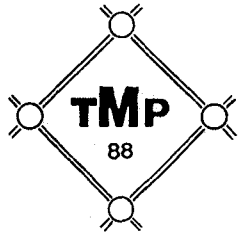
International Conference

TEACHING MODERN PHYSICS

– Condensed Matter –

Universität München,
September 12th – 16th 1988



PROCEEDINGS

EDITORS: K. Luchner and
H. Deger, R. Dengler, R. Worg

World Scientific
Singapore • New Jersey • London • Hong Kong

Published by

World Scientific Publishing Co. Pte. Ltd.
P O Box 128, Farrer Road, Singapore 9128

USA office: World Scientific Publishing Co., Inc.
687 Hartwell Street, Teaneck, NJ 07666, USA

UK office: World Scientific Publishing Co. Pte. Ltd.
73 Lynton Mead, Totteridge, London N20 8DH, England

INTERNATIONAL CONFERENCE ON TEACHING MODERN PHYSICS—CONDENSED MATTER

ISBN 9971-50-923-7
ISBN 9971-50-960-1 pbk

Printed in Singapore by JBW Printers & Binders Pte. Ltd.

WORKING-GROUP 6

NON-FORMAL EDUCATION

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Abstract

Non-formal education covers a wide variety of contexts, providers and potential learners. This working group looked particularly at the provision, and availability of resources to support all types of non-formal education and at problems and possibilities in the arena of the public awareness and understanding of science.

1. Introduction

Non-formal education covers a range of situations as diverse as professional scientific and technical updating by distance education and popular reportage of progress in scientific research and development by the media. It caters for all ages and for the needs of learners at a variety of levels. Its provision is the responsibility of many different types of educators. Because of the breadth of this area our working group faced a difficult task in focussing on specific topic areas in condensed matter physics for a particular learning situation. Our work was necessarily discursive but we concentrated on two main areas - the provision of, and access to, a wide variety of resources that enhance non-formal education of all types and problems and possibilities in the area of public understanding of science.

2. What is Non-Formal Education?

A simple definition seems impossible but we were able to delimit broad categories.

- Open and distance learning systems at all levels, although these may be part of formal structures of accredition for academic or vocational qualifications.

- General access learning opportunities such as science museums, and exhibitions, scientific toys and games, theatre, and educational broadcasting.

- Non-mandatory or non-credit bearing courses within formal education.

- All aspects of information, and understanding about science for the public and of the promotion of scientific literacy.

Common to many of these are the exploitation of innovative means of teaching and learning and also the need for access to a wide variety of resources and technologies.

Obviously the degree of commitment of a learner in any of these situations will vary tremendously. For some it will be a long-term undertaking, for many just the occasional excursion. Nevertheless if learning outcomes are to be successful, the frameworks for learning must be carefully structured and supported. We identified three important aspects of the provision of any non-formal education context.

(i) Aims - the definition of the subject content in terms of what people need to know and how, in their situations, they can best learn.

(ii) Approaches - the exploration of appropriate methods of presenting subject content for different purposes.

(iii) Access - the recognition that non-formal education needs to be readily and easily accessible.

3. Some Perceived Problems

There was considerable interest among school teachers in the group in developing the possibilities of non-formal education. They saw a need to reduce the separation between school learning and everyday life and for much more connection between physics and other subjects and for collaboration with teachers of other disciplines. They were looking for ways of stemming the loss of interest and dissipation of curiousity which often seems to occur in formal courses. To do this requires a greater access to non-conventional approaches and methods of presentation and also to a wide range of resources.

Some also expressed a need for subject updating and guidance about what is currently important and stimulating in particular areas of physics. Meeting these needs has considerable implications for the in-service education of teachers, itself an important area of non-formal education.

We agreed that science is an important element in our culture - at least in the parts of the world we represented, Europe and North America. Consequently we want some understanding of science to be much more accessible to most people. We were concerned that the distance between science specialists and the layman is very great and that scientists often give the impression that they are happy that it should be so. We wondered what might be essential areas of condensed matter physics that everyone should know about, what level of understanding should be aimed at and how we could best 'sell' this knowledge.

4. Resources

Each non-formal education context needs teaching and learning materials that are structured specifically to meet the aims of that context, using appropriate methods of presentation and being easily accessible for the intended learners. A common concern in all contexts is a need for suitable resources. We felt that it was not necessary to create everything from scratch because a great deal is already in existence. It was not clear how we could find out about such resources and how, or indeed if, they could easily be made widely available. Despite the wealth of material already available we thought it likely that many people would need to identify other things they needed or would like and would need help to fill the gaps.

The varieties of resources we looked at included TV, video and videodisc; museums and exploratoria with 'hands on' exhibits; games; drama; work on promoting the public understanding of science; and good relationships with, and advantageous use of journalistic media.

One way forward that was agreed was for the group to act as a network for the exchange of information on resources. This, while a helpful beginning, was not deemed sufficient. We would hope to persuade an international body to produce a catalogue of resources which included not only listings but some evaluation of what was available.

Material prepared by commercial institutions appears widely available but we learned of difficulties experienced by some colleagues in obtaining such material, for instance in Eastern Europe. The availability of materials prepared in educational establishments seemed possibly problematic because of issues of ownership and copyright. Such difficulties are not insurmountable but to overcome them will probably require international co-operation by bodies of national standing. If a group of practitioners such as ourselves were to act effectively as a resource network we would need the backing of an organisation such as the European Physical Society.

