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CITATION ACCURACY IN THE JOURNAL LITERATURE OF
FOUR DISCIPLINES: CHEMISTRY, PSYCHOLOGY,
LIBRARY SCIENCE, AND ENGLISH AND
AMERICAN LITERATURE

DISSERTATION

Presented to the Graduate Council of the
University of North Texas in Partial
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Catherine J. Sassen, B.A., M.L.S.

Denton, Texas

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The primary purpose of this study was to determine if there is a relationship between the bibliographic citation practices of the members of a discipline and the emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline. Citation practices were evaluated by assessing the accuracy of a sample of 1,280 bibliographic citations selected from 40 scholarly journals in four disciplines. The emphasis placed on citation accuracy and purposes in the graduate instruction of a discipline was measured by examining graduate program requirements in college catalogs that were chosen to reflect the educational backgrounds of the authors whose citations were selected for the study.

Although a statistically significant difference in error rate was found among the citations grouped by discipline, this difference was not explained by the variable of citation instruction. The average number of courses pertaining to citation instruction was highest in library science, followed by English and American

literature, chemistry and psychology. The average number of erroneous fields per citation was least in citations from chemistry, followed by English and American literature, library science and psychology. A one-way analysis of variance procedure was used to compare the citations from each discipline on the average number of erroneous fields per citation, and a statistically significant difference was found ($p=0.0162$). The Newman-Keuls multiple comparison test was used to determine that chemistry citations differed significantly from psychology citations.

Citation errors were analyzed in relation to the formats of documents cited. The Kruskal-Wallis test was used to determine that statistically significant differences existed among erroneous citations grouped by document format ($p<0.0001$).

Implications of the research results were considered. These implications pertained to instruction on bibliographic citation, the editorial policies of journals, the bibliographic citation practices of authors, style manuals and their rules for bibliographic citations, and the design and use of information storage and retrieval systems.

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CHAPTER I

INTRODUCTION

Many readers of scholarly literature assume that the bibliographic references in journal articles are accurate and contain all of the information needed to locate the cited documents. However, citation errors have been documented for over a hundred years in studies of the journal literature of the sciences and the social sciences (Sweetland 1989). Most of these studies have described the extent and types of errors in a population of citations from one or two disciplines, but have not identified variables that are related to the errors.

Statement of the Problem

Researchers have speculated that a variety of factors, ranging from the deficiencies of style manuals to the carelessness of authors, may be associated with the problem of citation errors. The factor of the author's education has been suggested several times. This factor was referred to as "instruction in scholarly writing" by White (1987, 291) and "training in the norms and purposes of the bibliographic citation" by Sweetland (1989, 302).

Each discipline has norms which are taught to students in research methods courses at the graduate level. This study was designed to examine a discipline's graduate course requirements pertaining to citation norms, and the citation practices of the members of the disciplines. The study was concerned with the following problem: Is there a relationship between the accuracy of the bibliographic citations constructed by members of a discipline and the emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline?

Significance of the Problem

Information Retrieval

A citation may be used as the basis for an acquisitions request, a catalog search, an interlibrary loan request, or a reference question. The accuracy of the citation affects how easily the cited document may be located. If the citation contains errors, the search for the cited document may entail a lengthy verification process. If the errors are severe, they may prevent the retrieval of the cited document.

Errors in Citation Indexes

According to Garfield (1983, 26), most of the errors in index entries appearing in citation indexes published by the Institute for Scientific Information may be traced to the documents from which the citations were taken. If an

erroneous citation is reproduced in a citation index, it may cause even more information retrieval problems than it did in its former life. First, there is the matter of a user retrieving a citation from the index, which should group citations to the same author together. Errors in the author field of a citation will affect how that citation is indexed, and may prevent its retrieval. The consequences of these errors are related to their severity, frequency, and the use that is made of the citation index.

Citation indexes are often used in citation analysis. Concerns about the accuracy of citations in Science Citation Index and the implications for citation analysis have been discussed by Boyce and Funk (1978), Oppenheim and Renn (1978), Thompson (1978), Broadus (1983), MacRoberts and MacRoberts (1989), and Moed and Vriens (1989).

One application of citation analysis is the evaluation of researchers (Garfield 1979, 62). Protesting the qualitative use of citation indexes, Edmonds and Harris (1977) have written about the errors in personal names in Science Citation Index. Rosenberg (1979) and Swartz (1979) also have addressed this issue in relation to errors in personal names in Social Sciences Citation Index.

Aside from citation analysis, a citation index may be used to locate current works that have cited a specific article or author known to the user (Garfield 1983). If a citation taken from the index contains errors, the

retrieval of the cited document may be delayed or prevented. Concerns about the accuracy of citations in Social Sciences Citation Index and the implications for information retrieval have been discussed by Rudolph and Brackstone (1990).

Concerns about the Quality of the Author's Work

Citation errors may affect the reader's perceptions of the quality of the author's work. The Publication Manual of the American Psychological Association cautions:

"Because one purpose of listing references is to enable readers to retrieve and use the sources, reference data must be correct and complete. . . . Accurately prepared references help establish your credibility as a careful researcher" (American Psychological Association 1983, 111-112). This concern is echoed by Roland (1976, 717): "Who can have confidence in a work in which he can find mistakes, whether in the data, the interpretations, or the references?" Baron (1985, 405) states that he has observed a correlation between citation accuracy and the overall standard of work in Ph.D. theses. Book and article reviews which have drawn attention to citation errors include Littman (1976), Garfield (1986), and Grisso (1986).

Ethics

Several authors have written about the issue of citation accuracy within the context of ethics in scholarship. According to Roland (1976, 717) and Hartmann (1984), the author of a publication has the responsibility of providing accurate information, including accurate citations, for the readers.

Although some errors in citations may have resulted from carelessness, others have been associated with dishonesty (Berg 1990). In False Prophets, Alexander Kohn (1986) documents many cases of misconduct in science. The problem of faulty bibliographic references plays a part in two of the cases. The first case concerns Sir Cyril Burt, a British psychologist, who was renowned for his research concerning intelligence and heredity (Kohn 1986, 52-57). Investigations of his research revealed several discrepancies, including his citations to nonexistent papers to justify his research methods. The other case concerns Zoltan J. Lucas (Kohn 1986, 104-110). Lucas, an associate professor of surgery at Stanford University, studied the immunology of rats with kidney transplants. Investigations of his research revealed a variety of problems, including citations to nonexistent publications of his own.

Limitations of Earlier Studies

Although the problem of citation error has been documented for over a hundred years, few researchers have designed studies to identify factors associated with it. Several authors have suggested that education may be associated with citation accuracy. A study of bibliographic citations from several disciplines may be used to determine if there is a relationship between citation accuracy in a discipline and the emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline. This relationship cannot be assessed by examining the results of the existing studies of citation accuracy because most of them are limited to a single discipline. It is not appropriate to compare the results of these studies because they differ in research methods. For example, some researchers verified citations only by comparing them to the documents cited (Goodrich and Roland 1977, 17; Evans, Nadjari and Burchell 1990, 1353), but others verified some citations in reference sources if they lacked immediate access to the original documents cited (Poyer 1979, 397; Doms 1989, 442). The studies also differ in the ways they defined errors. For example, some researchers considered any deviation in the punctuation in the title field in a citation from that used in the title on the source document to be an error (Key and Roland, 1977, 136; White 1987, 288), but others did not (Eichorn

and Yankauer 1987, 1011). The studies also differ in their presentation of results. For example, some researchers have summarized errors in volume number, pagination and year of publication separately (Key and Roland 1977, 137), but other researchers have grouped this information into a category labeled "entry" (Boyce and Banning 1979, 350; White 1987, 289).

