS credits? Can we change from an other grading system to ECTS? Should we use two systems in parallel?
3. The third paper concerned: „Strategies Implemented to Improve the Training of Engineering Technicians" von H. J. de Jager, Vanderbijlpark, South Africa
In this paper three different strategies and new teaching methods were discussed. Important aspects were criteria for visual, auditory and kinesthetic learners.
4. Paper number 4: „Applying learn Team Coaching to an Introductory Programming Course" by Christina B. Class, Lucerne , Switzerland
This paper described and introduced a new learning method, the so called "learn-team-coaching" and its application in an introductory programming course. A very interesting approach, which could be used in other disciplines as well.
5. Paper number 5: „Zur Möglichkeit der curricularen Verankerung des Arbeitens mit Projekten" von Ralph Dreher, Flensburg, Deutschland.
Working with projects is one of the most important approaches to realize independent, self regulated learning and doing.
This Paper showed in a stimulating way reasons and discussions about installing „Working with projects" in the process of curriculum development.
6. Presentation number 6: "Development of Creativity in the Engineering Education" von E. Rovida & F. Rosa, Milano, Italy.
In this presentation different ways, possibilities to increase the students creativity were showed, especially for designers but also other students.
7. Paper number 7: „Simulation of Engineering Systems in Mechatronics Curricula" von P. Noskievic, Ostrava, Czech Republic
This presentation was of a more technical aspect. It showed how to implement computer simulation in the curriculum of Mechatronics and explained the advantages to an experimental work with real equipment.

Once again: all the papers and presentations were really interesting, stimulating and of high quality.

As the chairman of this working group a say thank you again to all the speakers for their presentations and for the stimulating discussions.

Bern, 27.9.2006 Traugott Schelker

2.2 Languages and Humanities in Engineering Education

The working group Languages and Humanities has been consolidated over the last few years. Although its field is disfavoured as an element of engineering education in the context of the Bologna Reform, the interest in it has not diminished. As a constant, two main topics are discussed in the papers, which can be understood as regional trends at least to a certain extent.

The first one is more pragmatic. It deals with the solution of real problems. Here, questions of teaching English as a foreign language in technical universities dominate. Contributions mainly come from the Czech Republic and Russia.

English is, as far as I see, a clear must for all technical students. It is a university topic where the students do not bring along enough of it. Today, English is the language of science and technology, thus the students are well motivated. In the countries of the former East Block, English was no big topic. It was taught with the aim to make the students able to understand English scientific articles. By now, it is most important not just to have reading but also communicative abilities. Teachers involved with English work hard to produce good teaching material and learning facilities. The contributions of *Tatjana Polyakova* have been illustrating this for the last few years. This year, she presented the newest situation of foreign language teaching (not just English) in technical universities in Russia. There, the Bologna requirements are studied and applied very closely. She underlined the importance of combining language teaching with the introduction in the respective civilisation, and sees the need of connecting it with the criteria of the European language portfolio for all languages taught.

The colleagues from the Czech Republic show the same dedication for English teaching at their universities. In both countries, the students really appreciate this effort. *Jana Máliková* from Brno reported her experiences with e-learning in language teaching. A test run lead to surprising results, at least partly: the students are more interested in e-learning materials (like documents) than in interactive e-learning programs. The topic is to be pursued, however. *Dagmar Máliková* underlined the importance of professional writing skills for foreign language learning. In the past, the stress was on oral competence, yet, if you want to learn a language thoroughly, writing must not be neglected. In Brno, they have developed a writing course that combines e-learning tools with direct contact with teachers. The latter ones, *Dagmar Máliková* insists, cannot be replaced.

German as a foreign language is less discussed in this context. Yet, this year, *Ladislav Baumgartner* from Brno pointed out that in a country that has common borderlines with German speaking neighbours on two sides (and a long tradition of links to them), German language skills cannot be neglected. The interest in German language experienced a sharp decline with the introduction of the Bologna system. This is no catastrophe: The situation will balance itself. One problem he pointed out is that ECTS credits can be obtained without any relation to the actual level of a course. Here he touched the point *Tatjana Polyakova* has mentioned in her presentation.

The second main topic of the working group is the discussion of the position of languages and humanities in a technical curriculum. In the Tallinn sessions, this topic was a little less in the foreground than usual. Robert Ruprecht who usually discusses this point tried rather a pragmatic approach under the main question: Have I understood the bologna message well?

Bologna leads to the knowledge society. The simple learning approach is attractive for the students. In his own teaching tradition he put the stress rather on reflection. If students may not manage to establish the link between knowledge and understanding immediately, the teacher may not feel happy. Still, knowledge does not exclude understanding; thus we teachers may just learn to be patient.

