GIREP newsletter

Groupe international de recherche sur l'enseignement de la physique
International Research Group on Physics Teaching
Internationaler Arbeitskreis zur Förderung des Physikunterrichtes

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PHYSICS EDUCATION IN AUSTRIA

1. Types of secondary education and Physics

In the lower secondary branch (class 5-8, S I) of the Austrian school system there are 2 streams: Hauptschule and Gymnasium. The wording of the corresponding syllabuses is identical, but the aims are different. Pupils from Hauptschule enter apprenticeship after class 8 to become skilled workers or start working as unskilled workers after completing one further year of obligatory schooling, or continue in one of the branches of upper secondary education. Pupils in the gymnasium types of schools either continue their upper secondary education (S II) in the same schools (class 9-12), or they go to technical/business schools (class 9-13). (Also good pupils of Hauptschule are allowed to enter upper secondary education in a gymnasium or a technical/business school). They finish their studies with a final examination (oral and written) called Matura. Matura is the only entrance requirement for studies at university. In S I there are 2 physics lessons a week in each of classes 6-8, in classes 9-12 a total of 7-10 physics lessons per week.

2. Syllabus

The syllabus concentrates in its formulation on aims which should be achieved by pupils. With respect to content it describes a framework. Teachers are allowed and encouraged to make choices, to spend more time on topics they consider important, of special interest to their class or just timely. Unfortunately, these excellent features of our syllabus are not well known, and too often, teachers cover the whole text book in the same depth (or shallowness).

Despite a reform 2 years ago, the next reform is under way. The prescribed material will apparently be reduced to the „essentials“ (whatever politicians think they are). Teachers will have to define their own syllabus. (I am very sceptical about this approach.)

3. Experimentation in School

Schools are rather well equipped with experimental material (there is a century long tradition for that). Two major innovations have been carried through recently: Every school has at least eight full sets of material for pupils’ desktop experiments (and in many schools they are used) and every gymnasium has been given a PC with a high quality data acquisition system for classroom use (still more used by teachers than by pupils). There has also been emphasis on alternative teaching methods since the traditional frontal presentation is no longer valued by the pupils.

School autonomy makes enhanced science courses with additional (lab) hours possible - but other fields of study have then to be reduced. On the other hand school autonomy leads in some schools to a reduction of the science content of the curriculum (there is strong public emphasis on foreign languages!).

A substantial number of teachers (esp. when their major field of study has not been physics) is reluctant to use experiments during their lessons. This is a constant concern for teacher educators and for the inspectorate.

4. Quality

Quality of science education in school, esp. in S I, seems to be better than perceived by the public. The recent TIMSS study, a comparison between typical pupil populations in more than 40 countries, ranked our pupils in the age group 13-14 at the 8th place among 39 states.

Austrian teams participate in the International Physics Olympiads since 1983. Their scores were always in the middle field.

5. Teacher education

Teacher students study at a teachers training college for Hauptschule, at the universities for gymnasia. The former education is more practical, there is much work in schools, but the science content suffers. At university it is the other way: Only since 10 years, teacher students have to spend some time in classroom and give lessons. A forthcoming reform of the teacher education at university moves the teacher studies one or two steps away from the professional studies towards pedagogy.

Inservice training is provided by special institutions and by private (and also teacher) initiatives. The emphasis has shifted from updating the subject knowledge to updating the general pedagogical methods.

5a. A special program of INSET

At the GIREP meeting in Ljubljana I reported about the advanced 2-year course: „Pedagogy and subject related didactics for teachers“. It aims at the professionalisation of the teacher by reflection and by evaluation of the effects and side-effects of changes in the own teaching.

6. Professional associations for physics teachers

The Austrian Physical Society (consisting mainly of physicists in university and industry) has a teachers branch and organizes during its yearly meeting a teachers' day with an INSET program. Last years teachers' day concentrated on the transfer of modern physics to school for increased attractiveness of the schools.

