

## **Institutes for Science and Mathematics Teachers Sponsored by The National Science Foundation**

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The National Science Foundation, established by Congress in the National Science Foundation Act of 1950, has as one of its functions "the support of research and education through grants, fellowships and other means". This has included support to secondary teachers of science and mathematics in the form of Academic Year Institutes beginning in 1956-57 with two institutes and a total grant amount of \$504,700, and increasing consistently to 1962-63 with 55 institutes and a total grant amount of \$11,520,800. By the end of the academic year 1962-63 almost 8,000 teachers will have completed a full year of graduate training, largely in content courses of science and mathematics, in these institutes at a total cost of \$49,277,435. About one-sixth of the budget for the Division of Scientific Personnel and Education is devoted to the academic year institutes for 1962-63.

The Foundation has three broad principles in dealing with programs in education in the sciences, 1. The first responsibility is to work with the ablest people concerned. 2. "The Foundation is concerned with the

substance of science, mathematics and engineering" and leading scholars in these fields are encouraged "to take an active part in seeking solutions to problems which bear on the improvement of subject-matter instruction".

3. The Foundation is also concerned that local control be retained in the schools.

The programs of the Academic Year Institutes have been and still are in the content of science and mathematics. The courses to a large degree have been organized for the use of secondary teachers. Courses offered do consider the background of the participants as chosen for the institutes and they are fundamental and modern in character and are considered at the graduate level. It is true that many of the courses do not satisfy the requirements for a so-called standard Master's degree in mathematics or a particular science like physics or zoology. However, it should be considered that the courses are organized and taught for a different purpose.

It has been continually and strongly recommended by the Foundation that these teachers should do their work with first rate scientists and mathematicians who have the ability of exposition in their fields. This has been accomplished in most cases. Furthermore it has been the aim of the entire program on a long term basis to assist and influence the provisions of a "more adequate original training for such teachers". Obviously it will not be possible and it should not be necessary to continuously "re-train" teachers whose undergraduate training has been inadequate. A trend for a more adequate basic training for prospective science and mathematics teachers is noticeable in many institutions over the country. While other forces have aided in this development, the fact that it has been demonstrated that it is possible to organize and teach effective, modern courses in mathematics and the sciences has had considerable influence.

The Academic Year Institutes have been and are well distributed over the various disciplines in mathematics and the sciences and over the country. By school level the grants have been made predominantly to senior high school teachers, though junior high, pre-service and college teachers and subject matter supervisors have been included (Table I). The two most recent innovations in the Academic Year Institutes have been the inclusion of a relatively small number of pre-service teachers and of subject matter supervisors. These were introduced first during 1961-62 by the Oklahoma State University and the University of Wisconsin, respectively. A number of other institutions have received permission to add some participants in these categories for the year 1962-63.

Another outcome of this program has been Master's degrees obtained by the participants as a result of the year of study. While a number had Master's degrees before they entered the institutes, these are usually in

#### Academic Year Institutes (1956-63)

TABLE I — Program History

Grant Fiscal Year	Academic Year	Institutes Entering Programs for First Year	Total Inst.	Participants		Total Amount Grant
				H.S.	Col.	
1956	1956-57	2	2	95	—	\$ 504,700
1957	1957-58	14	16	775	—	4,250,885
1958	1958-59	4	19	925	—	4,906,500
1959	1959-60	14	32	1,508	24	9,020,380
1960	1960-61	3	33	1,491	43	9,224,400
1961	1961-62	11	43	1,494	75	9,849,700
1962	1962-63	11	55	1,725	105	11,520,800
	Totals		200	7,993	247	\$49,277,435

professional education rather than in science or mathematics. The Foundation does not require that the participants work for a degree at all or that the institution offering the institute make any provision for a degree. However, both the Foundation and the colleges or universities recognize that many participants will want a degree, since it usually qualifies one for a salary increase and other prestige factors. Institutions have met this problem in various ways. A few have made no provision, except that of telling the participants that they may use the course credits on any degree for which they are acceptable in the university. A number have made arrangements to grant the participants a Master's degree in education. This seems to me to be unfortunate for students who take all of their work in science, since other students in the same institution obtain the same degree with all work taken in professional education courses. Others have provided a Master's degree in natural science or one in education with an emphasis on science or mathematics. In a few institutions participants have been encouraged to work for a Master's degree in mathematics or in one of the sciences, provided they have the background and ability to conform to the regulations set up by the graduate school and the department concerned.

The effects of these programs are difficult to measure, but a study made of the participants of the first two Academic Year Institutes at the Oklahoma State University, after they had been back in the schoolroom one or two years (Ostlund, 1961) indicates that their activities, particularly those related to the professional areas, had increased. Their mean salaries increased \$620 as a result of having attended the Institute, 90% thought their prestige in the school was increased. Perhaps most significant were the changes which took place in their classroom procedure. They listed such things as a broader understanding of science and mathematics, the use of new and more modern concepts, a wider variety of topics, a feeling of mastery and security in subject matter which enabled them to improve their classroom presentations and encourage student initiative. In all they listed a total of 111 favorable comments in this area. Altogether the favorable comments on the institute experience were six times the unfavorable ones.

During the last five years more than 100 Oklahoma teachers of science and mathematics have received a year's training in the Academic Year Institutes at the Oklahoma State University or at other institutions over the country. Some of these are being used as supervisors, some are teaching in college but most of them are high school classroom teachers. While they are doing a more effective job in the classroom, and perhaps this is their most important function, this trained potential for leadership could be used to a better advantage in our schools. Ways of making use of these teachers have been discussed with the officials of the National Science Foundation and the U.S. Office of Education; while these two agencies are receptive to these ideas, no practical programs have yet been initiated.

The Oklahoma State University and other institutions over the state have initiated projects on an experimental basis in which selected teachers, many of whom are NSF Institute trained, are working directly with both mathematics and science teachers at the elementary level. These projects are effective and are receiving support from the schools and individual teachers in the state. They will be continued and expanded next year. The Oklahoma State University will receive partial support during the academic year 1962-63 for work in a limited number of schools for elementary mathematics and for 10th grade biology in connection with its Seventh Academic Year Institute.

Another area, much more basic in nature, is the improvement of the

pre-service training of both elementary and secondary teachers of mathematics and science. Again the Academic Year Institutes and other NSF programs have exerted an excellent influence, largely by the work of participants who have entered the field of college teaching as a result of the training received in the institutes. Requirements have been raised, new courses have been organized and required and the general level of the beginning teacher's competence has been vastly improved because of this effort.

#### LITERATURE CITED

- Ostlund, L. A. 1961. Field Study Academic Year Institute Participants. Arts and Science Studies, Social Studies Series No. 6, Oklahoma State University, Stillwater, Okla.