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ABSTRACT

The United States-Japan Cooperative Science Program was initiated for the purpose of conducting research related to logical thinking and reasoning skills of science students. The findings of these research efforts were reported and discussed at a seminar for science educators from the United States and Japan. This report provides the review of the seminar's objectives, schedule, and expected outcomes which was delivered by two participants at the opening session of the conference. Objectives targeted included: (1) discussion of the results of the United States-Japan Cooperative Science Program; (2) suggestions for improving the process of curriculum development, implementation, and evaluation of science education; and (3) identification of ways to improve the system and methods of pre- and inservice training for teachers. The conference agenda and a complete listing of the seminar's participants are also provided. (ML)

Review of Seminar Objectives, Schedule and Expected Outcomes

U.S.- Japan Seminar on Science Education

Floyd E. Mattheis
Shigekazu Takemura

Co-Directors

U.S.-Japan Seminar on Science Education (Honolulu, Hawaii, September 14-20, 1986).

U.S.-JAPAN SEMINAR ON SCIENCE EDUCATION
SEPTEMBER 14-20, 1986
HONOLULU, HAWAII

Review of Seminar Objectives, Schedule and Expected Outcomes
Dr. Floyd E. Mattheis and Dr. Shigekazu Takemura, Co-Directors

Takemura

The concepts and laws of natural science as well as the acquisition of scientific method skills are being emphasized in schools today, but skills in logical thinking and reasoning are not given importance for mastery by the learners. Research shows that during a learner's stay in the elementary and secondary school levels, his/her level of development also changes from the concrete-operational thinking phase in the direction of the logical-abstract thinking phase. However, research in this area is so limited at present that a lot of problems are still unsolved related to the skills of learners in logical thinking and reasoning.

Some serious social problems can be observed in education at present in Japan and in the United States. One of these is the fact that as the learners progress from the lower school levels to the higher school levels, they also grow up disliking science subjects.

Knowing the importance of research related to logical thinking and reasoning skills, the U.S.-Japan Cooperative Science Program was initiated during the school year 1984-1985 in order to make possible the conducting of research on a wider scale. In order to be able to analyze the skills that junior high school students in both countries possess, instruments such as the reasoning and logical thinking test, integrated process skill test, and inventory for the in-school and out-of-school environment of learners were administered and analyzed. The reasoning and logical thinking test includes topics on conservation, proportional reasoning, controlling variables, probabilistic reasoning, correlational reasoning, and combinational reasoning. The topics utilized in the integrated process skill test are comprised of identifying variables, operationally defining, stating hypotheses, graphing and interpreting data, and designing investigations. The environment of the learners includes various factors such as the curriculum, teachers, administrators, school facilities, the community, and so on.

The data gathered through the various instruments were used to determine the correlation of the learners' environment with the reasoning and logical thinking skills and with the acquisition of the integrated process skills. Various factors were controlled due to the differences that exist between the

environment of the learners in both countries in order to make the results of the research more meaningful and more useful.

The expected outcomes or objectives of the seminar are stated as follows:

1. The results of the U.S.-Japan Cooperative Science Program will be reported and discussed in the presence of recognized leaders in science education from the United States and Japan and from other countries of Asia and the Pacific. The more specific goals are (a) to determine the differences in the science education programs in both countries and points of originality, (b) to determine the similarities or universality of the educational activities in both countries, and (c) to determine if both countries can mutually benefit from the successes and failures in science education through knowledge exchange based on research findings which are important in planning the future course of this area of knowledge.

2. Valuable suggestions for improving the process of curriculum development, implementation, and evaluation of science education in the United States and Japan will be made. The more specific goals are (a) to develop curricula for future educational programs, (b) to determine principles and methods of curriculum development for education in the future, (c) to determine the content for the new curriculum, (d) to develop new media such as instructional materials and equipment, (e) to determine suggestions on the process of lesson planning, (f) to foster the improvement of teaching strategies and techniques, (g) to devise methods of evaluating scholastic ability, and (h) to devise ways of evaluating the lessons.

3. Valuable suggestions for improving the system and method of pre- and in-service training programs for teachers will be determined based on the results of the U.S.-Japan Cooperative Science Program. To meet this objective, the more specific goals are stated as follows: (a) to compare the pre- and in-service training programs in both countries, (b) to develop model teacher training programs for educational institutions, (c) to improve the publication output of science teachers, (d) to improve the facilities for teacher training institutions, (e) to improve the objectives and contents of the training programs, (f) to improve the method of teacher training, (g) to improve the evaluation process of teacher training, (h) to improve the quality of the instructional staff of training institutions, and (i) to make clear the relationship between teacher training and educational innovation.

The proposed seminar is the first of its kind to be undertaken in both countries, and so it is envisioned that this would bring about the improvement of academic research output. The new suggestions on how to increase the amount of research related to the U.S.-Japan Cooperative Science Program, curriculum development, and teacher training could be established during the seminar.

