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ABSTRACT

As a background paper for discussion at the 1973 National Annual Convention of the Association for the Education of Teachers of Science, analyses are made concerning the present status and future development of science teacher education. Shortcomings in current teacher preparation are discussed in connection with recent changes in the economy and society. Professional aspects of science teaching are described as the main concern in the future teacher preparation program. Educational objectives should be directed toward the understanding of (1) the changing character of science, (2) the place of science in society, (3) the nature of knowledge in science, (4) the learning of science based knowledge, (5) the philosophical basis of science education and the rationale for curriculum choices, and (6) the valuation of goals and similar topics. Capability of generating insights into problems of teaching and knowledge in liberal arts and humanities are also required. Great efforts and support from outside disciplines are needed to help beginning teachers gain a personal sense of purpose and direction and a basis for intelligent action. Science teachers' responsibility as consumers of education research rather than as researchers is stressed. The author indicates that "new" science teacher education is likely to be formulated by teacher educators rather than by forces outside the profession. (CC)

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"Futuring" About Science Teacher Education*

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Accompanying the development of the new science curricula during the 1960's was a massive effort to re-train teachers to manage these innovative programs. In a ten year period Federal and private agencies spent nearly one billion dollars to improve the teaching of science. The pay-off may be broadly described as disappointing and in turn has contributed to a loss of confidence in teacher education programs. Newly trained graduates today, for the most part, are no more competent to manage modern science courses than teachers of fifteen years ago.

It seems to me that the major question we have for discussion is: What sort of changes will be necessary to establish a widespread feeling of legitimacy in science teacher education? The timing for this discussion could not be better. We are at the end of a curriculum era in science teaching, the next

*Prepared as a basis for discussion.

period is already emerging with different goals, subject matter and instructional characteristics.

Before I go on I should like each of you to recall some of the tremendous changes in American society that have occurred in the past decade -- changes so great that their impact on people is being compared to the displacements that resulted from the introduction of agriculture some 5000 years ago. Think about the major transformations in our economy, in life styles, in occupational demands, in our sense of values, in the influence of technology and in social disorganization. For us here, one of the most significant changes has been in the character of the scientific enterprise; its dependence upon technology, its movement toward a moral science, and the questioning of its explanatory systems. The surplus of scientists and science teachers and the problems of overskill are no less important. A majority of the teacher education programs of the 1970's are largely obsolete because they are designed to teach the science of the 1960's and there is little attention to on-going cultural

changes and emerging science curricula. Hopefully the "new" teacher education in the sciences will be formulated by those now responsible for teacher education rather than by forces outside the profession.

What sort of teachers do we need for the future? This is the question we must answer. It seems to me we should begin by rejecting as early as possible students who wish to become teachers but who are not really interested in a scholarly life and who lack the essential personality qualities for working with young people. A teaching candidate who is not willing to spend, or doesn't see the importance of spending, at least 3% of his annual income on professional books, magazines, and activities throughout his entire career is not a person that we should encourage.

As educators of teachers we need to make some changes in our own thinking. Our most important task is to educate teaching candidates as <u>students of teaching</u>; it is <u>not</u> our task simply <u>to train student teachers</u>. We must think of teachers as something

more than criterion referenced mechanists and servants to computers, bound to prescriptions and incapable of generating their own insights into problems of teaching.

The college's or university's responsibility for educating teachers should be primarily concentrated on the professional aspects of science teaching. This to me means developing an understanding of 1) the changing character of the scientific enterprise; 2) the place of science in society; 3) the nature of knowledge in the sciences; 4) the learning of science based knowledge; 5) the philosophical basis of science education and the rationale for curriculum choices; 6) the valuation of goals and similar topics. The intent of such a program is to develop a basis from which teachers are able to form hypotheses and make decisions about appropriate curriculum and instructional practices. We need teachers who have a conviction of and a commitment to the worthiness of their subject specialty for general education, teachers who are able to think and act within a frame of reference and who can justify their actions, teachers

who are capable of recognizing changes in society and adaptable enough to meet new conditions of living and human aspirations within the context of science and technology.

There is a popular notion that pre-service education should provide beginning teachers with a few so-called "survival skills" and then turn them loose in schools; actually this is more a "kiss of death" than survival. We all know that the interactions of a classroom situation are never twice the same; to what extent then can we justify training in specific instructional skills? A greater effort is needed to help beginning teachers gain a personal sense of purpose and direction and a basis for intelligent action.

The development of the specific techniques a science teacher needs should be part of carefully designed in-service programs. Skills are best learned where they can be applied and against a background of knowledge and insight that makes them reasonable and generalizable.

We should make a greater effort to help teachers, who have

acquired their knowledge of science within a discipline, to recognize that for the purposes of general education it must be taught outside the discipline. The pre-college science teacher must recognize that his major responsibility is that of an interpreter of science and not that of a researcher.

In the near future I would like to see beginning teachers given experience as consumers of educational research, as well as, prepared to participate or engage in classroom research on their own.

As teacher educators I think we have reached the point where it is urgent for us to put more pressure on the faculties of arts, sciences and humanities to provide more appropriate courses for teachers. The greatest drag on teacher education today is the failure of liberal arts faculties to initiate courses suitable for interpreting the knowledge within their diverse disciplines for a wider audience than their fellow specialists. These faculties criticize teacher education and at the same time jealously guard the critical knowledge that

would make general education in their field more effective.

I come back to the point that we are entering a new era in American life, and that the professional education of teachers for this period must be conceived in terms unlike those of the past.