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IGIP—Engineers as Teachers

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This paper presents the aims, the structure and the scientific background of the Internationale Gesellschaft für Ingenieurpädagogik (IGIP)—International Society for Engineering Education

INTRODUCTION

THE term 'Ingenieurpädagogik' has become a 'terminus technicus' for a young scientific discipline which deals with the problems of teaching technology. The English translation used is 'engineering education', although it is not fully accurate.

At the occasion of the first engineering educational symposium in May 1972 at the University Klagenfurt the 'Internationale Gesellschaft für Ingenieurpädagogik—IGIP' (International Society for Engineering Education) was founded. Today the Society has members from 62 different countries, and consultative status with UNESCO and UNIDO giving world-wide acknowledgement.

The basic aim of the Society is to promote the scientific element in the education of engineers and technical staff, whom we define as all those actively employed in technical fields from skilled workers to engineering graduates. Another aim is to provide co-ordination and support for endeavours which further the education of technical staff, both in an international and Austrian context, as well as the development of our own initiatives in this field. Beyond that we should offer teachers of technical subjects a setting within which they can co-ordinate their professional endeavours in close contact with the industry of their countries. Moreover the Society should provide a forum for industry at which industry could make known its special interests to engineers who have come from industry and are now engaged in teaching.

The organs of the Society are the board (managing committee), the executive officebearers, the International Scientific Advisory Committee and the assembly. The managing committee consists of the president, the vice president, the treasurer, one deputy and the secretary. The managing committee is elected by the assembly for a 4-year term.

Working groups may be formed if at least five members of the Society—in accordance with the executive committee—agree to work on a certain project (theme, field of activity). At present the Society has the following working groups: People and Technology, Curriculum Development in Engineering Sciences, Working with Projects, Women in Engineering Jobs, Engineering Education in and for Developing Countries. Apart from these there are local IGIP working groups in the CSFR, in Hungary, in Sachsen-Sachsen Anhalt (former GDR) and in the UdSSR.

The scientific basis of IGIP is constituted by the Ingenieurpädagogik. A detailed description of this young scientific discipline is given in [1]; some information has also been given in [2]. As the scientific background is important and characteristic for our Society, a brief description will now be given.

THE SUBJECT OF 'INGENIEURPÄDAGOGIK'

According to its nature 'Ingenieurpädagogik' has pronounced interdisciplinary aspects (Fig. 1). The subject of 'Ingenieurpädagogik' is the scientific exploration and practical realization of the objectives and contents of technical disciplines as well as of the process in which subject matter is transformed into learners' knowledge by certain media under the influence of a certain sociocultural environment with the help of certain instructional methods [1]. 'Ingenieurpädagogik' is thus interested in all activities aimed at the improvement of teaching technology at all technical schools and institutions—from vocational school to technical university and industry's training facilities.

The 'Ingenieurpädagogical' approach, internationally sometimes called the 'Klagenfurter ingenieurpädagogische Schule'—Klagenfurt engineering educational school—[e.g. 3]. is based on the traditional philosophic–humanitarian pedagogy but accentuates strongly, starting from the specifics of the technical disciplines and of the engineers, the approach of cybernetic pedagogy, which is based on the term information with its quantitative measures and on the conception of the feedback control system. Figure 2 shows a simplified model of the educational process. 'Ingenieurpädagogik' thinks of education as a process which, such as any

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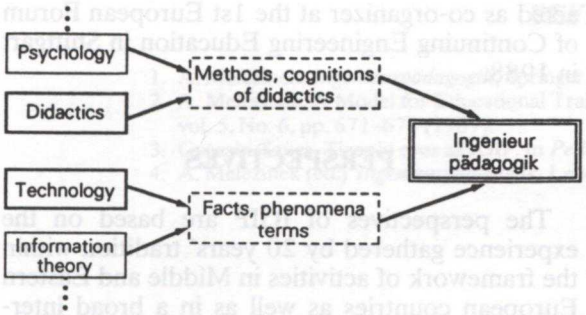

Fig. 1. Sources of 'Ingenieurpädagogik': the necessary technical knowledge is offered by the individual technical disciplines, e.g. mechanical engineering, electrical engineering, etc. The cognitions of pedagogy (didactics) are used for forming the according systems of knowledge for instruction and for structuring the educational units. Also the cognitions of other disciplines, such as psychology, information theory and cybernetics come into effect.