An outstanding presentation to the second main topic was introduced by *Denis Baggi*. He set out from the provocative statement that there was nothing to say against mathematics and logic, yet their application was usually wrong. This, he illustrated with examples taken from art an music. His audience would have listened to him for a long time, yet, at the end they found themselves confronted with a question they do not want to hear from the students: How shall we apply this in our teaching? Or, as the students use to say: What is it good for? The underlying message of his presentation to find more creative ways of teaching technical topics shall be developed further in Miskolc, as one hears.

To the second group belonged the paper of *A. Válisova* and *H. Pálková* (Prague and Brno) about the problem of social competence in teachers in engineering. In this paper the well founded needs of the students and ways to satisfy them are presented. However, the paper was not presented. This is very regrettable. The advantage of the void lay in the opportunity of discussing questions that had come up during the other presentations.

What the group could not realise: A seminar about one of our topics. Yet, it was represented through its chairman at the Hamburg Regional Conference in March, where he reported about his first experiences with the Bologna system. However, Group chairpersons are not identical with the groups. The wish remains that the group forms an identity which transcends the core of active members. We were quite happy to welcome new participants as every year. In coming years the question might come up whether the group should not merge with groups of related topics. For this, a solid base would be very important.

Accidentally a colleague of the Tallinn technical university attended the last meeting of the group just after an attendant had expressed the idea that the local organiser's university should be more involved in the symposium activities. She had just heard of our session and spontaneously decided to take part.

Finally I would like to thank all the contributors for their very interesting papers and their discipline in sticking to the schedule. Special thanks go to Professor *Markku Makkula* from Helsinki who spontaneously accepted to stand in for me as a chairman in the first session.

Biel, 5 October 2006 Robert Ruprecht

2.3 Mathematics and Natural Sciences

2.3.1 Change in the chair of the working group

For the year to come, *Leo Gros* passes the chair to *Stefan Stankowski* (Berne University of Applied Sciences, Biel. e-mail: stefan.stankowski@bfh.ch). *Stefan Stankowski* reported for the working group in the final plenary session. He will be in charge for the year 2007.

After that year, *Leo Gros* and *Stefan Stankowski* will share the function of chairman according to their disponibility.

2.3.2 Results of the working group session

The Baltic States Estonia and Latvia were prominently represented in this working group, as well as Russia, Germany and Switzerland. Two Turkish contributions had been scheduled but the authors did not appear, without giving excuses.

The presentations held in Tallinn covered the whole didactic spectrum in the context of mathematics, physics and the natural sciences.

T. Schelker was concerned with the basic concept and the general vision of mathematics teaching. He pleaded for a systemic approach in mathematics. Systemic thinking is multi-dimensional and connected, in contrast to one-dimensional logics. In principle, this contribution has an impact exceeding the field of mathematics but playing a role also in other domains. A more profound analysis could analyse the degree to which systemic thinking should appear in mathematics teaching right from the beginning. Is it necessary to introduce mathematic concepts (or, more generally, formal concepts) by causal logics before going over to a higher level of increased complexity? Or should the multi-dimensional concept be presented right from the beginning?

L. Gros gave an engaged pleading for retaining traditional "wet chemistry" in forming chemical engineers. In the first place, careful work with solutions (titration, precipitation reactions etc.) is a prerequisite for the ability to do correct, reliable, conscious and responsible work in chemistry. Secondly, understanding of materials, reactions and a holistic view of analytical processes is favoured. Leo Gros documented his view by giving examples ranging from process analytics to space science.

S. Stankowski presented an "open" form of physics laboratory, especially suited for freshmen.
Various different experiments are done in small groups of students. The outcome is open, no particular result is expected to be obtained. The emphasis is on representation and interpretation of data. In this way, a culture of asking questions and trying out new ideas is laid down right from the beginning of the study. Formal modelling and the interplay between logical thinking and practical visualisation are given an important place. An extensive discussion followed the presentation, mainly about the question whether it was a good idea to expose students to problems before laying down the theoretical bases or if such a procedure was just ideal for motivating them.

A. Zeidmane presented in detail the organisational structure of agricultural studies in Latvia, with a special emphasis to the university's reaction to sinking numbers of students in the natural sciences. In her contribution as well as in the discussion to *Stefan Stankowski's* paper, she pleaded for study programmes where the different parts follow each other in a systematic way, building up basic knowledge step by step. Most important in any case is the formation of cognitive competences.

