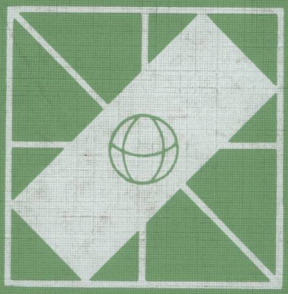
informatics in elementary education

edited by
j.d. tinsley and e.d. tagg



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INFORMATICS IN ELEMENTARY EDUCATION

Proceedings of the IFIP WG 3.1 Working Conference on
Informatics in Elementary Education
Malente, near Kiel, F.R.G., 25-29 July 1983

edited by

J. D. TINSLEY
Education Officer
Birmingham Education Department, U.K.

and

E. D. TAGG
Formerly Senior Lecturer in Mathematics
University of Lancaster, U.K.

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Informatics in Elementary Education
(up to 13 years of age)
Malente, near Kiel, F.R.G., 25-29 July 1983

organised by
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Programme Committee
F. B. Lovis (U.K.), P. Bollerslev (Denmark), U. Bosler (F.R.G.),
E. D. Tagg (U.K., *Editor*), J. D. Tinsley (U.K., *Editor*),
T. J. van Weert (The Netherlands)

Organising Committee
U. Bosler, K.-H. Hansen, F. Holst,
G. Jacobsen, I. Moors, H.-J. Waldow (all F.R.G.)

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PREFACE

Technical Committee 3 (TC 3) of the International Federation for Information Processing (IFIP) oversees the activities of four Working Groups, one of which, WG 3.1, is concerned with the field of secondary education.

A Working Conference on "Microcomputers in Secondary Education" was organised by WG 3.1 at the Centre International d'Etudes Pédagogiques de Sèvres (France) in April 1980. After this event it very soon became clear that it was time to plan a Working Conference on Informatics in Elementary Education (up to 13 years of age). Since TC 3 has, as yet, no Working Group which embraces the field of elementary education, WG 3.1 was asked to extend its activities and to organise this Working Conference.

The Conference duly took place at the Gustav-Heinemann-Bildungsstätte (Haus Seehof), Malente, FRG, from 25 to 29 July 1983 and was attended by 48 invited delegates from 16 different countries. A total of 17 papers were presented and a number of subsequent discussion sessions was carefully recorded. These papers and discussion reports form the main point of the contents of these proceedings.

It should be recorded that once it became clear that this Working Conference would attract participation from so many countries, TC 3 took the decision to set up a further Working Group, WG 3.5, to plan and to organise future activities in the field of informatics and the elementary school.

The onerous task of organising the logistics of this Conference was undertaken by a committee from the staff of the IPN - Institute for Science Education, Kiel, under the chairmanship of Dr. Ulrich Bosler. The site proved ideal, the weather superb and the arrangements for our accommodation quite excellent. We are most grateful to Dr. Bosler and his team for all the hard work which made our stay so pleasant and, in particular, to the secretaries from IPN, Mrs. Freya Holst and Mrs. Ingrid Moors, who worked so hard and willingly to enable us to meet the deadlines for the publication of these Proceedings.

And, finally, as Chairman of WG 3.1, may I express my personal thanks to the two Editors of this book, who worked as hard as any one and who never allowed either the complexity of their tasks or the superb weather to deprive them of their cool.

All concerned with this Working Conference are conscious that it dealt with a field of rapid and exciting change and of unlimited opportunity. We hope that our efforts will help and encourage others to jump in and get their feet wet.

Frank Lovis

Chairman WG 3.1

EDITORIAL

The welcome addresses of Dr. Plett and Dr. Bosler contained material of interest and significance for the conference and permission was therefore sought - and granted - to include these in the Proceedings with the other invited papers and discussions. The papers and discussions are arranged in the order in which they were presented. The discussions took place at the end of each session and were summarized by the rapporteurs.

We are very grateful to the following for the special contributions they made to the completion of these proceedings.

1) Jean Foster for retyping many of the early revisions of the paper and overseeing the final preparation of the proceedings.