Purpose of the Study

The primary purpose of this study was to determine if there is a relationship between the bibliographic citation practices of the members of a discipline and the emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline. Citation practices were evaluated by assessing the accuracy of a sample of bibliographic references from articles in the scholarly journals of a discipline. The emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline was determined by examining descriptions of courses required for a master's degree in the discipline in a sample of college catalogs. The catalogs used in this examination were chosen to reflect the educational backgrounds of the authors whose citations were selected for the study.

Hypothesis

The following hypothesis was developed for the study: The greater the emphasis a discipline places on citation accuracy and purposes in its graduate instruction, the lesser will be the number of errors in the bibliographic citations in the journal literature of the discipline.

Definitions of Terms

The definitions of the following terms are used for the purpose of this study:

The emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline was determined by examining descriptions of courses required for a master's degree in the discipline in a sample of college catalogs. A course description was considered to pertain to citation accuracy and purposes if it mentioned cataloging, descriptive bibliography, the documentation of scholarly papers, or another similar term.

Citation practices were assessed through an examination of a sample of bibliographic references from articles in the scholarly journals of a discipline. Each citation was evaluated to determine if it included accurate information, and if it contained all of the information needed to identify and access the cited document.

The disciplines studied were chemistry, psychology, library science, and English and American literature.

A scholarly journal is a periodical that is refereed, contains articles accompanied by bibliographic references, and is published by a leading American professional association or university.

Assumptions

The hypothesis was based upon the following assumptions:

1. It was assumed that the errors in the bibliographic citations accompanying a journal article were primarily the responsibility of the author(s) of the article.

2. It was assumed that, in most cases, an author of an article in a scholarly journal would hold at least a master's degree in the discipline associated with the journal.

3. It was assumed that if a discipline stressed citation accuracy and purposes, this emphasis would be reflected in the courses required for a master's degree in the discipline.

4. It was assumed that the emphasis of a course was evident from its description in a college catalog.

5. It was assumed that students who were taught the importance of a particular scholarly practice would attempt to follow that practice.

Limitations

Limitations in the sampling frame of the study have reduced the extent to which the findings may be generalized. The random sample of bibliographic citations was limited in terms of the scholarly journals, issues, articles, and references from which it was drawn. The scholarly journals were limited to those which the investigator determined were refereed, contained bibliographic references, and were published by a leading American professional association or university. The issues were limited to those published in 1986. The articles were limited to those which contained at least four bibliographic references, and which had five or less authors. The references were limited to those which appeared to represent documents that would be accessible to the investigator for verification purposes.

Summary

This chapter began with a discussion of the problem of citation errors and its significance. A hypothesis was proposed which related the incidence of errors in the bibliographic citations of the journal literature of a discipline with the emphasis that the discipline places on citation accuracy and purposes in its graduate instruction. Definitions of terms, assumptions and limitations of the study were stated.

A review of the literature on citation accuracy will be presented in the following chapter. The research design and procedures used in the present study will be described in the third chapter. The findings of the study will be analyzed in the fourth chapter. A summary of the study, a discussion of the results and their implications, and suggestions for further research will be given in the fifth chapter.

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CHAPTER II

LITERATURE REVIEW

This chapter contains a review of the literature of citation accuracy that pertains to the problem chosen for investigation in this study. A more general approach to the literature is precluded by the focus of the study. However, a comprehensive review of the literature of citation accuracy has already been written by Sweetland (1989).

Citation accuracy studies, including case studies, comparative studies and other related studies, will be discussed first. Papers on citation verification techniques will be surveyed. Factors that researchers have suggested are related to citation errors will be reviewed.

Citation Accuracy Studies

Case Studies

Many case studies concerning the problem of citation error have appeared in the journal literature for more than a century. One of the earliest case studies was published in 1859 by Aristide-Auguste-Stanislas Verneuil, a surgeon and a scholar. He reviewed the six hours of work that it took him to verify some miscitations that he encountered in researching the surgical literature (Gilbert 1941).

The most famous case study in this area concerns "Dr. O. Uplavici" (Dobell 1939). In 1887, Jaroslav Hlava published a paper written in Czech which was entitled "O uplavici." (The English translation of this title is "On dysentery.") The paper became known through an abstract in a German language publication in which the author's name was given as "Uplavici, O." Hlava's paper subsequently was attributed by other sources to a variety of "authors," including "O. Hlava," "Uplavici Hlava," and "O. Hlava [O. Uplavici]." In 1910 the Index-Catalogue of Medical and Veterinary Zoology indexed Hlava's paper under the name of "Uplavici, O. [Dr.]." The miscitations continued until 1938 when Dobell published a paper on the history of the case.

Although many other case studies on citation error have been published, they will not be reviewed here. Even though studies of this type are interesting and provide some idea of the history of the problem of citation error, other types of studies must be considered for an indication of the extent of the problem and the methods used to research it on a large scale.

Comparative Studies

Researchers have used comparative studies to investigate the problem of citation error in the literature of many disciplines. Most of these studies have been done

with citations drawn from the literature of the health sciences. To conduct a comparative study, the researcher selects a sample of citations, and compares each citation to its cited document.

Studies in the Health Sciences

The preface to part two of Die Lehre von der Krebskrankheit (Wolff 1911) is considered to be the first published account of a comparative study of citation accuracy. Wolff verified approximately 10,000 citations while researching cancer literature, and found that nearly 10 percent were erroneous.

Goodrich and Roland (1977) verified 2,195 citations from ten major American medical journals and found 28.88 percent of the citations to be erroneous. The errors found in selected citation fields were as follows: author, 163; article and book title, 343; journal title, 1; volume number, 29; page number, 78; year, 8.

Key and Roland (1977) checked 1,867 citations from the bibliographies of 129 articles accepted for publication in the Archives of Physical Medicine and Rehabilitation. They found that 53.83 percent of the citations were incorrect. They were unable to verify 6.16 percent of the citations. The errors found in particular fields were as follows: author, 599; title, 463; journal title, 105; volume, 381;

publisher, 27. The researchers verified citations in reference sources if the cited documents were unavailable.

Poyer (1979) conducted a study of 2,496 citations from selected "high impact" journals held by a medical library. He verified citations in reference sources if the cited documents were unavailable. He determined that 14.7 percent of the citations were erroneous. He was not able to verify 1.92 percent of the citations. The number of errors found in particular fields were as follows: author, 357; journal title, 8; volume number, 32; pagination, 40; year, 29.