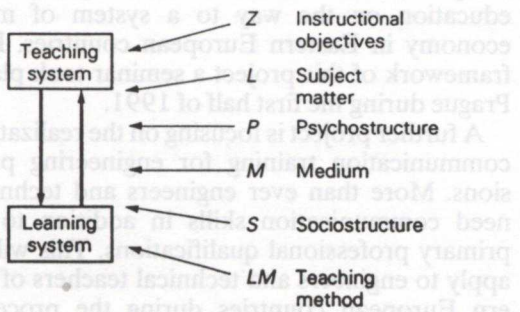

Fig. 2. Simplified 'Ingenieurpädagogical' model of the educational process: the educational process has two bearers—the teaching system and the learning system. Between these two information is passed, sometimes only in one direction (monodirectional), sometimes in both directions (bidirectional). The educational process is subject to certain regularities and in its course is influenced by a series of factors. These factors are: objectives (Z), subject matter (L), media (M), psychostructure (P), sociostructure (S) and teaching method (LM).

other, is subject to certain regularities and in its course is influenced by a series of factors.

The 'Ingenieurpädagogical' approach attempts to realize an integral way of looking at education in the sense of 'science and art'. It tries to connect the science of instruction and the teacher's art.

THE ACTIVITIES OF IGIP

The activities of the International Society for Engineering Education are among others documented in the book series 'Ingenieurpädagogik' edited by the author of this paper. The series by now consists of 26 volumes [4].

IGIP considers as one of its most important tasks supporting the co-operation of all people and institutions interested in teaching technology, and furthering the exchange of experiences. Therefore we organize an engineering educational symposium every year.

As already mentioned earlier, the first IGIP symposium took place in 1972 in Klagenfurt. Its general theme was 'Results and Perspectives of Engineering Education'. Thirty-three papers were read by experts mainly from Austria and Germany. The second symposium, 'Ingenieurpädagogik '73' had a general theme 'Engineering and how to Teach it' and also took place in Klagenfurt. Fifty-seven papers were read this time and their authors came not only from Austria and Germany but also from Switzerland, Czechoslovakia, Hungary, Poland, Yugoslavia and Sweden. The third conference, 'Ingenieurpädagogik '74', was carried out under the general theme 'Engineering Education and the Use of Computers'. This time we also listened to speakers from England, France and the United States. For the first time we left Klagenfurt and met in Salzburg at the 'Interpädagogica', a special exhibition for education and further education. Our meetings became more and more successful each year. 'Ingenieurpädagogik '75' was held in Klagenfurt again and had the general theme 'Advances in Engineering Education'. The fifth conference, 'Ingenieurpädagogik '76' took place at the occasion of the centennial anniversary of the Höhere Technische Lehranstalt in Graz. That year's general theme was 'Engineering Education—Problems, Findings, Perspectives'.

The positive response to our engineering educational symposia as well as the obvious need for more communication and exchange of experiences in the field of technical training were the reasons for towns from abroad to apply as conference sites. 'Ingenieurpädagogik '77' was the first meeting to take place abroad. We accepted the invitation of the International Centre for Advanced Technical and Vocational Training and organized our symposium in Torino. The general theme was 'Learning how to Learn in Engineering Science'.

In June 1978 the symposium 'Ingenieurpädagogik '78' took place in Klagenfurt, this time within a whole scientific week 'Education in the Technical Era'. In 1979 we were again invited abroad and held our 'Ingenieurpädagogik '79' under the general theme 'The Teaching of Technology at Universities and Colleges' at the Eidgenössische Technische Hochschule in Zürich. In 1980 we took the centennial anniversary of the Höhere Technische Lehr- und Versuchsanstalt Wien I as an opportunity to organize a meeting in the capital of Austria. At this meeting the central point of interest was 'Engineering Education in Senior Technical Schools'.

Our tenth and thus 'Anniversary' Symposium we of course held in Klagenfurt at our university. We could have used this opportunity to look back at the achievements of the past, but we thought it better to turn toward the future and placed the conference under the general theme 'Engineering Education'—Prospects for the Eighties'. At the 'Ingenieurpädagogik '81', 86 papers were read and discussed by people from all over the world. Experts not only from Europe but also from

further afield (U.S.A., India, Tanzania, etc.) were present.