Mattheis

The objective of this seminar is to look at some ways that we can build upon or use the results of the U.S.-Japan cooperative research project as a basis for planning and developing additional cooperative projects. The most important outcomes of this seminar will be developed after we leave and go home. I'm looking forward to the presentations, questions, and discussions, but we have to be realistic and understand that generally there is a "gestation" period in the development of productive ideas. It's similar to an agricultural project where you plant a variety of seeds. Some seeds sprout and begin to grow in a few days, while other seeds may take months to develop. We will try very hard to establish a climate at this conference where a variety of ideas can begin to grow.

There is no prearranged agenda as to what the exact nature of future cooperative projects will be. The backgrounds and interests of the participants will determine the direction of these projects. For most of the science educators from the U.S., this is the first opportunity to meet with and interact with a team of science educators from Japan over an extended period of time. We know that this experience will be enjoyable and educational for the members of both teams who are in Hawaii this week.

We hope that the atmosphere of this seminar will promote the free exchange of ideas that might possibly improve the manner in which science is taught in both countries. As we move through the agenda of the seminar this week, please be thinking of ways in which science educators from the two countries could work productively on problems related to curriculum, research, and teacher education.

One thing I'll say now that I forgot to mention earlier and needs to be said is how much we appreciate the fact that our Japanese colleagues are working with us on this seminar in English. If you can imagine our reading our papers in Japanese, you have some idea of how difficult it would be for us to conduct the seminar in Japanese. I want to thank all of the Japanese participants for making your presentations in English because I know that this is not your first language and it is difficult for you. All of us appreciate your hard work.

I would also like to say that if we speak too fast or you have difficulty understanding what is being said, please raise your hand or stop us so that we can try to clarify what is being said. The U.S. presenters need to speak slowly and loudly so that our Japanese colleagues will understand the ideas you are presenting.

The first speaker this morning is Dr. Oki from Tokyo University. Dr. Oki is a famous chemist and is the youngest person ever to be promoted to full professor at Tokyo University. We are very happy to have Dr. Oki participating in this seminar with us. In addition to being a chemist, Dr. Oki is also serving as president of the Japan Society for Science Education. He was one of the Japanese participants in the US-Japan seminar held in Washington, D.C., in November 1985. He made an outstanding contribution to that seminar, and I was very happy to see that he was selected to be on the Japanese team of participants that came to Hawaii. He is an outstanding scientist and an outstanding science educator, and we are very pleased to have him present his paper to us this morning.

U.S.-JAPAN SEMINAR ON SCIENCE EDUCATION

East-West Center, University of Hawaii

and

Kaimana Beach Hotel

Honolulu, Hawaii

Sponsored by the National Science Foundation

and the Japan Society for the Promotion of Science

September 14-20, 1986

SUNDAY, SEPTEMBER 14

6:30 PM	Cocktails--Kaimana Beach Hotel
7:00 PM	Dinner--Kaimana Beach Hotel Orientation to Conference - Dr. Floyd Mattheis and Dr. Shigekazu Takemura Special Entertainment

MONDAY, SEPTEMBER 15

7:30 AM	Bus leaves for East-West Center (coffee and pastries)
Session 1	Chair: Dr. Floyd Mattheis
8:00 - 8:30	Review of Seminar Objectives, Schedule, and Expected Outcomes (Dr. Floyd Mattheis and Dr. Shigekazu Takemura)
8:30 - 9:30	Overview of Pre-College Education in Japan and U.S.A. (Dr. Michinori Oki and Dr. Charles Coble)
9:30 - 10:00	Description of Cooperative Research Project Between Hiroshima University and East Carolina University (Dr. Shigekazu Takemura and Dr. Floyd Mattheis)
10:00 - 10:15	Break
10:15 - 10:45	Discussion of Results of Reasoning/Thinking Skills Test, Process Skills Test, and Educational Environment Questionnaire in Japan (Mr. Katsunobu Matsumoto)
10:45 - 11:15	Discussion of Results of Reasoning/Thinking Skills Test, Process Skills Test, and Educational Environment Questionnare in U.S. (Dr. William Spooner)
11:15 - 11:45	Small Group Discussion (3 groups) Did it add to knowledge base? What? What additional data do we need? Is it sound educational research? Does it have any educational value? Does it need to be replicated? Different data analysis?
11:45 - 12:00	Reports of Three Groups
12:00 - 12:45	Lunch
Session 2	Chair: Dr. Shigekazu Takemura
12:45 - 1:15	Educational Implications of the Educational Environment and Its Correlation to the Reasoning/Thinking Skills and Process Skills of Learners in Japan (Mr. Atsushi Yoshida)

1:15 - 1:45	The Constructivist Epistomology of Jean Piaget: Its Philosophical Roots and Relevance to Science Teaching and Learning (Dr. John Staver)
1:45 - 2:15	Small Group Discussions (Same as morning groups)
2:15 - 2:30	Reports from Small Groups
2:30 - 2:45	Go over plans for evening and next day (Dr. Floyd Mattheis)
2:45	Bus returns to Kaimana Beach Hotel
4:30 - 10:00	Luau

