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Kenneth Thompson  
*Marshalltown Schools*

Darrel Hoff  
*University of Northern Iowa*

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# **EARTH SCIENCE TEACHER EXCELLENT AND OTHERWISE: IS THERE A DIFFERENCE?**

*Kenneth Thompson  
Marshalltown Schools  
317 Columbus Drive  
Marshalltown, IA 50158*

*Darrel Hoff  
Professor of Astronomy & Science Education  
University of Northern Iowa  
Cedar Falls, IA 50614*

Teaching effectiveness is a much debated topic. Yager and Lunetta (1984) have suggested that the lack of teacher effectiveness is a part of the current crisis in science education. Hawley, et al. (1984) makes it clear that teachers are important determiners of student achievement, and Medley (1979) concurs, saying "The effect of schooling on the individual pupil depends to a considerable extent on how his teacher is."

But how can teacher effectiveness be determined? Historically, teacher effectiveness has been judged to be a product of a variety of factors including personality types, teaching methods, classroom climate and teacher competencies. Others have suggested using measurements of student mastery of selected concepts as an index of teacher effectiveness.

## **Survey**

We have completed a study comparing earth science teachers who have been previously selected as excellent teachers with a random group of non-selectees. This study probed such dimensions as teacher preparation, classroom style, self perception of personality characteristics and professional involvement in science education. While we make no claim that this is a definitive study true of all science teachers, several striking differences emerge between the two groups that may provide insight for both pre-service and in-service preparation. This study is not meant to suggest evaluation techniques for judging teacher merit in general.

Annually, the Iowa Academy of Science presents several awards, called the Excellence In Science Teaching Awards (ESTA) to teachers in a variety of fields. These fields have included earth science since 1970. The selection is made by a committee chair, a selection committee and the director of the ESTA. The committee's decision is based on information in a nomination packet and two letters of recommendation. Nominees need not be members of the Iowa Academy of Science.

A 25-item questionnaire was sent to the 15 winners of the ESTA-ES (1970-1984) and to 30 non-winning earth science teachers randomly selected from a list provided by the Iowa Department of Public Instruction. Twelve winners and 25 non-winners responded for a response rate of 80 percent and 83 percent respectively.

Rather than reproduce the entire questionnaire and results, several key items that illustrate the greatest similarities and differences will be selected and discussed.

## Educational Background

Surprisingly, little difference appears in the educational preparation of these two groups. About two-thirds of each group are Iowa educated. None in the winners' group had an undergraduate degree in earth science, and only three of the comparison group possessed such a degree. In both groups most teachers held an undergraduate degree in some area of science with course work in earth science. In both groups most had three or more earth science courses at the graduate level. In both groups most were experienced teachers. Of the winners 83 percent had 15 or more years of teaching, and 72 percent of the comparison group had taught 15 years or more.

In summary, though no statistical tests were applied, the two groups' professional preparation and experience are not strikingly different. An exception is the possession of an advanced degree. Here, 100 percent of the ESTA-ES group possessed an M.A. or M.S. and only 56 percent of the comparison group did. But of that graduate degree group only about a third of each had majored in earth science.

## Major Differences

Major differences between the two groups occur in the categories of self perception of personality, classroom style and continuing professional activities.

When asked whether they perceive themselves as more content or process oriented, 58 percent of the ESTA-ES indicated a *process* orientation and 73 percent of the comparison group indicated a *content* orientation. This response was supported by responses to a parallel question in which they were asked to choose the most dominant feature of their earth science teaching. The list provided included five items: textbooks, lectures, discussion, laboratory activities, and teacher made materials. Of the ESTA-ES group, 92 percent chose either laboratory activities or teacher made materials. Of the comparison group 66 percent chose textbook or lectures.

Respondents were asked to choose the personality traits they possessed which they believed to be most beneficial to being a successful teacher. Of the ESTA-ES group, 82 percent chose either *enthusiasm* or *diligence*. Of the comparison group, 53 percent chose *patience* or *tolerance*.

There were striking differences in the area of professional activities, "memberships" and use of professional journals and publications. Respondents reported on attendance at professional science educational meetings. Only one awardee reported *not* attending a national, regional or state meeting in science or science education in the previous year, while 40 percent of the comparison group indicated not attending such a meeting. A total of 50 percent of the awardees belongs to three or more scientific or science educational organizations, while only 12 percent of the comparison group does. More surprising is that none of the ESTA-ES group reported belonging to *no* organization of these types and 32 percent of the comparison group reported no science or science education organizational membership.

A corollary question asked how many science or science educational journals each respondent regularly reads. Of the ESTA-ES group, 75 percent reported reading *three or more* journals. Of the comparison group, 68 percent reported reading *two or less*. Of the awardees, 50 percent had published in one of these journals. None of the comparison group had had an article published.

### Conclusions

Although it cannot conclusively be demonstrated that teaching effectiveness can be measured by outstanding teacher recognition, it is striking that the teachers who identified themselves as enthusiastic process/activity teachers and are identified by their peers as being excellent teachers show characteristics of continued professional growth and involvement.

How can a spirit of professionalism in pre-service and in-service education be promoted? An obvious answer is increased membership recruiting at all levels. In pre-service methods courses, what emphasis is placed on professional organizations and their values? Are pre-service teachers encouraged to join appropriate professional groups and attend meetings? Other experiences and activities are required of our students; dare we *require* pre-service professional involvement as well?

Teacher educators attending professional meetings should routinely contact local teachers and invite attendance. Low-cost group travel can be organized to include pre- and in-service teachers. Solicitation of publishable ideas from our in-service colleagues ought to be done aggressively. Supporting professional memberships by direct personal invitation is relatively easy to do.

If one accepts the premise that professional growth is promotable, then more can be done by teacher educators than is presently being done.

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