DeLacey, Record and Wade (1985) studied quotation and citation accuracy with 300 references which were randomly selected from six medical journals. They found that 23.67 percent of the citations were incorrect. Errors were categorized as "major" if they prevented immediate document retrieval, or "minor" if they did not. The researchers identified 26 major errors and 45 minor errors.

Eichorn and Yankauer (1987) studied quotation and citation accuracy with a sample of 150 references chosen from three public health journals. They found that 30.67 percent of the citations were erroneous, with five major errors and 41 minor errors. Citations to foreign language journals, to journals not in the researchers' library, and to documents other than journals were excluded from the study.

Foreman and Kirchhoff (1987) examined 112 citations which were randomly selected from 17 nursing journals. The researchers categorized ten of the journals as "clinical," and seven of the journals "non-clinical." They summarized citation errors in these categories. Of the 65 citations from the clinical journals, 38.4 percent had minor errors and 4.6 percent had major errors. Forty percent of the errors in the clinical journals were alphabetic, and 60 percent of the errors were numeric. Of the 47 citations from the non-clinical journals, 21.3 percent had minor errors, and none of the citations had major errors. Eighty percent of the errors in the non-clinical journals were alphabetic, and 20 percent of the errors were numeric. The researchers noted that articles in the non-clinical journals were "more scholarly" and were more likely to have been written by authors with doctorates than were the articles in the clinical journals.

Doms (1989) checked a sample of 500 citations from five dental journals, and found that 42.2 percent of the citations were erroneous. He was unable to verify five percent of the sample. He verified 349 citations by consulting the cited documents, and 126 citations by using reference sources. He identified 75 major errors and 173 minor errors.

Evans, Nadjari and Burchell (1990) studied quotation and citation accuracy with a sample of 150 references

randomly selected from three surgical journals. They found that 48 percent of the citations were incorrect. They were unable to identify 8.67 percent of the citations. They identified 13 major errors, which included incorrect journal titles and omissions of year and volume numbers. They also identified 41 minor errors, which included "overlapping page errors, misspellings, omissions, and substitutions" (Evans, Nadjari, and Burchell 1990, 1353).

Putterman and Lossos (1991) examined 384 citations selected from two medical journals published in Israel. They found that 26 percent of the citations contained only minor errors, 8 percent of the citations contained major errors, and 3 percent of the citations were unverifiable. They found more errors in authors' names than in any other citation field.

Studies in Other Disciplines

Boyce and Banning (1979) studied citations from the Journal of the American Society for Information Science (JASIS) and Personnel and Guidance Journal (PGJ). Of the 487 JASIS citations, they found that 13.55 percent were erroneous, and 23 percent were impossible to verify. The errors found in specific fields were as follows: author, 7; article and book title, 23; journal title, 3; entry (including volume number, year and pagination), 27; omission, 6. Of the 782 PGJ citations, they found that

10.74 percent were erroneous and 18.54 percent were impossible to verify. The errors found in specific fields were as follows: author, 11; title of article or book, 15; journal title, 2; entry, 43; omission, 13. The researchers verified entries by checking reference sources if the cited documents were unavailable.

White (1986a) studied citations from JASIS and three psychology journals. Of the 5,656 citations selected for the study, 38.67 percent were identified as erroneous, and 19.52 percent were not verified. The number of errors found in particular fields were as follows: author, 1,269; title, 1,030; entry, 834; other, 181. In the published derivation of this study (1987a), White focused on citations selected from two psychology journals. Of the 2,788 citations selected for the study, 38.45 percent were identified as erroneous, and 14.35 percent were not verified.

White (1986b, 1987b) conducted another study in which he verified citations published in JASIS and the Journal of Counseling and Development over a period of four decades. He pooled the data from both journals after finding "no systematic differences" in errors between the two. Of the 2,933 citations selected, 43.88 percent were flawed, and 0.1 percent were unverifiable. Of the 1,315 citations from the 1980s data, 46.9 percent were flawed. The errors found in the citation fields were as follows: author, 396; title,

253; entry, 247. Of the 653 citations from the 1970s data, 42.6 percent were flawed. The errors found in the citation fields were as follows: author, 142; title, 128; entry, 136. Of the 682 citations from the 1960s data, 42.1 percent were flawed. The errors found in the citation fields were as follows: author, 139; title, 161; entry, 150. Of the 283 citations from the 1950s data, 37.1 percent were flawed. The errors found in the citation fields were as follows: author, 34; title, 47; entry, 55. Only citations to journals held by the author's home university library were selected for the study.

In a third study, White (1991) verified 10,149 citations selected from ten journals from the disciplines of psychology, education and information science. He identified 40.3 percent of the citations as incorrect. The errors found in the citation fields were as follows: author, 2,463; article title, 2,082; journal title, 93; year, 94; volume number and date, 265; issue number, 280; pagination, 801; other, 12. Only citations to journals held by the author's home university library were selected for the study.

In a study of quotation and citation accuracy, White and Hernandez (1991) verified references from the American Educational Research Journal. Of the 856 citations verified, 46.26 percent were found to be incorrect.

White, Hernandez and Holt (1991) studied quotations and citations from 16 social science journals. Three of the sample of 405 citations were unverifiable. The researchers found that 28.8 percent of the citations from journals that published experimental research were erroneous, and 41.9 percent of the citations from journals that published papers which were "practitioner/professional in nature" were erroneous (White, Hernandez and Holt 1991, 5).

Characteristics of Comparative Studies

The research design and procedures developed for the problem investigated in this dissertation were derived from elements of earlier comparative studies of citation accuracy. This section presents a discussion of the various methods used in the earlier comparative studies.

Although there are many differences among the comparative studies, there are also some basic similarities. Each study began with the selection of a group of citations. In most cases, each citation was compared to its cited document. Any discrepancies between the citation and the cited document were noted. The accuracy of the citation was determined by applying a set of rules. The miscitations were categorized and summarized. However, the researchers who carried out these activities did not use the same procedures.

Most researchers selected citations from the journal literature of one discipline, or from several related disciplines. They used a variety of sampling plans. Some researchers selected all citations appearing in certain journal articles, or in particular journal issues. Others selected a random sample of citations from one of these sources. Some researchers restricted the citations to those that cited documents that were readily accessible for verification purposes.

Researchers usually verified citations by comparing them to the cited documents. However, some researchers verified citations in reference sources if they lacked access to the cited documents. The rules used to judge discrepancies between the citation and the cited document varied with the researchers.

There is little uniformity among the studies in the way the findings were summarized. Although most researchers reported the number of citations verified, some did not report the number of citations initially selected for the study. The number of incorrect citations was given in most cases. Definitions of error categories varied.

Other Citation Accuracy Studies

Many other studies have included some assessment of citation accuracy. Some studies included an evaluation of citation accuracy in relation to certain aspects of the

publication process. Other studies concerned the accuracy of citations taken from a variety of sources, including citation indexes, online databases, catalog searches, interlibrary loan requests, and term papers written by undergraduate students.

Citations Studied in Relation to Certain Aspects of the Publication Process

Researchers have written about the accuracy of citations that they have studied in relation to certain aspects of the publication process. Accounts of these studies have appeared most often in editorials and in letters to journals. These accounts differ from the reports of formal comparative studies that were mentioned in the preceding section of this chapter because they do not contain as much information about the research procedures used by the investigators.