5. The Public Domain

We then turned our attention to the wider knowledge and understanding of science. Our thoughts about the flow of information to the public were stimulated by a description of the difficulties experienced in interesting the press in this particular meeting. We felt that much of what had been presented to us would have been of considerable general interest.

5.1 Journalism

The lecture by Brian Schwartz on high temperature superconductivity had shown us how, in some circumstances, the world clamours for information. We felt disappointed that this meeting was unlikely to reach a wider audience and we wondered what we might have done to improve that situation. It was suggested that we might arrange to use such a meeting as a chance to learn more about the scope of journalism and the work of journalists. We might then have a better understanding of what sort of information to provide and how to present it. Perhaps we might work with a journalist during the duration of a meeting to produce a daily press release and to organise suitable interviewees and material for local radio or television.

5.2 Television and Video Programmes

We noted that there are excellent television programmes designed for the explanation and popularisation of science and scientific and technological developments. We also noted that such programmes which dealt with biological topics are often available, and selling as videotapes but such did not appear to be the case for those dealing with physics topics. We asked ourselves if we, as a group of scientists, wanted to make televison or video programmes would they be different from those made by television

companies. Some of our aims would be to entertain and provide something to talk about over morning coffee; to share knowledge of things we found interesting; to diminish people's fear of science and the future they see it creating; and to distinguish between what science can and cannot do. These are probably close to the aims of many television producers working in this area but maybe rather different from some of our main aims as science educators in other fields and consequently perhaps more difficult for us to approach initially.

6. Conclusion

The breadth of the area covered by this working group meant that the production of detailed teaching materials for a specific context was not possible. Rather we looked at what we wanted to achieve in several areas and how we might best go about it. We also gathered together a range of sources of support, ideas and materials for future work in non-formal education. These are detailed in the appendix. We hope individually, and in collaboration, to pursue these ideas further and that some of our conclusions might stimulate work in other arenas.

Appendix

This appendix is illustrative of the sort of resources in which the group were interested. It contains examples of things known to members of the group.

Science Museums and Exploratoria

Many of these have their own literature describing exhibits and linking them with simple experiments to do at school or at home. 'Launch Pad' at the Science Museum, London publishes an accompanying book which contains information, things to do, a quiz, puzzles and home experiments.

Similarly - 'Hands-on Science: An Introduction to the Bristol Exploratory' Richard Gregory, London: Gerald Duckworth (1986).

Reviews of many of these centres are becoming available.

'Interactive Science and Technology Centres' Stephen Pizzey, London: Science Projects Publishing (1987) (worldwide coverage).

'Interactive Science Centres' - a report by Alan Sutton available from the Institute of Physics, London (European coverage).

Theatre

Molecule Theatre: a theatre company based in London which takes plays based on science concepts, and aimed at 7 - 12 year olds, around the United Kingdom. Topics have included energy, magnetism and current electricity. It also stages Molecule Discussions - discussion lectures for 13 year olds and upwards on important scientific issues of the moment. 1988 topics include superconductivity, genetic engineering and world food resources in the next century.

Distance and Open Learning

This is becoming widely available at many levels.

For example: a course on condensed matter physics at undergraduate level 'The Physics of Matter' from the Open University, U.K. In association with this course but available separately is a videodisc which contains four substantial problems on the theme of water. (For further information contact Physics Department, Open University, Milton Keynes, U.K.)

Television and Video

There is a wealth of such material available. Some can be purchased, some is produced for educational purposes and can be used in educational contexts under certain circumstances. Conditions of use vary from one provider to another and from country to country. Information can be obtained directly from television companies, and from videotape distributers.

Catalogues of available material, reviews of content and usefulness, and even videotape loan services, are provided by organisations such as the Institute of Physics (U.K.), Association for Science Education (U.K.) and the American Association of Physics Teachers (U.S.A.)

Learned Societies and Professional Bodies

Such organisations are much concerned with the promotion of science in all areas. They often have considerable resources which can be tapped and have the advantage of bringing together the spheres of education, research and industry.

For example: the Institute of Physics in the United Kingdom has a wide variety of support services for education of all kinds. These include the publication of a journal (Physics Education) and a newsletter (Snippets), a video loan service, a list of lecturers, material about careers in physics, the promotion of exhibitions and competitions and a small grants scheme to support innovative developments in physics education. (Further information from the Institute of Physics, 47 Belgrave Square, London.)

Public Understanding of Science

In Britain a Committee on the Public Understanding of Science (COPUS) was established in 1986 by the Royal Society, the Royal Institution of Great Britain and the British Association for the Advancement of Science to provide a focus for a broad ranging programme in the United Kingdom to improve awareness and understanding of science and technology. Membership is drawn from the many groups involved in promoting science, including the formal education system, industry, government, the media, museums and science fairs, press and broadcasting and the scientific community itself. Among its current activities are: grants to assist new initiatives aimed at improving the public understanding of science; media fellowships providing opportunities for professional scientists and technologists to spend short periods working within media organisations. The provision of forums when scientists can meet producers and writers of television programmes to encourage greater science coverage, not only in science documentaries but also in news, current affairs, programmes, educational programmes, features and drama series.

Similar work with editors and proprietors of popular newspapers.

The provision of forums for scientists to meet and influence Parliamentarians and to provide briefings on science matters of current concern in Parliamentary debates.

Supporting the awards of annual science book prizes for a children's book and an adult's book that have done most to promote the public understanding of science.

(Further information from the Royal Society, 6 Carlton House Terrace, London.)