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THE PEOPLE'S REPUBLIC OF CHINA

Strengthening the Second Secondary School attached to East China Normal University

Project Findings
and
Recommendations

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United Nations Educational, Scientific and Cultural Organization

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THE PEOPLE'S REPUBLIC OF CHINA

STRENGTHENING THE SECOND SECONDARY SCHOOL ATTACHED TO EAST CHINA NORMAL UNIVERSITY

Project Findings and Recommendations

Report prepared for the People's Republic of China by the United Nations Educational, Scientific and Cultural Organization (Unesco) acting as Executive Agency for the United Nations Development Programme (UNDP)

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TERMINAL REPORT

I. INTRODUCTION

Background

1. In China's modernization plans high priority is given to education, and particularly to secondary education, as being the basis for economic development. The Second Secondary School attached to the East China Normal University (ECNU) is considered as a model centre for secondary schools in China and an experimental base for research on teaching methods and materials for science teaching. The Unesco project is concerned with science teaching at the secondary level.

2. At the beginning of the project there were 22 classes, 105 teachers, 75 administrators and 1,000 carefully chosen students. In the science department there were three biology teachers, nine chemistry teachers and eleven physics teachers. There were five science laboratories; one for biology, two for chemistry and two for physics. However, the laboratory equipment was inadequate in quantity and quality. The Second Secondary School, therefore, wished to renew some of the laboratory equipment and also to acquire new equipment, so that all the necessary experiments could be performed by the students and other experiments demonstrated by the teachers and shown to the students through closed-circuit television.

3. In the years preceding the commencement of the project experiments had been carried out with new teaching materials and methods in mathematics, physics, foreign languages and Chinese and progress had been made in some courses. The School frequently invited colleagues from Shanghai and other parts of China to attend symposia, at which there was an exchange of experiences and information. Two or three large-scale model classes were arranged each term which also helped to improve the standard of teaching. In this way the School had already achieved initial successes in improving teaching standards and in cultivating promising students. Graduates in 1979 topped the science enrolment test of the institutes of higher education. In the science enrolment test for 1980, six students held the first, second, fourth, fifth sixth and eighth place respectively in Shanghai. From 1979 to 1980, thirty-one prizes were won by the School's students in district, city and nationwide tests in mathematics, physics and chemistry. But, as mentioned above, the science laboratory equipment was quite outdated.

Official Arrangements

4. The Project Document was signed on 20 November 1980 by the Government and on 27 November by UNDP and Unesco respectively. The total UNDP contribution was foreseen as US $ 220,000 and the Government contribution as ¥ 4,334,000 RMB in kind. The project became operational in September 1980 and activities terminated on 3 November 1982.

Objectives of the Project

(a) Immediate Objective

5. The immediate objective of the project was to upgrade the level of science teaching in the Second Secondary School attached to East China Normal University (ECNU) through:

i) upgrading the level of science teachers;

ii) improvement of teaching methods and curriculum development;

iii) provision of science laboratory equipment and other teaching aids.

(b) Development Objective

6. The development objective of the project was:

i) to make the School a model for secondary education in China;

ii) to establish an experimental base for carrying out research on secondary school education methods. Through experimenting with different teaching methods and materials in the Second Secondary School, those elements which could be successfully applied in other secondary schools in China could be developed. This, in turn, would contribute to the formulation of an educational strategy for secondary school education in China by the Ministry of Education.

II. PROJECT ACTIVITIES AND OUTPUTS

Consultants

7. The Head of the Integrated Science Section at the Centre of Science Education of Chelsea College, University of London, Professor John May, visited the School twice, from 1 - 20 November 1981 and from 27 October to 3 November 1982.

8. More than ten lectures were given by this Unesco consultant. Administrators and science teachers from secondary schools in Shanghai, and some of those from Jiangsu, Jiangxi, Jilin and Fujian Provinces, attended these lectures. The total attendance was about 2,600.

9. During his two visits, the consultant also arranged 15 symposia, each of which had at least ten participants, with all science and mathematics teachers of the School and some teachers from other schools and institutes attending. Laboratory design, teaching methodology and evaluation techniques were discussed. Films were used to show how teaching was accompanied by experiments in schools in the United Kingdom.