By teachers' initiative the „Verein zur Foerderung des physikalischen und chemischen Unterrichts“ has been founded already in 1895 and serves presently more than 1000 members (out of 1700 schools). It organizes every year since 1947 a whole week of lectures and seminars for physics and chemistry teachers. The Week is attended by about 500 teachers each year despite the fact that it takes place during school period and the recent budget cuts discourage the participation of teachers.

There are 2 journals for physics teachers*: Wissenschaftliche Nachrichten*, sponsored by the Ministry of Education, covers besides physics also mathematics, chemistry, philosophy and geography. *PLUS LUCIS*, the journal of the „Verein“ is intended for communication between physics teachers and covers more practical aspects.

More information may be obtained from: Helmut Kühnelt, Institut für Theor. Physik, Univ. Wien, Austria, e-mail: Helmut.Kuehnelt@univie.ac.at

A FEW REMARKS ABOUT TEACHING PHYSICS IN POLAND

In the very moment it is difficult to speak about physics teaching in Poland because we are now at a very unstable point, even at a turning point in all respects. It is really very hard to predict in which direction situation in education will develop.There are loud goodwill declarations and promises made by changing governments and appropriate ministries of education. They promise a radical change in education, to make it worthy of the XXI century. Only small steps, usually very provisory, are undertaken. Some committees are working on reform of education and on new curricula.

To begin with, let us describe the inherited situation. After the second world war, although the country was very poor and ruined and the political system was wrong, physics education and science in general was appreciated. Among many subjects taught in schools science was immune to ideology. Physics was obligatory subject in elementary school (grades 6 - 8, which means three years) and in high school (grades I to IV, which means four years). The teaching hours were not symbolic. They varied, and there were some reforms in the meantime, but there were never less than two hours per week in all this seven-year period.

Schools were poorly equipped with old instruments, but a number of interschool laboratories existed which later were very much criticized for not being creative enough. Under such conditions teachers nevertheless did their best. Physics was considered a difficult subject, but also a prestigious and highly estimated subject. Students participated in Olympic Games in Physics and the best students chose to study physics. Poland together with Hungary proposed and organized International Olympic Games in Physics. Our students used to win first prizes. Dr Waldemar Gorzkowski from Warsaw is now President of the Commitee of International Olympic Games in Physics. The universities were full of excellent students and Polish physics rapidely developed. We "exported" a number of very good phycists.

The key person in this success story were physics teachers. In majority they had university education (78% in 1992) and teachers' colleges, a kind of professional high school for elementary physics teachers. This type of school was founded to educate a large number of teachers for elementary schools. Later it was changed and the requirement for every teacher was to have university education (master degree). One can say that in general Polish physics teachers had reached a rather high level. But, even with these good teachers, the majority of students considered physics difficult.

Today physics teachers for high schools are educated in universities and pedagogical universities. At a classical university students study physics and have extra pedagogical and methodological topics. In pedagogical universities there is less physics and more pedagogy and methodology. Future teachers in elemetary schools are recommended to have the same study as high school teachers, but they have possibility to study only 3 years in a kind of college. During their studies students have practice in both kind of schools. They receive the tittle not of *magister*, but of *licencjat*. During their studies students have possibility to master computer programming, modelling and perform experiments on line with computer.

The above description of education of Polish physics teachers looks very optimistic, even bright. But unfortunately it is not transmitted to the level of physics teaching in our schools. Why is it so?

Because of very popular antiscientific trends and demands for so called *humanization* of the education, teaching hours of physics, as well as mathematics and other sciences, are rapidly dropping. To illustrate it: in the seventh grade, i.e. at the begining of

physics education, teacher can have to his/her diposition only ONE teaching hour per week! In high schools physics is obligatory only in the first two grades, and also here in a symbolic dimmension. Even the best teachers can do very little.The old school equipment is ruined, new one is very expensive. Dust covers physical instruments, because teachers have no time to use them. The school administration is willing to spend a lot of money on computers, but not on physical instruments and books. Also, parents want their children to know languages, economy and computer manipulation, eventualy tennis. The administration and the politicians are listening to the *vox populi*.