Two researchers have written about the citation errors they found when preparing materials for publication. Hartmann (1984) reported on the errors found in verifying 755 citations to be published in a fascicle of the Atlas of Tumor Pathology. He categorized the errors by citation field. Journal title errors occurred most often, followed by errors in pagination, journal volume, publication year, title, and name of first author. McHugh (1990) wrote an impressionistic account of the many citation errors that he

and his colleagues found while compiling two annotated bibliographies on the hard clam.

Other researchers have studied the accuracy of citations published in journals in relation to the verification practices of the journals. These studies have focused on citations in articles and in correspondence.

Lowry (1985) studied citations and quotations in correspondence. He selected citations from the correspondence received by the British Medical Journal, and from the correspondence printed in the journal. Of 67 citations from the correspondence received by the journal, he found that 24 percent were "slightly inaccurate," and 7 percent were "inaccurate." Of 248 citations from the correspondence printed in the journal, he found that 5 percent were "slightly inaccurate," and 3 percent were "inaccurate." It was not the journal's policy to verify all citations in the letters that were selected to be printed. However, editors did correct any mistakes that they noticed.

Lichter (1989) studied the accuracy of 148 citations published in four medical journals in relation to the journals' verification practices. Although he named the journals that he studied (American Journal of Ophthalmology, Annals of Internal Medicine, Archives of Ophthalmology, and New England Journal of Medicine), he did not identify the journals in relation to their citation

errors. "Journal A" had the highest error rate. Copy editors of the journal checked a small sample of citations in each article. "Journal B" had the second highest error rate. Editors of this journal did not check citations. "Journal C" had a much lower error rate. A part-time employee of the journal verified every citation against the original source. No citation errors were found in "Journal D" which used a full-time employee to verify every citation against its original source. Lichter also studied 280 citations from manuscripts that had been accepted for publication by Ophthalmology, the journal that he edited. He reported that a higher percentage of citation errors was found in this group than was found in citations taken from "Journal A." He concluded that the copy editing process could be used to eliminate some citation errors in authors' manuscripts, but citation verification still was needed to ensure the accuracy of published references.

Finally, one researcher studied citation accuracy in relation to journals' conformity with bibliographic standards. Hanson (1972) checked citations from 168 British scientific journals for compliance with British Standard Specifications for bibliographic references, and found many deviant practices. He reported that journal article titles were omitted in citations published in 100 journals, a violation of standards. He found that less

than half of the journals had abbreviated periodical titles with standard abbreviations from the prescribed list.

Citations in Citation Indexes

Broadus (1983) designed a study to test the accusation that some writers copy their bibliographic citations from publications other than the original sources. He found that Sociobiology by Edward O. Wilson contained erroneous citations to two journal articles by W. D. Hamilton. Of the 148 papers that cited Sociobiology and Hamilton's articles, 23 percent contained the same miscitations to the journal articles that first appeared in Sociobiology. Broadus collected the data for this study by searching Science Citation Index, Social Sciences Citation Index, and Arts and Humanities Citation Index.

Moed and Vriens (1989) downloaded 4,514 target articles and 24,433 citations to these articles from SCISEARCH, the online version of Science Citation Index. They compared the citations to the target articles and found that 9.4 percent of the citations contained at least one discrepancy. They also found evidence which indicated that some of the errors may have resulted from the practice of copying citations from reference lists instead of the original sources.

Rudolph and Brackstone (1990) searched annual cumulations of Social Sciences Citation Index from 1969 to

1988 for listings pertaining to Aaron T. Beck. Of the 222 citations found, 35 percent were incorrect.

Citations in Online Databases

Bourne (1977) studied spelling errors in a sample of 3,600 terms selected from 11 online databases. Although many of the terms examined were descriptors, others were taken from titles and abstracts. The error rates ranged from 0.01 percent in BIOSIS to 0.63 percent in ABI INFORM.

McCormick, Terry and Kollgaard (1979) studied the feasibility of verifying citations in online databases. They checked 280 citations from two marine fisheries journals against citations in online databases and concluded that the information in the databases was "quite accurate."

Gould (1981) studied the efficacy of manual and online bibliographic verification sources. She verified a sample of citations from journals in history, sociology, political science, and English literature. Of the 48 citations studied, 20 were flawed in some way. Gould's paper includes a review of the strategies she used to verify the problem citations.

Citations Searched in Library Catalogs

A study of the accuracy of book citations brought by users to the catalog was conducted at the library of the Atomic Weapons Research Establishment in Aldermaston,

England (Ayres et al. 1968). Of the 450 citations examined, title information was accurate in more than 90 percent of the sample, and author information was accurate in more than 75 percent of the sample.

Blackburn (1968) studied information brought by individuals to the general catalog at the University of Chicago's Harper Library. She surveyed 100 cataloger users and found that 66 percent of the data known by them was correct, 13 percent was incorrect, and 21 percent was impossible to verify.

Tagliacozzo, Rosenberg and Kochen (1970) studied catalog use at the Ann Arbor Public Library and at three University of Michigan libraries. The investigators conducted 2,681 interviews, 1,745 of which pertained to known-item catalog searches. They found that the title information was accurate in 70 percent of 1,588 cases, and the author information was accurate in 41.9 percent of 1,367 cases.

Citations in Interlibrary Loan Requests

Bell and Speer (1988) examined 618 interlibrary loan requests. They were unable to verify approximately 18 percent of the requests. Of the remaining requests, nearly 48 percent had at least one error.

Citations in Term Papers

St. Clair and Magrill (1990) studied citations from 1,958 term papers written by undergraduate students. Each citation was evaluated for completeness. No complete citations were found in four percent of the papers. One third of the citations in ten percent of the papers were incomplete. Two thirds of the citations in five percent of the papers were incomplete. Papers from business, religion and political science had more incomplete citations than those from English, history and philosophy.

Summary Statement

Reports of case studies, comparative studies, and other related citation accuracy studies indicate that citation error is a problem with a long history. Results of comparative studies and other citation accuracy studies indicate that the problem exists in the literature of many disciplines.

The comparative studies have documented the extent of the problem of citation error within certain disciplines. However, it is difficult to determine if the problem is more extensive in some disciplines than in others on the basis of these studies because most of them are limited to a single discipline, or to several related disciplines. It is not appropriate to compare the results of most of the studies because the studies differ in research methods.

Verification Strategies

Papers Describing Verification Strategies

Although some of the citation accuracy studies have mentioned strategies used to verify problem citations, other papers have focused exclusively on this topic. These papers have offered guidance in the selection of various manual and online verification sources, and have recommended appropriate search strategies to be used with particular types of problems.

Many online databases support a wide variety of search strategies and therefore offer distinct advantages for the verification of problem citations. Sweetland (1979) suggested techniques to use when verifying citations in online databases. Friedman (1980) wrote about the use of OCLC for citation verification purposes in public services. McKinin and Johnson (1983) examined ways in which the databases of the National Library of Medicine may be used for citation verification.