10. These activities helped the teachers to gain a better understanding of the educational system, school administration and secondary school science education in the United Kingdom as well as the use of science laboratories in European schools. Administrators and teachers increased their knowledge of science teaching methods, such as discovery learning and field trips, and also discussed the necessity and possibility of using a variety of teaching methods and programmes in order to fully develop the students' ability and intelligence. The lectures and symposia arranged by the consultant have led to improvement of the School's teaching methods and further educational research.

Training

11. A total amount of $ 72,000 was earmarked for 32 1/2 man-months of fellowships and $ 15,400 for study tours, giving a total of $ 87,400 for this component. Five teachers were sent abroad to study the content of teaching materials and methodology used in secondary schools in physics, chemistry and mathematics teaching. (Abstracts of the articles they wrote are given in Appendix E attached.)

12. A physics teacher and a chemistry teacher studied Secondary Science Education at the Centre for Science and Mathematics Education, Chelsea College, London University (United Kingdom) for a period of ten months from April 1982. They also visited ten secondary schools, four colleges and one primary school, the Nuffield and Chelsea Foundation Science Project, Dundee Science Curriculum Development Centre and the Scotland Examination Board. This gave them a better understanding of curriculum development, teaching methods systems of teacher training, evaluation techniques and vocational education in secondary schools in the United Kingdom. Methods of developing students' ability were investigated and the possibility of using such methods in China was considered.

13. A physics teacher and a mathematics teacher studied secondary education at Eastern Michigan University (E.M.U.) in the United States from February 1982 to May 1983. The programmes were funded by Unesco until September 1982, and from then on until May 1982, by the teachers themselves working as graduate assistants. They finished the Master's degree course and were awarded the M.A. by E.M.U. They also visited secondary schools, elementary schools, universities, centres of vocational education and museums in Michigan State and took part in class observation in three high schools.

14. The two teachers who studied in the United States of America came away with a better understanding of the American educational system, of the philosophy of education, evaluation techniques and teaching methodology. They had taken a course in the use of computers in education and methods of audio-visual instruction and, most importantly, they had learned how to develop ability and intelligence in students through science teaching. Furthermore, as graduate assistants, they had learned teaching methods currently used in higher education in the U.S.A.

15. A mathematics teacher studied secondary mathematics teaching at the School of Education, University of Massachusetts, from August 1982 to March 1983. He learnt much about secondary school mathematics teaching, investigated teaching materials and the methodology of secondary school science teaching. He

made a comparative study of American and Chinese mathematics text-books.

Study Tour

16. A study group of seven people, headed by the Vice-President of East China Normal University, visited Japan from 15 - 30 September 1981 to investigate secondary science education and school administration in that country. The group visited more than ten secondary schools and other educational institutions in Kyoto and Osaka and was much impressed by the following aspects:

1. The flexibility of the study programme. The students of senior grades are permitted to choose the courses they want to study.

2. The integrated set of teaching materials and reference books. This is one of the most important factors in improving the quality of teaching.

3. The variety of extra-curricular activities and education, for which the schools are well-equipped.

4. The attention paid to experiments in science teaching and to audio-visual programmes, so as to develop the students' ability to solve problems.

17. The members of the study group found their experience in Japan highly profitable and, on their return, lectured to thousands of secondary school administrators and teachers in Shanghai, thus informing their colleagues of current educational methods in another country.

III. ACHIEVEMENT OF IMMEDIATE OBJECTIVES

Equipment and Buildings

18. $ 125,000 was originally foreseen in Revision "B" for this component. This amount was increased to $ 127,864 in Revision "D" for laboratory equipment and teaching aids which were all delivered on schedule. The laboratory equipment is used and maintained by physics, chemistry, biology and geography teaching groups respectively and the teaching aids by a special group, the audio-visual and instruction teaching group.

19. The Ministry of Education has contributed 2,500,000 Yuan (RMB) for new school buildings. One six-storied building has been completed and is used as a student dormitory. Others are being built.

Teachers' Professional Competence

20. The consultant, Professor May, demonstrated his vast teaching experience and knowledge of new trends in science teaching which will undoubtedly help the teachers in their task of reforming education.