2) Dr. Ulrich Bosler and the two ladies he brought from IPN, especially Ingrid Moors who typed a great number of revisions of papers during the conference, including some complete revisions.

3) To Brian Samways and Birmingham Educational Computing Centre (BECC) for providing text processing facilities to enable the discussion reports to be revised quickly.

4) To all the rapporteurs for the speed and accuracy in the production of their reports and, in some cases, for recording them on the text processor.

5) To Gloria Jones for volunteering to type in discussion reports.

6) To the North-Holland Publishing Company for their efficiency in handling the manuscript.

David Tinsley
Donovan Tagg — Editors

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OPENING SESSION

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OPENING ADDRESS

Ministerialrat Dr. Peter C. Plett
Heinemannstr. 2, D 5300 Bonn 2

Ladies and Gentlemen, I would like to welcome you cordially here in Malente on behalf of the Federal Republic of Germany. Your working conference will deal with part of a theme which is at present occupying western industrialized nations, and in particular Western Europe.

In order to hold their own in economic matters, in particular vis-à-vis the United States of America and Japan, the Western European countries decided within the European Community, in early June to conduct comparative analyses in the field of the new information technologies in education in addition to the existing exchange of experience in order to increase the transferability of teaching programmes and software between member countries and in order to identify those equipment systems which can best be used for educational purposes.

With this aim in mind, both national and international expert meetings will be held within the next two years. Your work therefore has the full support of a topical subject in nearly all industrialized countries.

This conference deals with an important and interesting sector, namely the age group up to 13 years of age. While you will handle technical questions, I would like to use this opening address to put to you some administrative aspects so that you will know during your deliberations what we in the Federal Republic of Germany need to know about the theme, in terms of information required for policy-making.

I will begin by giving you a brief outline of the situation of informatics in elementary education in the Federal Republic of Germany to the extent that I am familiar with it. I will then mention pilot experiments and in a few sentences talk to you about the computer programming competition.

And finally I shall discuss the questions and hypotheses mentioned during my address which confront the Federal and Länder governments when they have to take decisions in this field.

THE SITUATION OF INFORMATICS IN ELEMENTARY EDUCATION

I would like to point out that elementary education as defined by you, i.e. up to the age of thirteen, does not correspond to fixed stages in German education. We have the kindergarten level of the 4 - 5 year olds, which in Germany is part of the elementary level. It is followed by the level of the 6 - 9 year olds, the so-called 4-year primary school. The 10 - 15 year olds attend different forms and types of school and together belong to secondary level I.

As far as I know, there is no such subject as informatics at the kindergarten and primary school level. In secondary level I, instruction focuses on informatics in grades 9 and 10 of this type of school. In Land Berlin informatics may be chosen as a compulsory optional subject and in Bavaria in intermediate schools as an optional subject. In a few other countries the contents of informatics may optionally be included in other subjects, mostly mathematics.

Since information instruction in secondary level I is confined to grades 9 and 10, that is to say to the 15 - 16 year olds, it can be summed up for your working conference that there is at present no informatics instruction in elementary education up to 13 years of age.

Of course, this is an official statement, which does not exclude the fact that even younger pupils at some school or other in Germany play with the computer in their leisure hours, perhaps with the aid of older pupils or a teacher. The pilot experiments in this field all take place in grades 9 and 10, i.e. for 15 and 16 year olds, and therefore need not be mentioned here. The same can be said about the federal computer programming competition. Here, too, there is a secondary I level, which, however, includes only 14 - 16 year olds.

In this year's computer competition, a pupil of secondary level I successfully worked on a very interesting solution to an old problem. When some of you arrived in Hamburg today and looked for the way to Seehof at Malente or whenever you arrived in a strange city and looked for the quickest way to a destination, you probably would have liked to have a computer-aided automatic information machine which you could have asked for the quickest connection to Seehof or to any other 1983 main street. Such an automatic information machine would have printed out within seconds when to take which means of transport and where, which connection to take, how, where and when, and at what time you would arrive at your destination. A pupil of secondary level I in the Federal Republic of Germany has tackled this problem and written an easily intelligible programme in BASIC. For this he recieved the special prize awarded by the Federal Minister of Education and Science to a participant from secondary level I for a particularly outstanding achievement.