To be a physicist no longer offers a lot of extras, like prestige, money, freedom of travelling. All this can be gained in other fields, to begin with in bussiness.

One can think therefore, that the perspective of physics education looks very dark. Amazingly enough, this is, however, not the case. On this black background there are some bright spots. There are many enthusiastic teachers who encourage their students for physics. There are local and global competitions. Students experiment after normal school lessons, perform even some real scientific investigations. We also had winners of international competitions of different kinds, e.g. very recently the team of Polish girls won the first price in the International Tournament in Gruzja.

Polish educational system depends very much on the political evolution in our country, and on the literacy of society. Let us hope that we are going in the right direction.

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A GALAXY OF PHYSICS EDUCATION MEETINGS

A rare coincidence of five physics education related meetings took place in College Park, MD, USA, from 31 July through 10 August 1996.

Leading the list was a meeting of ICPE/IUPAP – the International Commission on Physics Education of the International Union of Pure and Applied Physics. General information about IUPAP and its commissions can be found on its Web page at http://www.physics.umanitoba.ca/IUPAP/ and information about ICPE and its activities can be found on its Web page at http://www.physics.umd.edu/ripe/icpe/

ICPE publishes a *Newsletter* twice a year with information about physics education activities, conferences and projects around the world. Physics teachers interested in receiving the *Newsletter* should write to the Editor, Prof. E. F. Redish, Department of Physics, University of Maryland, College Park, MD 20740 USA, or contact him by e-mail at: redish@quark.umd.edu

Following ICPE was the ICUPE meeting, The International Conference on Undergraduate Physics Education. With about 300 participants from many countries around the world, this conference examined the changing role of the physics department in modern universities. The program focused on three types of students: (1) Physics majors, (2) Other scientists and engineers, and (3) Teachers; and on three sets of issues (1) the changing goals of physics courses, (2) the impact of physics education research, and (3) applications of modern technologies to physics education. In addition to the plenary sessions, there were parallel sessions, poster sessions, and Sample Classes in which conference participants were able to experience how the classes in a variety of new courses and instructional methods are actually taught. The complete program and abstracts for the

conference are available on a Web site: http://physics.umd.edu/~inted/ The Proceedings of the conference are to be published by the American Institute of Physics.

More than 1300 participants attended the 65 sessions of the annual Summer Meeting of AAPT (American Association of Physics Teachers) and the many workshops that were held from August 5 to August 10, 1966, and which covered an extremely wide variety of topics of interest to physics teachers at all levels. The AAPT Web site at http://www.aapt.org/ provides access to the programs and abstracts for this meeting and for future meetings of the AAPT.

Two other AAPT related meetings also occurred during two weeks . There was a week long series of workshops attended by over 150 highschool teachers of physics who are members of the Physics Teaching Resource Agents (PTRAs) The PTRAs are a group of highschool physics teachers who attend these workshops and then return to their homes and conduct workshops for other physics teachers in their own localities. This networking has been very effective in bringing new developments in physics education to teachers who might not otherwise have and opportunity to learn about them.

The first national meeting of the TYC21 group (Two-Year Colleges in the 21st. Century) brought together those who teach physics in the many two-year colleges in the USA. Information about the PTRA and the TYC21 meetings and activities is also available at the AAPTP Web site at http://www.aapt.org/

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ESERA

In April 1995, at the European Conference on Research in Science Education held in Leeds, England,.a new association was formed: ESERA (European Science Education Research Association).

The aims of ESERA are "to enhance the range and quality of research and research training in science education in Europe, provide a forum for collaboration in science education research between European countries, represent the professional interests of science education researchers in Europe, seek to relate research to the policy and practice of science education in Europe, foster links between science education researchers in Europe and similar communities elsewhere in the world".