Citations to papers in conference proceedings are often difficult to verify. Several authors have addressed this topic. Alldredge (1981), Colbert (1981), and Bell and Schultis (1981) wrote about the verification of conference citations in a variety of manual and online sources. Hlava (1981) suggested techniques to use in verifying these citations in online databases. Hintner (1981) covered the use of OCLC in this type of verification. Grimes (1981)

focused her remarks on the verification of citations to papers presented at biomedical conferences.

Summary Statement

Papers on verification strategies for problem citations recommend reliance on a variety of manual and online sources. Although this body of literature may seem incidental, its existence is further evidence that citation error is a widespread problem which has impaired access to information.

Factors Which May Be Related to Citation Error

This section contains a discussion of factors that researchers have suggested are related to citation error. These factors may be categorized as characteristics of authors, characteristics of authors' environments, characteristics of citations, characteristics related to the source from which the citations were taken, and the issue of responsibility. Throughout the discussion, the term "author" is used to designate the person who wrote the text which is accompanied by the citations under consideration. The term "researcher" is used to refer to the person who has written about the topic of citation accuracy.

Characteristics of Authors

Education

Several researchers have suggested that the problem of citation error is related to inadequate education in citation norms and purposes (White 1987a, 291; White 1991, 16; Sweetland 1989, 300). The need for improved citation instruction has been widely acknowledged (Barnard 1960, 3; Basefsky 1982a; Basefsky 1982b; Freimer and Perry 1986, 354; Berg 1990, 141; Rudolph and Brackstone 1990).

Sex

In a study of citations taken from one information science journal and three psychology journals, White observed that error rates were higher in the bibliographies of articles that listed a male first author (White 1986a, 9). In a study of citations published in the Journal of the American Society for Information Science and the Journal of Counseling and Development over a period of four decades, he reported that error rates were lower in the bibliographies of articles that listed a female author as the first or only author (White 1986b, 9). However, he was unwilling to draw any conclusions about the historical relationship between author sex and citation accuracy because there were very few articles in the sample with female first or only authors that were published before 1980.

Dishonesty

Several researchers have identified dishonesty as a factor which may be associated with erroneous citations (White 1986a, 11; White 1991, 16; Berg 1990, 139). In False Prophets, Alexander Kohn (1986) documented many cases of dishonesty in scientific research. The problem of bibliographic references to nonexistent papers was featured in the cases of Sir Cyril Burt and Zoltan J. Lucas (Kohn 1986 52-57, 104-110).

Failure to Examine Document Cited

Many researchers believe that miscitations result from the author's failure to examine the documents cited (Place 1915; Place 1916; Weller 1921; Roland 1976; Rudolph and Brackstone 1990). In their studies of entries in citation indexes, Broadus (1983) and Moed and Vriens (1989) found some evidence to support this argument.

Language Problems

Various miscitations are the result of spelling and transcription errors. Although such errors may be attributed to the author (Berger 1913; Kronick 1958, 220; Sweetland 1989, 289), some of them may be traced to editorial staff members or printers (DeLacey, Record & Wade 1985, 885; White 1991, 14).

Spelling and transcription difficulties may be compounded when an author is working with a citation in an

unfamiliar language (Berger 1913; Kronick 1958, 220). For example, some of the errors in the case of "Dr. O. Uplavici" may be attributed to several authors' misunderstanding of the Czech language (Dobell 1939).

A related problem in citation construction is choosing the correct entry element for a compound surname. The rules for entry of a compound surname vary according to the nationality of the name, and the person who compiles a bibliography may not be aware of the appropriate rules. Garfield (1983) has written about indexing and retrieval problems which may result from the incorrect entry of these names.

Characteristics of the Authors' Environments

Multiple Authorship Arrangements

In a study of citations taken from one information science journal and three psychology journals, White (1986a, 9) reported that error rates were higher in the bibliographies of articles that had multiple authors. He reported this finding again in a study of citations published in the Journal of the American Society for Information Science and the Journal of Counseling and Development over a period of four decades (White 1986b, 9).

Pressure to Publish

White suggested several times that pressure to publish may cause errors in citations (White 1986a, 11; White 1991, 16). He designed one study of citation accuracy with this factor in mind (White 1986b, 3). He examined citations published in the Journal of the American Society for Information Science and the Journal of Counseling and Development over four decades, and found that the error rate was higher for the more recent citations. Alexander Kohn (1986, 110) acknowledged the role played by the "publish or perish" climate of the scientific community in his discussion of the case of the falsified citations constructed by Zoltan J. Lucas.

Characteristics of Citations

Format of cited item

In a study of citations taken from one information science journal and three psychology journals, White reported that error rates were higher in citations to journal articles than they were in citations to books (White 1986a, 9). St. Clair and Magrill observed that term papers citing only books had a lower rate of incomplete citations than term papers citing only journals (St. Clair and Magrill 1990, 77).

Multiple Author Names in Citation

In a study of citations published in the Journal of the American Society for Information Science and the Journal of Counseling and Development over a period of four decades, White observed that error rates grew with the practice of multiple authorship (White 1987b, 195). He reported that the number of errors in a citation was likely to be higher if the citation contained more than one author's name.

Characteristics Related to the Source From Which Citations Were Taken

Number of References in the Source

Several investigators have studied the relationship between the number of citations associated with a paper, and the number of errors associated with a given citation taken from the paper. Eichorn and Yankauer (1987) verified references from three public health journals published in 1986. In two of the journals they observed a positive correlation between the number of citations in an article and the number of errors in a citation. The researchers suggested that "authors become less willing to read all their references carefully" as their bibliographies lengthen (Eichorn & Yankauer 1987, 1012).

Evans, Nadjari, and Burchell (1990) considered this factor in their study of citations selected from three surgical journals. They did not find a positive

relationship between the number of citations in an article and the number of errors in a citation.

St. Clair and Magrill (1990) studied citation completeness in undergraduate term papers. They observed a positive relationship between the number of citations in a paper and the rate of citation completeness. They wrote, "This may reflect the fact that instructors who demand longer bibliographies also emphasize correct citation style or it may indicate that students who are comfortable with the mechanics of bibliographic documentation simply include more citations with their papers" (St. Clair and Magrill 1990, 79).

Research Orientation of Journal

Two studies included an assessment of citation accuracy in relation to the type of research reported by the journals from which the citations were taken. The first study concerned nursing journals, and the second study concerned social sciences journals.

Foreman and Kirchhoff (1987) examined citations which were randomly selected from ten clinical nursing journals, and seven non-clinical nursing journals. They evaluated 65 citations from the clinical journals, and found that 38.4 percent had minor errors and 4.6 percent had major errors. In addition, forty percent of the errors in the clinical journals were alphabetic, and 60 percent of the errors were

numeric. They evaluated 47 citations from the non-clinical journals, and found that 21.3 percent had minor errors, and none of the citations had major errors. Moreover, 80 percent of the errors in the non-clinical journals were alphabetic, and 20 percent of the errors were numeric. The researchers described the articles in the non-clinical journals as "more scholarly" and more likely to have been written by authors with doctorates than were the articles in the clinical journals.