21. The teachers who were trained abroad and those who were members of the study group visiting Japan communicated their experience to all the other

teachers who have therefore also widened their outlook and become more aware of new teaching methods and evaluation techniques. Their professional competence has been improved in various degrees.

22. Two teachers were awarded Master's degrees after studying in the United States.

IV. UTILIZATION OF PROJECT RESULTS

23. Because the School is now better equipped and the teachers' professional competence has been upgraded, the staff is able to undertake educational research. A special group for research work on teaching methodology and materials has been established. Some experienced teachers have been trained abroad. This represents an important step towards the realization of the related development objective. Now the School is associated with the Asian Programme for Educational Innovation for Development (APEID).

24. All the laboratory equipment and teaching aids are now being used, with the result that the quality of teaching has greatly improved. The teachers are now considering and performing further experiments with teaching methods adapted from those of other countries and using the project-provided equipment.

V. FINDINGS

25. As a result of the project, the teachers of the Second Secondary School have had the opportunity to draw on each other's experience as well as on that of their colleagues in other countries and improve their methods of teaching. This project has not only been helpful in upgrading the standard of teaching in this particular school, but also in all the secondary schools in China because the Second Secondary School has become an information centre and an experimental base which communicates its knowledge to similar schools. With the help of the new equipment provided by the project, the teachers are able to apply modern methods to teaching as far as is possible.

VI. CONCLUSIONS

26. The exchange of experience and information which took place during the project period has resulted in strengthening and improving science teaching at the Second Secondary School attached to East China Normal University. It is hoped that the project will continue to benefit from the experience of other countries so that the staff can profit further from new ideas and educational innovations. Strengthening science teaching in the Second Secondary School is just part of the effort to make the School a model centre and experimental base for research in secondary school education. Further international assistance is considered necessary to attain this goal.

APPENDIX A

International Staff

Name	Country of Origin	Field of Specialization	Duration of Contract
May, J.(*)	United Kingdom	Head of the Integrated Science Section, Centre of Science Education, Chelsea College, University of London. (United Kingdom)	01.11.81-20.11.81 27.10.82-03.11.82

(*) Consultant

APPENDIX B

Counterpart Staff

Liu Fu-nian	President of ECNU	part-time	Project Leader
Cai Duo-rei	Principal of the Second Secondary School Attached to ECNU	full-time	Coordinator
Wang Hong-ren	Vice-Principal of the Second Secondary School Attached to ECNU	full-time	Assistant Coordinator
Chen Yen-pei	Physics teacher	full-time	"
Cheng Yung-sun	Chemistry teacher	full-time	"
Yung Yeng-jian	Biology teacher	full-time	"
Cao Keng-sui	Geography teacher	full-time	"
Chi Yi-zi	Audio-visual teacher	full-time	"

APPENDIX C

Unesco Fellowships/Study Tours

Name of Fellow	Place of Study	Period of Study From	To	Field of Study
A. FELLOWSHIPS				
Cao Lei (Physics teacher)	Chelsea College, University of London	Apr.1982	Feb.1983	Secondary Science Education
Wang Yun-sen (Chemistry teacher)	Chelsea College, University of London	Apr.1982	Feb.1983	"
Chen Kin-tian (Physics teacher)	College of Education, Eastern Michigan University	Feb.1982	May 1983	Secondary Education (Master's degree at EMU)
Zheng Ting-yao (Mathematics teacher)	College of Education, Eastern Michigan University	Feb.1982	May 1983	"
Ma Hui-sen (Mathematics teacher)	School of Education, University of Massachusetts	Aug.1982	Mar.1983	Secondary Mathematics Teaching
B. STUDY TOURS				
Gao Wenyan	Japan	15-30 Sept. 1981		Secondary Education
Xiao Yanpai	Japan	"		"
Wang Hongron	Japan	"		"
Yang Yongjian	Japan	"		"
Lu Liudi	Japan	"		"
Cheng Tungsun	Japan	"		"
Cheng Yanpai	Japan	"		"

