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Abstract

Summarized are the proceedings of the third annual conference of the Federation for Unified Science Education (FUSE), held in December, 1968. Includes are brief summaries of reports on unified science programs at Millburn Senior High School, New Jersey; Moncna Grove High, Wisconsin; Barringer High, Newark, New Jersey; Tamaqua Area Senior High, Pennsylvania; Moline Senior High, Illincis; and Monmouth Regional High, New Shrewsbury, New Jersey. Summaries are also given of papers on the history of FUSE, the potential value of Unified Science for elementary school teachers, the effects of a unified science curriculum on high school graduates, and a report of the internaticnal unified science conference held in Bulgaria in 1968. Notes are given of a session in which high school students discussed their impressicns of a unified science program with the participants. (EB)

Federation for Unified Science Education

BULLETIN

NUMBER 9

Feb. 1969

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Third Annual FUSE Conference

The Federation for Unified Science Education (FUSE) held its third annual conference at Millburn, New Jersey Friday and Saturday, December 13-14, 1968. Leonard Blessing, Science Department Chairman, and the staff of Millburn Township Public Schools hosted the conference. This issue of The FUSE Bulletin is devoted to the summarization of the conference proceedings.

The stimulating, diverse program included a variety of presentations prepared by various participants and a well organized session of planned classroom observations which provided everyone with the opportunity to see the Millburn Unified Science Program and staff in operation. Those participating in the conference also appreciated the opportunities everyone had to exchange ideas and to hypothesize solutions to relevant problems that seem unique to a unified science curriculum.

The conference participants were impressed with the program, the planned observations, and the efficiency and hospitality of the Millburn science staff as well as the administrative staff all of whom attempted to make the conference meaningful and worthwhile for every participant.

The proceedings include brief summaries of the following conference activities:

- A Short History of FUSE
  Dr. Victor Showalter
- The Unified Program at Millburn Senior High School
  Leonard Blessing, James Gardner, John Weir
- Report of the International Unified Science Conference held at Varna, Bulgaria, September, 1968
  Dr. Marjorie Gardner, University of Maryland
- Unified Science at Monona Grove High, Monona, Wisconsin
  Marianne Kratowicz and William Ziegler
- Unified Science at Barringer High, Newark, New Jersey
  Morris Lerner, Science Department Chairman
- Unified Science and It's Potential Value for Elementary Teachers
  Barbara Thomson, Ohio State University
- Unified Science Class Impressions
  Students from Millburn High Unified Science Class
- The Effects of Unified Science Curriculum on High School Graduates
  Dr. Victor Showalter, Educational Research Council of America, Cleveland, Ohio
- K. I. T. S., Unified Science at Tamaqua Area, Senior High, Pennsylvania
  H. Bruce Geiger and Ernest Popp
- Unified Science at Moline Senior High, Moline, Illinois
  F.D. Goar and Donald Fentem
- A New Unified Science Course at Monmouth Regional High, New Shrewsbury, New Jersey
  Norman Washington

FUSE at the NSTA Dallas Convention, 1969

If you are scheduled to appear on the program at the NSTA Convention, please complete the form at the end of this publication and return to one of the editors before February 15, 1969. We will have a pre-convention issue.

PROCEEDINGS
1968 FUSE CONFERENCE
MILLBURN SENIOR HIGH SCHOOL, MILLBURN, NEW JERSEY
December 13-14, 1968

SHORT HISTORY OF FUSE, Dr. V. Showalter

The Federation for Unified Science Education (FUSE) was founded by eight individuals that attended the September, 1966 Conference at Ohio State University. In 1967 eighteen participants attended a conference at the University of Chicago. Laboratory School, Chicago, Illinois and this year more than 100 have registered for the Third Annual FUSE Conference.

The FUSE label was conceived independently by Leo Klopfer (University of Chicago) and by Carl Pfeiffer (Monona Grove, Wisconsin). It is an appropriate label because it indicates the spirit of the group and the intent of its action; i.e., a common interest in a unified science approach to science curriculum. The purpose of the Federation for Unified Science Education is to disseminate ideas, information and materials appropriate to the development of unified science curricula and to encourage such development.

The FUSE Bulletin serves as a medium for communication among those science educators that are interested in a multidisciplinary approach to science curriculum. Current financial support for FUSE has come from a $2.00 membership fee and donations from educators interested in promoting this kind of publication.

The Unified Program at Millburn Senior High
Leonard Blessing, James Gardner, John Weir

The following aspcts of the unified science program at Millburn were discussed by its staff. Questions concerning the program were asked by participants.