White, Hernandez and Holt (1991) studied quotations and citations from 16 social science journals. They found that 28.8 percent of the citations from journals that published experimental research were erroneous, and 41.9 percent of the citations from journals that published papers which were "practitioner/professional in nature" were erroneous (White, Hernandez and Holt 1991, 5).

Citation to Item Printed in Source

Poyer (1979, 398) argued that journal article citation errors might be decreased if journal editors were to publish the correct citation to the article on the first page of the article. Garfield (1977a) wrote about the presence of such citations on reprints of journal articles, and the problems caused if they are incomplete or incorrect.

Style Requirements of Source

Several researchers have associated citation errors with the lack of a commonly accepted standard for bibliographic citation style (Freimer and Perry 1986; Rudolph and Brackstone 1990). Requirements among style manuals vary, and these inconsistencies may confuse authors and lead to citation errors.

Some journals do not prescribe a citation style for authors to follow, and errors may be associated with this lack of guidance. Doms (1989) mentioned this factor in his study of citation accuracy in five dental journals. Of the 100 references from the Journal of the American Dental Association, 45 were incorrect. Doms attributed some of the errors to the journal's failure to prescribe a form for bibliographic citations.

Some citation errors may reflect the deficiencies of style manuals. Basefsky (1982b) pointed out that citation practice lags behind recent developments in information technology. As a result, some style manuals provide little or no guidance for the construction of references to materials in non-book formats. Basefsky (1982a) also documented errors in citation examples printed in style manuals.

The practice of abbreviating journal titles has been associated with citation errors (Place 1915; Place 1916; Richmond 1965; Kinney 1967; Hanson 1972; Garfield 1977b).

A journal title abbreviation should be taken from a prescribed list of standard abbreviations. However, the instructions to authors may not specify the list to be used. Unfortunately, there may be more than one standard list in a single field, each with its own system of abbreviation (Kinney 1967, 5). A researcher who does not have immediate access to the prescribed list may create a new abbreviation that no one will be able to decode. Long journal titles which include corporate names and commonly used words are likely to be abbreviated incorrectly and inconsistently (Garfield 1977b).

Responsibility

Some confusion surrounds the issue of responsibility for citation accuracy. The point of view supported by authorities such as the American Psychological Association (1983, 112) and the International Committee of Medical Journal Editors (1988, 261) is that the author is to be held responsible. However, the high error rates reported in citation accuracy studies indicate that some authors have not taken this responsibility seriously, and that journal editors and referees have not enforced this responsibility. Cronin reported that 65 percent of the respondents of a survey of psychology journal editors and referees agreed that "journal editors and referees could pay greater attention to the quality and quantity of

references attached to submitted manuscripts" (Cronin 1982, 71). Several researchers have suggested that the primary responsibility for accurate citations rests with the author, but editors should check a sample of the citations accompanying each paper accepted for publication (De Lacey, Record and Wade 1985, 885-886; Doms 1989, 444; Berg 1990, 139).

The factor of responsibility played a part in the case of Zoltan J. Lucas, who cited nonexistent papers in his grant applications. Kohn argues: "Lucas might not have falsified his publication list had he not apparently been confident that what counted in the NIH refereeing system was quantity, and considered it unlikely that papers would be checked for veracity and quality" (Kohn 1986, 110). As it happened, Lucas' citations were not checked until many other irregularities in his research began to emerge.

Summary Statement

Various factors have been suggested to be related to citation error. However, most of the formal studies of citation accuracy were designed to measure only the variable of citation error. Few of the studies attempted to identify and quantify any of the factors related to citation error. Although many researchers have suggested that education may be a related factor, it has never been used as an independent variable in a formal study.

Summary

Reports of case studies, comparative studies, and other related citation accuracy studies indicate that the problem of citation error has existed for quite some time in the literature of many disciplines. The comparative studies have documented the extent of the problem within certain disciplines. However, it is difficult to determine if the problem is more extensive in some disciplines than in others on the basis of these studies because most of them are limited to a single discipline, or to several related disciplines. It is not appropriate to conduct a detailed comparison of the results of most of the studies because they differ in research methods.

The literature describing verification strategies for problem citations recommends reliance on a variety of manual and online sources. In addition, the literature indicates that citation error is a widespread problem that has impaired access to information.

Researchers have suggested that a variety of factors may be related to citation error. However, few of the formal studies of citation accuracy have attempted to identify and quantify any of the factors related to citation error. Many researchers have suggested that education may be related to citation accuracy, but this relationship has never been investigated in a formal study.

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CHAPTER III

RESEARCH DESIGN AND PROCEDURES

This chapter includes a description of the research design and procedures used in this study. The primary purpose of the study was to determine if there is a relationship between the bibliographic citation practices of the members of a discipline and the emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline. Citation practices were evaluated by assessing the accuracy of bibliographic references in articles in scholarly journals of the discipline. The emphasis placed on citation accuracy and purposes in the graduate instruction of the discipline was determined by examining college catalog graduate course descriptions.

Dependent Variable

The dependent variable of this study was the average number of errors found in a sample of bibliographic citations from a discipline. Citations from the journal literature of chemistry, psychology, library science, and English and American literature were examined. These fields were chosen to provide for some variance of the independent variable, which was the emphasis placed on citation accuracy and purposes in the graduate instruction

of the discipline. Another factor considered in choosing disciplines was the investigator's access to library collections which supported graduate programs in these fields.

Sampling of Citations

Ten scholarly journals from each discipline were selected for the study. A list of these journals may be found in appendix A. In the context of this study, the term "scholarly journal" refers to a periodical that is refereed, contains articles accompanied by bibliographic references, and is published by a leading American professional association or university.

A sample of 1,280 citations was gathered by selecting thirty-two citations from each of the forty journals. Eight articles were chosen from each journal, and four citations were chosen from each article. The selection of journals, issues, articles and citations was not entirely straightforward because of several complicating factors that are outlined in the following paragraphs.

Selection of Journals

Chemistry journals were selected from a list of the publications of the American Chemical Society appearing in the Encyclopedia of Associations (1989). Each journal listed was assigned a number. A table of random numbers was used to select a sample from the list. The ACS Style

Guide (1986) was checked to determine that articles appearing in the journals were refereed. Volumes of each journal were checked to see that the requirement of bibliographic references was met.

Psychology journals were selected from the list of publications of the American Psychological Association found in the Encyclopedia of Associations (1989). Each journal listed was assigned a number. A table of random numbers was used to select a sample from the list. The Publication Manual of the American Psychological Association (1983) was checked to determine that articles appearing in the journals were refereed. Volumes of each journal were checked to see that the requirement of bibliographic references was met.

Library science journals were chosen from a list of periodicals in the field published by leading American universities and professional associations. The list was developed by consulting the ALA Handbook of Organization and Membership Directory (1989) and a specialized bibliography (Via 1986). Individual journal volumes were checked to select the titles that best satisfied the requirements concerning adjudication and bibliographic references. Information about journal adjudication was also taken from Glogoff (1988) and O'Connor and Van Orden (1978).

