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ANALYSIS OF THE CHEMICAL EDUCATION LITERATURE

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ABSTRACT

The growth of the literature of chemical education has been rapid in the last decade with changes in the scope of journals in which original articles are being published. The purposes of this paper are to present base line data on articles related to chemical education and to discuss some of the characteristics of the two journals (*J. Chem. Ed.* and *Chem.*) that it is estimated contained more than 45 percent of all of the articles related to chemical education published during 1970 and 1971. A detailed study was made of all issues of the two journals published between January 1970 and December 1971. A tabulation was made of the number of articles by such factors as type of article, author affiliation, intended audience, length, and geographic residence of the author. Results of the study revealed that about 40 percent of the articles were related to research and methods of teaching. Less than 5 percent of the articles were related to teaching below the college level. Analysis of the professional affiliations of the authors revealed that over 88 percent were associated with colleges and universities. The largest proportion of the articles were published by authors living in the central part of the United States. Suggested changes in the scope of the two journals are included.

INTRODUCTION

In recent years the growth of the literature of chemical education has been rapid. This growth had led to changes in the scope of journals and the addition of new journals in which original articles are being published. For example, a study of *Chemical Abstracts* for the period 1962-1969 (an eight year period) revealed that there were a total of 2,635 articles that were abstracted that were related directly to chemical education (Ayers, 1971). Over 75 percent of all of the articles in chemical education appeared in a total of ten different journals. This same study revealed that there was a growing tendency for authors to publish chemical education papers in a wider variety of journals with over 80 percent being published in English. The purposes of this paper are to present baseline data on articles related to chemical education and to discuss some of the characteristics of the two journals that it is estimated contained more than 45 percent of all the articles related to chemical education published during 1970 and 1971.

METHODS

The two journals chosen for this study were the *Journal of Chemical Education* (*J. Chem. Ed.*) and *Chemistry* (*Chem.*). A detailed study was made of each issue of these journals that

was published between January 1970 and December 1971, i.e., a two year period. A tabulation was made of the number of articles that appeared in each of the journals during this period (it should be noted that the number of articles was about equally divided during 1970 and 1971). The articles were categorized on the basis of the level for which they were written (below the college level, college, and others). A tabulation was made of the number of articles that fell into five categories and included: research in teaching chemistry; other research (such as reports of original scientific research); methods of teaching chemistry; philosophy and history of chemical education; and a fifth category of general articles which included such items as summaries of meetings, editorials, and book reviews.

A summary was made of the average length of the articles that appeared in each of the journals in terms of the number of words. It should be noted that space taken up by figures or pictures was converted to equivalent words and used in computing the averages. Author affiliation was summarized into four categories: below the college level, colleges and universities, industry, and others. This later category included articles that did not list a specific author, i.e., news articles, editorials, etc. A summary was made of the geographical residences of the authors, i.e., northeastern part of the United States, southeastern, etc.

RESULTS AND DISCUSSION

The results of this study, related to the level for which the article was intended, revealed that there were a total of 612 articles published in *J. Chem. Ed.* during 1970-1971. Of this number, five were related directly to instruction at either the preschool, elementary, or junior high level; 36 were related to instruction at the senior high level; and 142 were related to college instruction. The remaining 429 articles dealt with a variety of topics including such items as book reviews, summaries of professional meetings, editorials, and research that could be applicable to all levels of instruction. An examination of *Chem.* revealed five articles directly related to instruction at the junior or senior high level, 15 related to college teaching, and the remaining 60 articles were related to other areas as defined above.

Table 1 shows a summary of the type of articles found in the journals. The two journals contained a total of 62 articles directly related to research and teaching chemistry, 108 reporting the results of original scientific research, 218 related to methods of instruction in chemical education, 52 concerned with the philosophy

TABLE 1: *Type of Article*

Journal	Research in		Methods	Philosophy and History	
	Teaching	Pure Research		Other	
<i>J. Chem. Educ.</i>	61	94	202	24	231
<i>Chem.</i>	1	14	16	28	21
Totals	62	108	218	52	252

and history of chemical education, and 252 related to other areas. An examination of the length of articles revealed that the average for both journals was about 1,850 words. It should be noted that these lengths included an estimate of the number of words that would correspond to figures and pictures.

Table 2 shows a summary of the professional affiliations of the authors of articles in the two journals. Over 88 percent of the articles appearing in these two journals were written by authors associated with colleges and universities; only about 1.9 percent were written by authors from public schools, and 4.8 percent by authors from industry. A detailed analysis of the articles from authors associated with colleges and universities revealed that they represented a total of 326 different institutions. The most productive institution was Ohio State University with 27 articles or 3.9 percent of the total.

TABLE 2: Professional Affiliations of Authors-Percent

Journal	Below College	College	Industry	Other
<i>J. Chem. Educ.</i>	0.8	91.8	4.4	2.9
<i>Chem.</i>	10.0	61.3	7.5	21.3
Totals	1.9	88.3	4.8	5.0

Table 3 shows a summary of the geographic distribution of the authors of articles in the journals. It will be noted that the groups have been divided into six areas, five within the United States and one encompassing all foreign contributors. Overall the central part of the United States was the most productive. The second most productive area was the northeastern part of the United States followed by the southeast. This is generally evident in the percentages shown for the two publications.

TABLE 3: Geographic Distribution of Authors-Percent

Journal	N.E.	S.E.	Central	S.W.	Far West	Foreign
<i>J. Chem. Educ.</i>	22.7	11.8	27.3	7.4	13.2	17.6
<i>Chem.</i>	26.3	26.3	22.5	3.8	14.8	6.3
Totals	23.1	13.6	26.7	6.9	13.3	16.4

CONCLUSION

This study has presented a summary of some relevant information concerning publication of information about chemical education. It is obvious that the study is

limited in scope in that only two journals were examined in depth. However, it is estimated that these two journals contained over 45 percent of the world's literature related to chemical education published in 1970 and 1971. During the period of the study, only a negligible amount of material was published in these two journals related directly to instruction at the elementary, junior, and senior high school level. There was an abundance of material related directly to college level instruction. It should be pointed out that well over 60 percent of the material was classified in a category labeled other. However, many of these articles were related in general to instruction at the pre-college level.

There appeared to be a dearth of articles being published in the journals related to research in the teaching of chemical education in the schools. Because of the intended audience of these journals, it would appear that there is a need for additional articles related to this area. It would also appear that there is a need for additional articles reporting research in the area of the applications and methods of teaching chemistry. Less than 30 percent of the space in these journals was devoted to this topic.

The majority of the articles prepared in the area of chemical education came from authors affiliated with colleges and universities. Very few articles have been published by authors with professional affiliations below the college level. Authors familiar with the problems of instruction at the pre-college level should be encouraged to publish in these journals, as they can provide much valuable and practical insight into the problems of chemical education in grades K-12. It should be pointed out, however, that many of the authors associated with schools below the college level do publish in other science education journals such as: *Science Education*, *School Science and Mathematics*, *Science and Children*, and *The Science Teacher*. The majority of the articles were prepared by authors from the eastern half of the United States, with foreign contributors accounting for 16.4 percent of the articles in chemical education.

This paper has presented a summary of some statistical information related to the publication of articles in the area of chemical education. It is hoped that by the presentation of this paper that other individuals interested in chemical education can be encouraged to publish and share their work with others. In turn, the end result can be better teaching at all levels.

LITERATURE CITED

- Ayers, J. B. 1971. The journals of chemical history, education, and documentation. *J. Chem. Doc.*, 11:12-13.