1. A unified science curriculum means extra work but if teachers are committed to this program, it will be successful.
2. Program started as a two year course (physics and chemistry were unified) which was implemented by team teaching. It evolved to a seven periods a week program with only one teacher but was cut to 6 periods in order to allow time to organize materials.
3. 1964 - The school board supported the staff financially while they developed a syllabus.
4. 1965 - Summer - The staff organized the rest of the second and third year by developing appropriate materials.
5. 1967 - Summer - The three staff members attended an NSF Institute. Each selected his weakest area in which to work and all went to the same institution which allowed for cross fertilization of ideas along with their course work.
6. John Weir - Science I
   a. Elimination of duplication was first step, e.g., metric system, slide rule, gas laws, etc.
   b. Avoided repetition of identical materials
   c. The advantage is that subjects loose identity temporarily
   d. All Science II studnets have had same background.
   e. Know students extremely well by end of sequence
   f. Continually review concepts
   g. More meaningful and educationally rewarding
7. James Gardner
   a. Emphasized interdependence
   b. Teacher Consultation - Re-examined the weekly program 2-3 times. Interaction among teachers is very rewarding

c. Team teaching - 2 in classroom
d. Printed Materials - use a large number of texts and supplementary materials
e. In a traditional conservative community the student's parents are sent letters explaining the program
f. Courses are not designed for top science student but many do take it.
g. Pre and post tests were given after 3 years. The control section was at the lower end of the scale

8. Questions and comments from the audience identified some pervasive aspects of a unified science curriculum.
   a. One of the real advantages of a unified science program is in the re-examination of curriculum. This is not done in many schools
   b. Unified Science is not general science

Planned Observations

The more than 100 participants were divided into small groups and assigned a tour guide who was a Millburn High School student. The staff had revised their schedule so that all were teaching at the same time for observation purposes. Each group visited the physics, biology, and chemistry classes as well as the unified science classes. A general orientation tour was provided and a student member of the Computer Club gave a demonstration.

The International Unified Science Conference held at Varna, Bulgaria, September, 1968

Dr. Marjorie Gardner, University of Maryland

The Interunion Commission on Science Teaching, composed of members from various scientific societies, called a meeting which they labeled The Congress on the Integration of Science Teaching. Dr. Gardner reviewed her impressions of the people, the country, and gave some insightful personal anecdotes relating to the conference. The highlights of the meeting were:

1. Discussion of the difference between integration and coordination,
2. Thirty nations were represented. Several American programs were presented as models.
   a. Rensselaer Polytechnic Institute, Troy, New York
   b. Portland Project, Michael Fiasca
   c. P.S.S.C.
3. A pervading question asked by members of the Congress was: "Are these courses relevant for their cultures?"
4. The end of the conference arrived with time spent making resolutions and drawing conclusions. Some of these were:
   - We will encourage others to proceed.
   - We want to know if integration is a good thing.
   - All nations should experiment with K-12 programs to fit their culture.
   - If we are going to teach integrated science, we must create new teacher preparation techniques and courses.
   - We need to evaluate students in unified science programs.
5. UNESCO plans to publish information concerning this aspect of the science curriculum.
6. Comments from FUSE participants
   - Definition: integration implies fragmentation
     unified is more appropriate since you are starting with a whole which is already unified.
   - Since we are not making any progress in motivating kids to take more science, there must be a better way than what we are currently doing.

Unified Science at Monona Grove High, Monona Grove, Wisconsin
Marianne Kratowicz and William Ziegler

The staff at Monona Grove became concerned with contemporary facts about science instead of seeking the most effective way of working with students in science. In 1961 Carl Pfeiffer surveyed the existing unified science programs around the United States and in 1962 his staff of five decided to move into a unified program that was:

1. concept centered, i.e., organized around interdisciplinary concepts
2. the only type of science curriculum offered at Monona Grove
3. a four year course
4. organized around a team teaching approach utilizing materials developed by the total staff

The two speakers gave an overview of their program. Some of the points they mentioned were:

1. The science curriculum is designed around the concept that
   MATTER + ENERGY + TIME = CHANGE
2. All students take 2 years of science
3. The seventh period is reserved for staff conference time. This is essential
4. Eventually hope to move from team situation to self contained classroom
5. All laboratories are set up as a team
6. Team always sits in on large group sessions. There are now 7 on the staff.
7. It doesn't take elaborate facilities. In 1955 Monona Grove High was one of the least expensive buildings constructed.