TUESDAY, SEPTEMBER 16

7:30 AM	Bus leaves for East-West Center (coffee and pastries)
8:00 - 8:15	Recap Monday and general announcements
Session 3	Chair: Dr. Michinori Ōki
8:15 - 8:45	Analysis and Comparisons of Science Education in Japan and the United States (Dr. Willard Jacobson)
8:45 - 9:15	Originality and Problems of Japanese Education (Dr. Shigekazu Takemura
9:15 - 9:45	Curricula Which Promote Reasoning (Dr. John Renner)
9:45 - 10:00	Break (coffee and tea)
10:00 - 10:30	Thinking in Science: The Science Process Skills (Dr. Michael Padilla)
10:30 - 12:00	Small group discussion
12:00 - 12:45	Lunch
Session 4	Chair: Dr. Charles Coble
12:45 - 1:15	Expected Style of New Curriculum Development in Japan--Provision of Good Setting, Development of Materials and Equipment (Dr. Tomosuke Terakawa)
1:15 - 1:45	Expected Style in New Curriculum Implementation and Evaluation in Japan--Recent Trends in Educational Reform in Japan (Mr. Takashi Yamagiwa)
1:45 - 2:15	Discussion (small groups--same as morning groups)
2:15 - 2:30	Reports From Small Groups

2:30 - 2:45	Wrap-up and afternoon and evening plans (Dr. Floyd Mattheis)
2:45	Bus leaves for Kaimana Beach Hotel
4:30 - 7:00	Windjammer Dinner Cruise

WEDNESDAY, SEPTEMBER 17

7:30 AM	Bus leaves for East-West Center (coffee and pastries)
8:00 - 8:15	Recap and General Announcements (Dr. Floyd Mattheis)
Session 5	Chair: Mr. Takashi Yamagiwa
8:15 - 8:45	Towards the Advancement of Teaching Logical Thinking: A Mental Processing Model for Proportional Reasoning (Dr. Rita Peterson)
8:45 - 9:15	Integrating Research on Misconceptions, Reasoning Patterns, and Three Types of Learning Cycles (Dr. Anton Lawson
9:15 - 9:45	The Recent Status and Problems of Pre- and In-Service Training of Science Teachers in Japan (Mr. Namio Nagasu)
9:45 - 10:00	Break (coffee and tea)
10:00 - 10:30	Expected Style of Pre-Service and In-Service Programs for Teachers: Objectives, Content, and Methods and Educational Innovation in Japan (Mr. Katsunobu Matsumoto and Mr. Atsushi Yoshida)
10:30 - 11:15	Small Group Discussions
11:15 - 11:30	Reports from Small Groups
11:30	Bus leaves for Island Tour and Polynesian Culture Center
11:30 - 10:00	Island Tour and Polynesian Culture Center

THURSDAY, SEPTEMBER 18

7:30 AM	Bus leaves for East-West Center (coffee and pastries)
8:00 - 8:15	Recap and Evening Plans
Session 6	Chair: Mr. Katsunobu Matsumoto
8:15 - 8:45	The Preparation of Teachers for Middle School Science (Dr. Patricia Blosser)
8:45 - 9:15	Management Skills in Science Teaching (Dr. Leroy Lee, President of NSTA)

9:15 - 9:45	Small Group Discussion
9:45 - 10:00	Reports of Small Groups
10:00 - 10:15	Break
10:15 - 10:45	Science Education in Korea (Dr. Han Jong-ha, Director, Korean Educational Development Institute)
10:45 - 11:15	Discussion of Working Groups
11:15 - 11:45	Pacific Ocean Fisheries Project--A Study of International Cooperation in Curriculum Design (Dr. Frank Pottenger, University of Hawaii)
11:45 - 12:15	Visit to Curriculum Development and Research Center
12:15 - 12:45	Lunch
Session 7	Chair: Dr. Floyd Mattheis
12:45 - 2:30	Working Groups (Research, Teacher Preparation, Curriculum Development and Implementation)
2:30 - 2:45	Wrap-up and plans for tonight and tomorrow
2:45	Bus leaves for Kaimana Beach Hotel
EVENING	Small Groups - Writing Reports (Kaimana Beach Hotel)

FRIDAY, SEPTEMBER 19

7:30 AM	Bus leaves for East-West Center (coffee and pastries)
ession 8	Chair: Dr. William Spooner
8:00 - 12:00	Joint Japanese-American Working Group Discussion of Previous Day's Identification of Needs and Problems: (1) Research, (2) Curriculum Development and Implementation and (3) Teacher Training
	Outlining Proposals for Action
2:00 - 1:00	Lunch
ssion 9	Chair: Dr. Shigekazu Takemura
:00 - 2:00	Reports from Working Groups
:00 - 2:45	Conference Summary (Dr. Takemura and Dr. Mattheis)
:45	Bus leaves for Kaimana Beach Hotel
:00 PM	Farewell Party - Kaimana Beach Hotel (Japanese Style Dinner)

US-JAPAN SEMINAR
SEPTEMBER 14-20, 1986
HONOLULU, HAWAII

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