In 1982 we went abroad again and organized our meeting in Ulm. This time attention was paid to 'International Education of Engineers'. The twelfth symposium, 'Ingenieurpädagogik '83', took place in Villach at the Höhere Technische Bundeslehr- und Versuchsanstalt' which in that year celebrated its 100th anniversary and the topic was 'Technology and Environment'.

'Ingenieurpädagogik '84' with its focus directed toward 'Transfer of Technology—Cooperation in the Service of Mankind' was held in Berlin (West) and at this occasion educational institutions, representatives of economy and many developing countries exchanged their experiences.

In order to discuss the results, problems and perspectives of engineering education as regarded from West and East we chose an Eastern European country as conference site in 1985. Technical University Budapest and the Hungarian Education–Technological Centre OOK have invited us to Budapest and there 'An International Comparison of Modern Engineering Training' was the general theme. It was a great success. One hundred and twenty papers were read; the proceedings comprise 800 pages. (The papers of all conferences were published in the book series 'Ingenieurpädagogik' [4].)

In 1986 our topic was 'Media and Technology' and once more we met at Klagenfurt for the occasion. Within this meeting the workshop 'Didactic Methods in Preventive Maintenance Training' initiated by UNIDO and UNESCO took place. In Portorose, Yugoslavia, we organized the conference in 1987 and placed it under the general theme 'Information, Technology and Society'. The next symposium took place in Basle in 1988. We were very much honored by the invitation of Worlddidac to carry out the symposium at the occasion of the world's biggest Education and Training Exhibition 'Didacta'. The topic 'Technology—how to teach and how to learn it' together with the exhibition offered an effective combination of theory and practice. In 1989 we held our symposium in Munich. The general theme was 'Technology and Human Life'. In 1990 our symposium 'Engineering Education 2000' took place as an integrated conference with ASEE and IEEE. The meeting places were Vienna and Budapest, about 500 leading experts participated. Our 20th International Symposium on Engineering Education '91 took place at the University of Technology in Dresden from 11 to 14 September.

As an example of the many further activities of IGIP we were involved in the co-organization of the 1st World Conference of Engineering Education in Cologne in 1984 as well as in the 2nd World Conference in Sydney in 1989. Furthermore we acted as co-organizer at the 1st European Forum of Continuing Engineering Education in Stuttgart in 1988.

PERSPECTIVES

The perspectives of IGIP are based on the experience gathered by 20 years' tradition within the framework of activities in Middle and Eastern European countries as well as in a broad international field. For example we may mention some of the activities already planned for the future.

Based on the request of the rector of the Czech Technical University in Prague and corresponding to the wishes from other Eastern European technical universities we are working on a project to support the modernization of engineering curricula. This project shall work out orientations and design recommendations concerning engineering education on the way to a system of market economy in Eastern European countries. In the framework of this project a seminar took place in Prague during the first half of 1991.

A further project is focusing on the realization of communication training for engineering professions. More than ever engineers and technicians need communication skills in addition to their primary professional qualifications. This will also apply to engineers and technical teachers of Eastern European countries during the process of change to a market economy with regard to European compatibility. With support from the Austrian Federal Ministry of Science and Research, an initial seminar for university teachers from the Czech Technical University in Prague was organized in Austria in 1991. Expanded seminars are scheduled for 1992.

Of course, we will continue to organize annually our international Engineering Symposiums. The next Symposium, 'Engineering Education '92', will be held in Klagenfurt in September 1992, the 'Symposium '93' in Esslingen in September 1993, and the 'Symposium '94' probably in Czechoslovakia in September 1994.

In conjunction with the International Liaison Group on Engineering Education and with FEANI and SEFI we will organize the 4th World Conference on Engineering Education 1995 in Vienna/Budapest.

IGIP and other similar organizations have done a lot of important and commendable work so far. For the future I imagine that an even closer and more systematic co-operation between all the organizations dealing in the field of teaching technology will result in more advances towards the achievement of our common objectives. Our Society is interested in such a constructive worldwide collaboration.

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