Unified Science at Barringer High, Newark, New Jersey
Morris Lerner

Mr. Lerner presented the following ideas regarding his unified science program:

1. There are many ways to unify science (e.g., conceptual schemes, big ideas, 31st yearbook, Monona Grove's concepts, etc.). Unifying factor is the teacher not the course.

2. Need more evaluation studies of students after they leave school since the things that happen to kids which are of importance occur after they are out of school.

3. We won't be able to get students to take science until it is relevant.

4. "Our anecdotal records, our talks with students, our observations of the handling of problems, the excitement that is always present in the class and laboratory and the general spirit of inquiry that exists tell us that we are on the right track." (Quoted from the article - Lerner, Morris, "Integrated Science," The Science Teacher, 31 (February, 1964).

Unified Science and Its Potential Value for Elementary Teachers
Barbara Thomson, Ohio State University, Columbus, Ohio

1. Traditional sequence is based on assumption that is untested: Objectives of science can best be attained through the course structure of separate disciplines
2. Unified Science denies this assumption
3. Justification for Unified Science - (Showalter's list)
   a. Natural phenomena have no inherent properties that make them exclusive property of chemistry, etc.
   b. Disciplines are intellectual conveniences that facilitate specialized study
   c. If scientific literacy is to be a reality, science education should be general rather than special
   d. Processes abd scientific inquiry are basic to all disciplines
4. Schools exist to help children learn. It is the teacher's responsibility to help children learn in the most effective way. If, as the research suggests, unified science helps students more effectively obtain the objectives of science

education, then why shouldn't we move in this direction? (Research: Showlater, Slesnick, Fiasca, Pfeiffer, etc.)
5. Elementary Programs that could be an effective unified science link in a K-12 curriculum are AAAS, ESS, COPES, SCIS, Minnemast, etc.
6. Unified science is not general science. There is a unifying structure that does not exist in typical general science approaches that occur at the elementary level.

Unified Science at the St. Louis Country Day School
Edward Mitchell
1. Chapter one deals with motion concept.
2. There are very few lectures. There is one teacher for each group (no team teaching). The sessions are activity oriented and operate on a modular system.
3. Utilize simplified concepts.
4. Elementary teachers start on some of these problems.
5. Students are encouraged to go into as much depth as interest and ability will allow. The teacher acts as a guide and interpreter to help build a unified framework for every student. The school is a private school for boys. Most of the students will attend college and complete college.

Unified Science Class Impressions
Students from Millburn High

Five students from Millburn High School Science Program volunteered to give their impressions of the program. These students prepared their own presentations and attempted to be candid and critical in their evaluations.

Student #1
- Relationships lead to understanding.
- You should take all three years.
- I like team teaching situation.

Student #2 - Transfer student
- I had 1 year of biology, 1 of general science but since I couldn't decide between chemistry or physics, I took U.S.
- Teachers really get to know students
- We don't have all that duplication
- The teacher knows what you have had and isn't below you or too far above you.
- I want to be an art teacher but I like science anyway.

Student #3
- Obviously, unified science is better
- Relating the 3 aspects seems easier than separate subjects. It makes sense.
- ADP and ATP is understandable with this approach.
- Friends in biology memorize a lot and it doesn't mean much. To us it does.
- We like the speed with which ideas can be presented. We have the chemistry and physics background so it makes it faster to learn science.
- Related areas add to better understanding and I retain it longer.

Student #4
- Parents were afraid of throwing togehter 2 unrelated courses. I discovered that sciences are really related after I worked as a volunteer at the hospital so I selected unified science.
- In the regular courses you forget what you learned after June. It's like having a piece of cake only you don't get the frosting until next year.
- Colleges seem unaware of these courses. Maybe someday college boards will have tests fir unified science students.
- Science is meaningful now and fun too!

Student #5
- The subject matter is interesting
- It allows for flexibility.
- You can branch in many directions in order to understand science better.
- Our teachers cooperate so well and the students really like this.
- Since the teachers work as a team, they <u>really</u> know you for 3 years and they know you well!

