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High School Science Instructors Can Help with Elementary Science

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ARTICLES

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Four years ago a number of questions were raised by the staff and administration at Spirit Lake. What is the nature of our science instruction at the elementary level? What capabilities do our staff have? What is needed to improve our elementary science program?

Now the writer is sure that others have asked these questions, and he is further convinced that asking questions is not enough. For this reason we set about getting an answer. We found many things to be happy about and many things that obviously needed correction. We were not in a worse shape than most schools, but "mutual malady" does little to satisfy a desire for better education.

In order to set up a program to improve our effort we first decided what goals we wished to attain. In retrospect we see this is extremely important because it constantly reminded our staff why we were undertaking this program of improvement. They understood and appreciated the total effort. To impose a program on an overworked staff without an understanding of the responsibility for it would certainly doom it to failure. The following criteria to direct our efforts were selected by the elementary staff, the administration, and the high school science teachers.

1. The high school science instructors will have the responsibility to offer the leadership.
2. The teachers must know what experiences are desirable to include in their course offerings.
3. The students must know why these problems are important.
4. The students must have an opportunity to express their opinions concerning these experiences.
5. Class work must be designed so that students become aware of the problems through activity.
6. The experience must incorporate ideas familiar to the student.
7. The teacher must be interested in discovering problems that arise out of student experiences.
8. Experiences should be centered in situations that are familiar to the student, **but** they should have a quality of the unfamiliar.
9. Experiences the teacher directs should be so wide in scope that all problems could not possibly be solved and selection by the group is necessary.
10. Situations should be created by the teacher which allow students to state ideas and pose questions to be answered.

It was soon evident that if teachers were to know what experiences they had to provide they needed a professional library and the assistance of specialists in the science fields. Reference books were ordered and the advice of science educators was obtained where possible.

We decided to spiral our program, and we set up a rough outline of topics and areas to be covered. Each grade level was to develop presentation in line with the specific areas that would result in acquisition of the skills and concepts associated with that area. We decided to have departmental meetings after school. The teachers met with the high school staff at departmental levels once a week for three months. The work was then continued separately with assistance from the high school staff as needed. The finished product

was edited by our elementary principal, who supplied the physical outline for the presentation. The high school science staff reviewed the content for accuracy and to eliminate duplication of activity. The final outline included:

1. Concepts to be taught
2. Activities to be used in teaching
3. Film references
4. Reading references
5. Estimate of timing
6. List of materials needed for the unit
7. A suggested mode of incorporating the **scientific attitude** into the presentation

The materials we produced this first year represent using facts to get at ideas. This important idea is emphasized in the materials themselves by the absence of specific directions for teaching the concepts through activity. Teachers are urged to think about the idea and then to use the materials provided as a suggested means to an end. Any activity may be chosen as long as it remains within the area under discussion, topically speaking. We all agreed on this point.

We started our second year with all our materials dittoed for use, and then ran into difficulties. Our teachers had been working with butterflies, leaves, and insects so long that it was difficult for them to adapt this expanded program.

What could be done? A meeting was called, and it was decided that we needed in-service training to be able to use the new course of study successfully. One of the fine aspects of this program at this point was that the teachers recognized this problem themselves. So we resumed our 4:15 to 5:15 meetings every two weeks for three months. Gyroscopes, levers, electrical devices, chemicals, and burned fingers resulted, but problems were ironed out.

The end of the second year found us feeling better about our progress. Units had been adjusted for time. In-service training makes us appreciate each other. Ideas restated became clearer and easier to present. Some areas were taken out and others were added. Field trips were developed that didn't overlap, but that did tie together the entire program.

At the beginning of the third year there were numerous complaints from the staff. Their main objection could be summed up in the statement, "We don't have the materials to carry out these activities". We decided at this point to set up a science resource materials center for each grade level. So we went back to the 4:15 to 5:15 meetings. We wanted the equipment for immediate use and not for next spring. The elementary teachers presented lists of materials which they needed to the high school teachers who prepared the materials. Each week the elementary teachers experimented with these materials, then packaged them for the unit. Square plastic dish pans, coffee cans, and plastic freezer containers became receptacles for the materials. Each was numbered, and an inventory set up. Forms for requesting replacements were devised. All material was inventoried, and each teacher knew what was available at each grade level. A teacher from each grade level was responsible for the materials for a quarter of each year.

We are starting the fourth year and the story now is that we need more direction in activities and more new ways of presenting materials. Again we are holding in-service meetings, this time at the departmental level, to produce new experiments and activities. We have written a laboratory manual with directions, sketches, and suggestions for teaching the activities presented in the outline.

Summarizing, in four years we have

1. Recognized our problem, asked some questions, and gotten some answers
2. Constructed a complete outline for K-8

(Continued Page 6)

and hours ranged from 45 to 100 per week. Needless to say the latter was for the teacher with 168 students.

Obviously teachers of laboratory science courses are being exploited by a society which doesn't understand the complexity of the task if we are to make use of the new tools available to do a better job of science education. The CHEM Study course was designed for a seven period week, and to be handled at all adequately there should be one double period for laboratory weekly. Many of these laboratories require several hours of preparation for each hour the students spend using the materials.

If a teacher is to fulfill any obligations to his home, family, church, and community, the professional organizations of science teachers must draw attention to the unreasonable demands on teacher time brought about by increasing enrollments, modern courses and their greater demands for laboratory preparation, and the general increase in clerical duties that come with larger classes and larger schools. **We should strive to get four classes of twenty-four students each to be recognized as an upper limit to teacher load in laboratory centered courses,** with at least one double period for laboratory, extended tests, and problem sessions weekly. These are tough objectives to realize in this day of increasing enrollments, and budgetary difficulties, but the situation cannot improve without our concerted efforts. We may not have time to be professional, but we had better take time if we hope to continue to improve science education to keep up with today's demands for adequately trained citizens.

The purpose of this article is not to discourage anyone from attempting the new courses, but to try to arouse a concerted interest in reducing teacher load in laboratory courses so that the improved courses can be taught without undue demands on teacher time. Good teachers have, and will make sacrifices to bring better education to their students, but they should not, in all fairness, have to bear the whole burden. At the risk of seeming ungrateful for the aid in establishing new courses which we have received, we must make the situation known to get it corrected. An average of 70 hours a week is definite evidence of the need for an adjustment in science teaching loads. I think Charlie Brown might say, "Science Teachers are **real people** when they have time to live!"

HIGH SCHOOL SCIENCE

(Continued from page 4)

3. Written a laboratory manual to accompany the K-8 outline
4. Planned and stocked a materials resource center
5. Provided more references for our staff library
6. Provided in-service training for our teachers
7. Planned a film program
8. Set up field trips
9. Set up training sessions for new staff members to familiarize them with our science program.

The elementary staff has worked whole heartedly on this project. The administration has been sympathetic toward the effort, and has shown interest in a tangible way by released time and financial assistance. Without the help of the high school science staff it would have been impossible to carry this project through to completion.

At Spirit Lake we are not complacent, however. We know there is much more to be done. We do take pride, though, in the fact that we are not accepting a packaged plan, but we are building our own. If we can be of assistance to anyone who faces these same problems we will be happy to share our experiences.