Membership of ESERA is open to researchers in science education from anywhere in the world and doing research in all aspects of education in respect of the natural sciences (to include: physics, chemistry, biology, earth science, general science, and applied science) for learners of all ages.

At this moment, two activities are the core of the communication and co-operation between ESERA members: a Conference and a Summerschool held every two years alternatively.

Summerschool is a training activity involving Ph. students from different Universities presenting their research in progress and offering it up for discussion. Some experienced reseachers are present in the SS giving some talks and workshops but specially offering their support to young researchers, stimulating discussion and assisting them in their reflections.
The Conference of the Association is an open Congress where researchers present their research in Science Education and discuss about its methodology.

An important objective of the ESERA is to establish personal ties which help the communication between European researchers in this field. In that sense it was established a forum to disseminate information and exchange views on research issues, policies and

practices regularly. A home page and an electronic letter ESERANEWS is running taking advantage of the accessibility that Internet provides.
(http://na-serv.did.gu.se/esera/esera.html).

The Executive Committee of ESERA is composed by: Professor Dimitris Psillos, University of Thessaloniki, Greece as President, Dr. Philip Adey, King's College, London, UK as Secretary, Professor Piet Lijnse, University of Utrecht, The Netherlands as Treasurer and Dr. Björn Andersson, University of Göteborg, Sweden, Dr. Silvia Caravita, Istituto di Psicologia del C.N.R., Italy, Dr. Maria Pilar Jiménez Aleixandre, University Santiago de Compostela, Spain, Professor Laurence Viennot, University D. Diderot, Paris, France

Ths statutes of ESERA association establish: "ESERA is a good opportunity to enhance specifically the research in Science Education and to cooperate with other associations whose aims are close to it".

So, my personal hope is that we will be able to see an excellent cooperation between GIREP and ESERA. Physicists around the world interested in teaching, in doing research, in going deeper on which Physics to teach or in its adequate present approach will find a good way to collaborate.

Roser Pintó
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INFORMATION ABOUT CONFERENCES

Hands-on Experiments in Physics Education

The next regular GIREP Conference 'Hands-on Experiments in Physics Education' will be held August 23 - 28,1998 in Duisburg/Germany.
Simple and easy to perform hands-on experiments are an important part of physics teaching. For all levels of experience (Kindergarten, school, university, science centers, home experiments) and for developed and developing countries there are appropriate hands-on experiments and toys relating to physics that can create motivation and interest. Elements of modern museum and exhibition didactics are closely related to this topic. There is extensive literature (books, publications etc.) where you can find either the physical theory or educational aspects concerned.
The conference will include experimental and theoretical lectures, panel discussion, posters, video presentations, workshops and an exhibition of experiments and toys.
The main group of participants will be teachers (school to university).
Further information will be published in the next newsletters or can be obtained from C. Ucke (Technical University Munich, Physics Department E 20, D-85747 Garching, e-mail: ucke@e20.physik.tu-muenchen.de).

Physics and other Sciences

The Executive committee of GIREP has approved the idea of a working colloquium devoted to "Physics and the other Sciences" to be held at the Hessisches Institut fuer Lehrerbildung in Weilburg (BRD) from August 31st to September 4th, 1997. The opening ceremony will be held in the evening of Sunday August 31st; September 1st to 3rd will be reserved for introductory lectures and work in small groups whilst Thursday 4th will be open to teachers and resource persons.
The subjects treated will cover Astrophysics, Biophysics, Geophysics, Environmental and Materials Sciences.
Further details can be obtained from:

Dr. G. SAUER, Hessisches Institut für Lehrerbildung, D-35781 WEILBURG, Germany; tel: +(49 6471) 328 46; Fax: 328 50, e-mail: g.sauer @ tulpen.gi.he.schule.de