Questions

A number of questions were asked the students. The questions and answers are very relevant since the students were very open and free to speak.
- How do students in conventional programs feel about students in unified science? They are jealous!
- Since you have a team teaching approach do you really know the teachers? Yes and they know you <u>well</u> for three years.
- Since you have different teachers, do you have difficulty fitting yourself to a team presentation? They may be different but they are all <u>good</u>.
- Have you had enough math to cope with problems at 10th grade? No, but any of the teachers will help and make classroom or individual presentations that meet our deficiencies. We learned to use a slide rule and this helped me. The same problem in a math class is not so hot but the science teacher introduces it as you need it so its not too difficult. Do you understand?
- If you could change one thing, what would it be?
  It should be more widespread.
  I'd like one textbook. It's very hard to carry so many books and we use lots!
- Do you find there is a problem with 3 teachers averaging grades? No, we receive separate grades and they average them. Also, if there might be a conflict of personality with one teacher the other 2 can still be fair. It's all right.
- Do you mind having a "new" teacher" We like teachers that know us.
- Can't you drop the class? Yes, but only 3 have and I had language scheduling conflicts while the other moved away.

Effects of Unified Science Curriculum on High School Graduates

Dr. Victor Showalter, Educational Research Council

1. Possible long range effects of a four-year unified science curriculum in the high school were identified and evaluated.
2. Specific effects were grouped in areas of (a) interest in science, (b) scientific literacy, (c) preparation for college science.
3. The 358 subjects graduated 4-7 years prior to the study.
4. A portion of the subjects experienced a unified science curriculum based on interdisciplinary themes and content.
5. Data were obtained from high school and college transcripts and a questionnaire constructed with the assistance of 50 science educators.
6. Findings indicated a general and consistent favorability for graduates from the unified science curriculum although the level of significance exceeded the arbitrary minimum in isolated cases only.

K.I.T.S. Unified Science at Tamaqua Area Senior High, Pennsylvania

H. Bruce Geiger and Ernest Popp

1. K.I.T.S. = Keys to Interdisciplinary Tutorial Study (K-12)
   Interdisciplinary content structure
   52 K-12 teachers in public and private schools from rural and urban areas.
2. Described the 13 weeks of inservice experiences including exposure in depth to NASA facilities, the group met to decide the kinds of materials needed and to develop these instructional materials.

3. A presentation utilizing 35 mm. slides illustrated the kinds of activities that were part of the 13 week teacher program.
4. More information can be obtained by writing to

Stephen Rituper, Jr.
Director
Kits for Science
2330 Church Street
Bethlehem Area School District
Bethlehem, Pennsylvania 18015

Unified Science at Moline Senior High, Moline, Illinois
F.D. Goar and Donald Fentem

1. 1200 students, 9 teachers (In 1964 they had 24 students and 2 teachers) Original materials were provided by the Portland Project, Dr. M. Fiasca, and they were given permission to select and adapt any of them to fit their particular situation.
2. Received a grant from the local education association to develop a student and teacher guide. They leaned heavily on the Portland Materials but expanded course in many dimensions.
3. Anyone in grades 11 or 12 may take this course but at the 10th grade only honors students.
4. Students and teachers are very enthusiastic about the program.

A New Unified Science Course at Monmouth Regional High School, New Shrewsbury, N.J.
Norman Worthington

1. 1200 pupils (24 per class) New school in 1961. 10 member staff. All have had experience teaching at least one NSF course.
2. 1968-69 initiated unified program after the Board of Education supported 3 members of the science staff during the summer of 1968 for development of instructional materials.
3. Need both commitment and involvement.
4. Although the attempt was to develop a fresh and original approach, after they looked at the program, it was very similar to other unified science programs.
5. In the fall of 1968 the program was initiated with 24 9th grade students and 3 teachers.
6. Developed their own excellent films to use as part of their instructional package.
7. The future plans are to expand and involve as many staff members as possible.

Note:

Please send any corrections or additions that should be made in the preceding material to either of the editors. Thank you.

Miscellaneous FUSE Conference Information

1. The conference participants who arrived by plane at the Newark airport wish to thank James Gardner for carrying the large sign upon which was written FUSE and for answering the numerous (close to 100) inquiries from strangers who wished to know why he was picketing in the airport terminal. Thank you, Jim, for meeting us and providing transportation to the hotel.
2. The principal of Millburn Senior High suggested that FUSE really means FUN USING SCIENCE EDUCATION. Thank you for this contribution.
3. The Carl Pfeiffer contingent committed themselves and their school for the next annual FUSE meeting in 1969 (Monona Grove, Wisconsin).

If you will be a participant in the NSTA Convention in Dallas, please complete the form below and return by February 15th to one of the editors. Thank you.

Name _____

School _____

School Address _____

Nature of NSTA Presentation _____

_____

Title _____

Date and Time to be Presented _____

Comments _____

_____

_____