APPENDIX D

Equipment Supplied by UNDP

Delivered

Physical instruments for Middle School	March-Oct.1982	Most of the instruments and equipment come from Japan. The physical, chemical, biological and geographical instruments and equipment are from the Shimazul Physical and Chemical Instruments Company and the audio-visual aids (video and camera equipment) are from the Sony Company. Some instruments and equipment (i.e., electronic computers, lantern slides, projectors, photographic equipment and sound recording equipment) were ordered from the United Kingdom, Australia, Norway, Sweden and Hong Kong.
Chemical instruments for Middle School	"	
Biological instruments for Middle School	"	
Geographical instruments for Middle School	"	
Audio-visual educational aids for Middle School	"	

APPENDIX E

ABSTRACTS OF THE ARTICLES WRITTEN BY THE UNESCO FELLOWSHIP HOLDERS

I. An Introduction to the Teaching of Computer Science in High Schools in China

by Zheng Tingyao

This article is dedicated to instruction in computer science to the students in some key high schools in China. It consists of four parts.

In the first part, the article reviews the development and ability of computers and discusses the possibility and necessity of introducing computer science to some key Chinese high schools.

In the second part, the author sets up a Computer Science course for tenth grade students. Both the contents of this course and the time schedule (for about one school year) are given.

In the next part, there is a detailed discussion of why and how computers and some mathematics contents, such as the principles of computers, the binary system, functions and graphs, approximate calculation, binomial expansion and probability can be taught in such a curriculum to get better learning results. Several interesting programmes written in Apple Basic are introduced as examples.

To show the vast expansion of computer application, the article suggests in the last part that some topics of Social Science be taught to students.

According to the situation (some key high schools own personal computers and some are going to have them), the suggested plan will help to begin experiments in the field of teaching computer science.

II. Physics Teaching and Ability Development

by Chen Xintian

The paper points out that learning the facts, concepts and laws of the physical world is far from sufficient. We must concentrate our efforts on becoming more effective teachers by focusing upon the development of students' abilities in order to meet the social needs of our people and our nation.

Based on the current situation of physics teaching, and after a brief review of work in this field, the paper lists in detail five areas of ability which should be fostered and developed in secondary science education.

A large section of this paper contains an examination of some of the ways in which physics can be taught in order to develop these abilities. In

each area, the advantages and disadvantages are analyzed and a detailed teaching procedure, related to a specific topic, is presented as an example.

The paper concludes that teaching is an art and that a creative teacher should adopt many procedures and, through a variety of means, teach and help the students to develop their abilities.

III. Analytic Study of University Entrance Examinations in China in 1982, 1983 by using Joint Matriculation Board Syllabus of the United Kingdom

by Cao Lei

This paper examines the validity of university entrance examination papers in China from the point of view of ability requirement. It consists of four parts:

1) A brief introduction to the Chinese examination system and a short statement of its advantages and disadvantages.

2) A comparative study of ability requirements in physics examination papers in China in 1982 and 1983 by using both a Chinese physics syllabus and the United Kingdom's Joint Matriculation Board examination syllabus. The paper suggests that clearer and more detailed ability requirements should be stated in the Chinese one.

3) An analysis by comparing question types of Chinese examination papers with Joint Matriculation Board examination papers (A-levels) in the United Kingdom. The author points out that some new types of questions and new test techniques should be used instead of the traditional ones.

4) An article on innovation in the Chinese admissions system for higher education and the entrance examination paper. The article discusses the possibility of using two types of examination paper which can be scaled with a ranking method for the students who use the textbooks based on two different syllabuses.

IV. Assessment of Laboratory Work in Chemistry

by Wang Yunsen

This paper consists of three parts:

1) Laboratory work is very important in chemistry teaching. The objectives of chemistry laboratory work are: (a) to help students to understand the basic concepts of chemistry; (b) to help them to understand how the results of the experimental work shape chemistry concepts and theories; (c) to teach students experimental skills such as designing experiments, analyzing and

interpreting data; (d) to develop creativity, independent thinking, independent action, self-confidence and curiosity about the world of chemistry.

2) Laboratory work cannot reach its objectives efficiently if there are not suitable methods to assess it.

3) An attempt to establish standard methods to assess this most significant part of chemistry education in laboratory work.

The standard methods of assessment are a combination of continuous assessment during the work session, of laboratory reports and the final examinations in both written and practical form.