Creativity in Physics Education
International conference on physics teachers, 19-23 August 1997, Sopron, Hungary
homepage http://hercules.elte.hu/creativity.html
Further details can be obtained by George Marx, Department of Atomic Physics, Eötvös University, Puskin utca 5, Budapest H-1088, Hungary, fax 36-1-2660206

GIREP CONFERENCE 1996: NEW WAYS OF TEACHING PHYSICS

GIREP conference 1996 is still on the GIREP www page **http://www.pef.uni-lj.si/~girep;** there you can still read all abstracts and get an overview of what was going on. On the other side, the Proceedings are being prepared. So what should the organiser report about the conference when all the facts are already known? That it was much work, but also much fun because of so good cooperation of people from the countries all over the world, and of Slovene team as well? I think that this is the most important message of such a conference: it is a meeting of enthusiasts who like to tell about their work and show what they are doing, and like to listen and look to and try what others are doing in the same field. The loveliest moment of the conference, for me, was to listen to the choir singing the song Margaret Cox has prepared; it was a confirmation that people felt well, at ease and happy. And every effort was worth of that feeling.

Seta Oblak

GIREP CHOIR - It is a long way to changing Physics!
Dedicated to Seta Oblak and the Conference organising committee

Composers:
Margaret Cox (Choir Leader)
Laurence Rogers (Musical Director)
Roman Dengler & Jan Dunin-Borkovsky

Choir song - 1 - To the tune of: "It's a long way to Tiperary"
Verse 1
It's a long way to Ljubljana
It's a long way to go
There are new ways of teaching physics
To change the ways I know

Farewell to the blackboard
So long to the chalk
Hello Web and multi-media
It's the right way to walk

Verse 2
Many nations bunch together
Where particles go uphill.
There's energy concentrated
And the changes will overspill.

Workshops, panel sessions,
Many languages to know.
Every change is driv'n by differences,
So this way is right to go.

Song 2 - to the tune of "Pack up your troubles in your old kit bag."

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FEES

The accounting year runs from January 1 to January 1. Fees paid after September in any year will be credited on the following year, unless the applicant specifies otherwise.

The current fee (1996) is 12 GBP (GBP = British Pounds Sterling) or USD 18, preferably paid into the following account:

Christian Ucke, Postbank (GIRO) Muenchen, Account No. 355 28-808, BLZ 700 100 80.

BLZ (= Bankleitzahl) means a special sort of code for the Postbank in Germany.

Please do not pay into other accounts.

The members should pay their own bank charges and mailing costs. At the same time, please send a note (by letter, fax or e-mail) to the Treasurer, confirming how much money you sent and when and for what years.

In some countries, it is possible to transfer money from the national **Post**bank with EUROGIRO free of charge (Belgium, Germany, Japan, Luxembourg, Switzerland, Spain) or with a small charge (Denmark, Finland, France, Great Britain, Netherlands, Austria, Sweden).

If you send a EUROCHEQUE filled out in DEM, there are no expenses at all for the Treasurer. If you send a cheque filled in your local currency, there are DEM 3 expenses for the Treasurer. Please do not send cheques drawn on a bank from your country (except UK) but filled out in GBP (horrible expenses then).

It is also possible to pay by credit card (EURO-/MASTERCARD or VISA; no others). Please write or fax to the Treasurer your full card number, expiration date and the amount. Add 5% expenses to the amount. The Treasurer will convert that amount into DEM and then charge your credit card account in DEM. It is not recommended to use e-mail for sending credit card numbers.

If you prefer to reduce bank expenses, you may pay several years fees in advance.

In cases of real difficulty to arrange payment, please contact the Secretary or the Treasurer who are ready to advise whether special arrangements can be made.
The last General Assembly of GIREP members in Udine (August 1995) accepted the following supplementary new article for the GIREP statutes:
Each year in October, those members who have not paid for the previous two years will be removed from the membership list.
Italian members: There is no more special arrangement for Italian members because of the new possibilities.

GIREP HOME PAGE: http://www.pef.uni-lj.si/~girep