A. Soloviev reported about encouraging results with freshmen as a consequence of accompanying and advising future students already in the years before their admission to university. He demonstrated the success of such practice by the results of entrance examinations. Giving more attention to future students already at the stage of gymnasium or college is clearly an important aspect. It may be interesting to include it more extensively in discussions of university pedagogy. Of course, institutional obstacles may be high in various countries, but nevertheless a critical view on the preparation of our students should be useful.

Hans Eberhard Heyke, formerly at University of Applied Sciences Esslingen, was not able to participate at the symposium, but his ideas were presented by *Günther Kurz.* He critically considered the impact of the Bologna reform on natural sciences teaching, arguing that the solid foundation of knowledge and especially the interdisciplinary competencies in the different natural sciences were degrading. He proposes a model of supplementary studies comprising elements of mathematics, physics, chemistry, biology, medicine, mineralogy, environmental sciences and the history of science, under the name of the universal genius Leonardo da Vinci.

Matti Heinloo from Tartu, Estland, gave an extensive presentation detailing the use of mathematics software (MathCad) for discussing kinematical construction problems in mechanics. The software is modified in a way that allows students to solve problems and follow the movement of special systems in animated graphics.

Irina Shoshishvili from the South Russian Technical University emphasised the role of process knowledge in the technical formation. Students should learn to understand that scientific knowledge

does not arise by itself, but is related to information which has to be transformed into a technical process which in turn is the base for the generation of energy and extraction of raw materials. They in turn give rise to products that have to be transported.

In a contribution out of schedule, *M.G.Minin* from Tomsk reported on the organisation of tests and ranking. Regular tests combine domains with related contents. Questions are individually composed from a data bank and test understanding rather than simple knowledge.

In summary, the contributions offered an interesting overview across different aspects of teaching mathematics, physics and natural sciences. Some extensive and animated discussions continued even after the end of the official working group session.

The large spectrum of the contributions was stimulating, showing the various facets of didactical problems in the context of these disciplines. Of course, some similar problems also exist in other disciplines. However, the formal language of mathematics and natural sciences creates special situations and didactic needs, making it fruitful to discuss these questions specifically in the framework of the concerned disciplines. This justifies the existence of this particular working group. In addition, laboratory work has a special importance for physics and natural sciences.
On the other hand, the diversity of subjects treated in the sessions may also mean a certain danger of dispersing efforts. At the end of the working group session, we had discussed about lots of subjects, but without getting into a more profound analysis of any particular pedagogic theme.
The reason may also be that different countries have different organisation structures of their studies and are therefore concerned with different types of problems.
Nevertheless, it would be valuable to concentrate energies in a more focussed way.

Of course, there is no question of restricting subjects for forthcoming conferences in any way. The whole spectrum of didactics and engineering pedagogy should remain open for future authors and the possibility should always exist to discuss any open questions. In particular, new aspects which so far had remained outside the focus of the discussion are welcome.
Nevertheless I would like to propose, in an experimental way, that different authors might get into contact and agree to treat one particular subject from different points of view. Perhaps one or the other of the authors might envisage composing a contribution directly related to questions raised in the Tallinn conference, such as described in the present report. That would then allow giving the discussion increased continuity.

Leo Gros, Stefan Stankowski

2.4 International Aspects of Engineering Education

Our main goal is to discuss widely the International Aspects of Engineering Education in details, like globalization of engineering education and comparative studies, student mobility, etc.

Every year we have two or three sessions with 10 to 15 papers that show a wide variety of different matters concerning the formation of the new engineering in the different parts of the world.

This year we had two sessions with 10 papers from Brazil, USA, Austria, Russia, Kazakhstan, and Ukraine. All the works were very interesting and they showed the variety of approaches considering the formation of the engineer for the future besides the concern about the low number of students enrolling engineering programs. It seems that in every part it is an important issue and some propositions were presented in different formats.

Every year our group organizes three different International Conferences in South America, with more than 400 works. Science, technology and engineering education are some of the main topics that have received special attention from the different segments of society.

During the last one we had the presence of the former President of IGIP, Prof. Federico Flückiger and in the previous year the presence of the past President of IGIP, Prof. Adolf Melezinek as well as in several occasion the presence of Prof. Robert Ruprecht, Chair of Working Groups of IGIP, besides the presence of attendees from all five Continents.

Those who are interested in joining this working group please send e- mails to **igip@copec.org.br** , subject: IGIP – IAEE.

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Melany M. Ciampi

Remark
The missing reports shall be published in the next issue of the IGIP Report. From November 15th on, short versions of them can be found under the address www.igip.org