English and American literature journals were chosen from a list of periodicals in the field published by leading American universities and professional associations. The list was developed by consulting specialized bibliographies (Hauptman 1986; Hauptman 1987). Individual journal volumes were checked to select the titles that best met the requirements concerning adjudication and bibliographic references.

Selection of Issues

The investigator planned to verify the citations by comparing them to the cited documents, and to locate the documents by searching union catalogs. Sufficient time had to be allowed for the creation of catalog records representing the most recent materials cited in the sample of scholarly journals. Thus, it was decided to select the citations from journal issues published in 1986.

The selection of issues was affected by the journal's publication frequency. If the journal published four or less issues a year, each issue was chosen. If the journal published more than four issues a year, four issue numbers were chosen at random by using a table of random numbers.

Selection of Articles

Articles were chosen from tables of contents in selected issues of journals. Each article in a table of contents was assigned a number, and a table of random

numbers was used to choose articles. If four issues of a journal had been selected, two articles were chosen at random from each issue. If the journal published three issues a year, three articles were chosen at random from each of the first two issues, and two articles were chosen at random from the third issue. If the journal published only two issues a year, four articles were chosen at random from each issue.

Article selection was influenced by the number of bibliographic citations accompanying an article. The design of the study required the selection of four citations from the references accompanying each article. If an article had less than four citations, it was excluded from the sample.

The number of authors of an article was considered in the selection of an article. If an article had more than five authors, it was excluded from the sample. One of the assumptions of the study was that authors are responsible for the accuracy of the bibliographic citations accompanying their journal articles. If an article has more than five authors, it is unlikely that each author is equally responsible for the accuracy of all of the citations.

Author characteristics were considered in article selection. One of the assumptions of the study was that most authors would hold at least a master's degree in the

discipline associated with the journal. A few articles were excluded from the sample because they included biographical information indicating that the authors did not hold graduate degrees in the discipline to which the journal pertained.

Another author characteristic used to screen articles was the institution from which the author graduated. A few articles were excluded from the sample because they included biographical information indicating that the authors did not hold graduate degrees from American institutions of higher education. This followed from the plan to examine graduate program descriptions associated with the authors' educational backgrounds in a collection of catalogs from American colleges and universities.

Selection of Citations

After an article was selected, four of its bibliographic references were chosen. Each reference was assigned a number, and a sample was selected by using a table of random numbers. If an article was accompanied by a bibliography, the references were taken from the bibliography. If an article was not accompanied by a bibliography, the references were taken from the endnotes or footnotes. In many cases, an endnote or footnote consisted of a single bibliographic citation. However, if the endnote or footnote included more than one citation,

each citation was assigned a number. Then a table of random numbers was used to select the citations to be verified.

Each citation was screened. The cited document's format, language, date of publication, and place of publication were considered. If any of these elements indicated that the document might be difficult to access, the citation was eliminated from the sample, and a substitute was selected. Categories of items excluded from the study were computer programs, unpublished papers, audiovisual media, local government documents, items published before 1850, theses and dissertations from universities outside the United States, and articles from newspapers which did not circulate nationally in the United States.

Each citation selected for verification was photocopied. The photocopy for each citation was attached to a separate data collection form. Each form was marked with the identification number for the journal from which the citation was taken. Appendix B contains a copy of the form.

Verification Procedure

The verification procedure consisted of comparing each citation to its cited document. Reference sources were

searched to verify bibliographic information and to identify libraries that held the documents.

Verification of Journal Title Abbreviations

The first step in the verification procedure for journal article citations was the identification of journal title abbreviations. Chemical Abstracts Service Source Index (1907-1989), Index Medicus (1960-1986), Library Literature (1986), and MLA Directory of Periodicals (1986) were searched. The NCPTWA Word Abbreviation List (1971) and the American National Standard for the Abbreviation of Titles of Periodicals (1974) were consulted for guidance in interpreting abbreviations not verified elsewhere.

Identification of Holding Libraries

The initial search to locate documents was done in the online and card catalogs of the University of North Texas Libraries. This institution was chosen for the first search because its library collections support doctoral programs in each of the disciplines chosen for the study.

The second search to locate documents was done in union catalogs. Journal citations were searched in the AHE Union List of Serials (1990) and the Texas Union List of Serials (1986). All remaining citations were searched in the OCLC Online Union Catalog (1990).

Consultation of Reference Sources

If a citation was not verified in one of the catalogs mentioned above, reference sources were consulted to find a more complete or correct version of the citation. The cited document's format, language, publisher, date of publication, and place of publication were considered in selecting appropriate reference sources. Sources searched for monographic titles included American Book Publishing Record (1876-1977), Books in Print (1948-1987), Cumulative Book Index (1928-1987), and National Union Catalog (Pre-1956; 1956-1977). Sources searched for serial titles included New Serial Titles (1950-1989) and Ulrich's International Periodicals Directory (1965-1987). Indexes to journal articles searched were Cumulated Index Medicus (1980-1986), Nursing and Allied Health (1983-1990), Nutrition Abstracts and Reviews (1964), Science Citation Index (1980-1989) and Social Sciences Citation Index (1981-1989). Government document indexes searched included MARCIVE GPO CAT/PAC (1976-1990), EPA Publications Bibliography (1970-1990), Government Reports Annual Index (1980-1986), Selected Water Resources Abstracts (1980-1986), and the NTIS database (1964-1990).

Some citations had errors which necessitated further searching. One chemistry citation referred to a paper presented at a conference. However, the name of the conference was abbreviated and could not be verified. The

authors' names were searched in the CA Search database (1967-1990). The correct version of the citation was found, including a fuller form of the conference name.

One psychology citation referred to a journal title which could not be verified in any source. The authors' names were searched in the PsycLit database (1974-1990) and the correct version of the citation was found. The incorrect version of the citation had omitted the first word of the journal title.

Site Visits

After the bibliographic searching was completed, data collection forms were sorted by holding libraries. Visits were made to ten libraries in the Dallas-Fort Worth area to verify citations. The libraries visited were Dallas Public Library, Fort Worth Public Library, and the libraries of Southern Methodist University, Texas Christian University, Texas College of Osteopathic Medicine, Texas Woman's University, the University of North Texas, the University of Texas at Arlington, the University of Texas at Dallas, and the University of Texas Southwestern Medical Center-Dallas. The libraries of two institutions outside the Dallas-Fort Worth area were visited because of their unique holdings. These were the libraries of Texas Tech University in Lubbock and the University of Texas at Austin.

A library visit included several activities. The library's catalog was searched for the cited documents. Local call numbers were recorded on data collection forms. Documents were located and compared to the corresponding citations. The results of these comparisons were recorded on the data collection forms.

Verification Difficulties

Some journal article citations referred to journal volumes which were located without any difficulty. However, the citations were not easily verified because of a variety of problems. If the citation referred to an article which did not begin on the page cited, the index to the journal volume was checked. If the volume did not contain an index, an index to journals in the discipline was checked.

Another problem was the journal article citation that contained an error in the date or volume number. For example, a citation might refer to volume 30 (1970), but volume 30 on the shelf had the date of 1975. If the cited article did not appear in the volume number mentioned in the citation, then the volume for the year mentioned in the citation was checked. If the cited article was not found at that point, an index to journals in the discipline was searched.