As you can see from the competition and in particular from the awarding of the prize, the Federal Government thinks that the participiation of younger pupils is desirable.

Let me now say something about the questions and hypotheses.

1) The school will not be able to halt the advance of the microcomputer in all fields of life. The microcomputer will pervade children's toys, leisure time and working life.

2) The school may ignore this advance if it holds the view that the microcomputer does not belong in the curriculum. However, one day it may have to accept the fact that any undesirable developments force a belated response by the school; this is what has happened with so-called traffic education.

3) If the microcompunter is used in informatics, this is done for data acquisition and data processing; that is to say, computer utilization is a cultural skill.

4) The school cannot afford not to teach its pupils a cultural skill which they will need in the future. It it did so it would run the risk of creating computer illiteracy.

5) Given the present number of lessons, we must find out which subjects will have to be reduced in favour of informatics or in which subjects informatics could be integrated.

6) At what age or in what grade should informatics first be taught?

7) Which benefits and drawbacks for the child are entailed by the early start of informatics instruction?

8) What would the curriculum look like for different age groups?

9) Should there be special hardware for young children?

10) Should there be special software for young children?

11) Which programming languages should be taught and is it necessary at all to use programming languages?

12) What experience has been gained in other countries?

13) With regard to which questions are pilot experiments and/or research projects required?

The Federal Government would be pleased if you were able to provide answers to some of my hypotheses and questions from your international deliberations.

From the Conference papers I have gathered that this international Conference in Germany admits only a single conference language: English. If this is possible here in Germany this week (and I am not sure at all whether a German language conference would be feasible in England or France), something has been achieved in the field of colloquial languages which is still to be achieved in the case of computer languages. There are BASIC, Pascal, Fortran, Cobol, Elan and many other computer languages. Perhaps it would be a precedent if the International Federation for Information Processing could agree on some international standards, for example on a single computer programming language. This would be a unique example; for the fact that only a single language is admitted as conference language here is a rare exception internationally.

I hope that this Working Conference will be a success and that you, the participants, will have a pleasant stay in this lovely North German landscape.

WELCOME ADDRESS

Ulrich Bosler
Chairman, Local Organizing Committee

Ladies and Gentlemen, on behalf of the IPN - Institute for Science Education in Kiel I may say welcome to Malente! But what is IPN? The Federal Republic of Germany has a decentralized educational system. The responsibility for education rests with the "Länder" which are individual states like Bavaria or Northrhine-Westphalia. The IPN is the main institute of the Federal Government which works nationwide. On our main board you will find representatives of the federal ministry of education as well as of all the "Länder". The main subjects of the institute are biology, chemistry, physics, and the theory of education. One area is computer science.

The title of this working conference is "Informatics in Elementary Education". For me it is a question rather than a statement. It is not a conference for people who have produced results after a long period of work. It is a working conference in an uncharted landscape. Our main questions are:

- Have we yet reached the stage where we can evaluate the introduction of computing systems into elementary classes?
- Are we able to demonstrate examples of good practice which will encourage teachers to adapt their teaching methods to adopt new strategies?
- Are we seeking a fundamental or just peripheral change in traditional learning systems at the elementary school stage?
- Are there useful analogies which can be drawn from the introduction of modern scientific topics into the elementary curriculum?

I think we should have enough scepticism about our own work and the work of some of our colleagues. In my judgement we must be sensitive to the different educational traditions of the countries represented here in our working conference.

We should ask ourselves whether it is necessary to use a computer for the new learning approaches we have identified. Why should we use a computer to draw a square on a video screen? What is wrong with the blackboard, paper and pencil or even the sand at the seaside? Children can make circles by holding hands in the garden! The computer only requires us to use our brains. Surely we can use our bodies and our emotions as well as our brains for our learning.

I hope that this working conference will provide an open atmosphere here in Malente so that we can answer some of the questions.

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