Indexes to journals in chemistry and psychology were searched most often for these types of problems. Indexes including authors' names were preferred, especially in the discipline of chemistry. Citations to journal articles in chemistry rarely included article titles. This left the searcher with few clues to follow. The correct versions of some citations were retrieved by searching authors' names in the CA Search database (1967-1990) and the PsycLit database (1974-1990). Many of the chemistry and psychology article citations listed multiple authors. Different combinations of multiple authors' names were searched with the logical operator "and" to retrieve the correct versions of erroneous citations.

Citation Verification Through Interlibrary Loan

Interlibrary loan requests were submitted for documents verified in bibliographic sources but not located in library visits. All monographs which could be located through interlibrary loan were borrowed, regardless of fees.

Photocopies of many journal articles were received through interlibrary loan. Some of the photocopies contained enough information to verify the corresponding citations, but others did not. Photocopies for a few journal articles were available only for a fee. It was decided that the corresponding citations would remain

unverified because it was unknown if the photocopies would contain enough information to completely verify the citations.

Error Measurement

Error measurement consisted of an assessment of citation accuracy and completeness. Each citation was evaluated to determine if it included accurate information, and if it contained all of the information needed to identify and access the cited item.

Development of Criteria

Criteria were developed to evaluate the citations collected for this study. The criteria are a synthesis of rules used in earlier citation accuracy studies and standards for bibliographic description from cataloging codes, interlibrary loan forms and style manuals. The style manuals prescribed by the journals in the sample were studied in the process of formulating the criteria. The chemistry journals called for the use of The ACS Style Guide (Dodd 1986). The psychology journals prescribed the Publication Manual of the American Psychological Association (American Psychological Association 1983). The library science journals contained style instructions and also referred authors to The Chicago Manual of Style for Authors, Editors and Copywriters (University of Chicago Press 1982). The English and American literature journals

directed authors to The Chicago Manual of Style for Authors, Editors and Copywriters (University of Chicago Press 1982), the MLA Handbook for Writers of Research Papers, Theses and Dissertations (Gibaldi and Achtert 1979), The MLA Style Manual (Achttert and Gibaldi 1985), and The MLA Style Sheet (Modern Language Association of America 1971).

Use of Data Collection Form

A copy of the form used for data collection appears in appendix B. The form contains sections to be used in describing the document, and in evaluating the fields of the citation. A photocopy of a citation was attached to the top of the form. The form was completed when the citation was compared to the cited document. The criteria pertaining to the format of the cited document were applied in judging the accuracy and completeness of the citation, unless they were contradicted by instructions in a style manual that an author was required to use. If a field in a citation contained one or more errors, the corresponding section of the data collection form was coded as having an error. If a field in a citation was correct, the corresponding section of the form was coded as not having an error. If a section on the form did not pertain to the format of the citation being evaluated, it was coded as not having an error. If a citation was not evaluated because

the cited document was not located, or because the photocopy of the cited document did not contain sufficient information for verification, the sections of the form pertaining to specific citation fields were coded as missing data.

Criteria for Citation Completeness

Fields required in citations

Journal or serial article

author, title, journal title, volume number, pagination, publication date; issue number is required if the pagination within the volume is not continuous

Journal supplement

journal title, volume number, publication date, supplement number

Article in journal supplement

author, title, journal title, volume number, pagination, publication date, supplement number

Special issue of a journal

editor (of issue), title (of issue), journal title, volume number, issue number, publication date

Book

author(s) or editor(s), title, edition,
publisher, publication date

Book chapter

author(s) or editor(s), chapter author(s), title,
chapter title, edition, publisher, pagination,
publication date

Book in set

author(s) or editor(s), title (of set), edition,
publisher, volume number, publication date

Chapter in book in set

author(s) or editor(s), chapter author(s), title
(of set), chapter title, edition, publisher,
pagination, volume number, publication date

Conference proceedings

author(s) or editor(s), title, edition,
publisher, publication date

Paper (chapter) in conference proceedings

If the title of the conference proceedings is
treated as the title of a book in the citation,
the following fields are required: author(s) or
editor(s), chapter author(s), title, chapter
title, edition, publisher, pagination,

publication date. If the title of the conference proceedings is treated as a journal title in the citation, and if the style manual allows this option, the following fields are required: author, title, journal title, volume number, pagination, publication date.

Paper (Chapter) in book in set of conference proceedings

author(s) or editor(s), chapter author(s), title (of set), chapter title, edition, publisher, pagination, volume number, publication date

Entry in Dissertation Abstracts International

author (of dissertation), title (of dissertation), title of set, name of university, volume number, pagination, publication date, year of graduation

Technical or research report

author(s) or editor(s), title, edition, publisher, publication date, document number

Annual

author(s) or editor(s), title, edition, publisher, publication date

Article (chapter) in an annual

If the title of the annual is treated as the title of a book in the citation, the following fields are required: author(s) or editor(s), chapter author(s), title, chapter title, edition, publisher, pagination, publication date.

If the title of the annual is treated as a journal title in the citation, and if the style manual allows this option, the following fields are required: author, title, journal title, volume number, pagination, publication date.

Newspaper Article

author, title, newspaper title, volume number, issue number, pagination, publication date

Criteria for evaluating the completeness of specific fields

Author: If the document has more than one author, the names of all of the authors must be included in the citation, unless otherwise specified by the style manual.

Editor: If a document has an editor as well as an author, it is not mandatory to include the editor's name. If the document has an editor but no author, the name of the editor must be included in the citation.

Chapter author: If the chapter has more than one author, the names of all of the authors must be included in the citation, unless otherwise specified by the style manual.

Title: The title proper of the document is required, unless otherwise specified by the style manual. "Title proper" is defined as "the chief name of an item, including any alternative title but excluding parallel titles and other title information" (Anglo-American Cataloguing Rules, 1988, 624).

Chapter title: The title proper of the chapter is required, unless otherwise specified by the style manual.

Edition: The edition statement must be included if it refers to an edition other than the first.

Publisher: The publisher's name may be omitted if the style manual allows this option.

Volume number: The volume number is not required if the style manual allows a specific date to be substituted.

Issue number: The issue number is not required if the style manual allows a specific date to be substituted.

Pagination: The pagination may be omitted if this option is allowed by the style manual.

Criteria for Evaluating Accuracy of Specific Fields

Author or editor, Chapter author: The form of the author's or editor's name must be the same as that appearing in the original document. Another form will be accepted if it is permitted by the style manual. All author and editor names appearing in the citation will be evaluated, even if they are not required by the criteria for citation completeness.

Title, Chapter title: The title proper must be an exact transcription of the title proper on the document as far as wording and spelling. The subtitle will be evaluated for its accuracy if it appears in the citation.

Title of journal or other serial: The title proper must be an exact transcription of the title proper on the document as far as wording and spelling. The subtitle will be evaluated for

its accuracy if it appears in the citation. A journal or serial title may be abbreviated if this is allowed by the style manual. The abbreviated title will be checked against a list of the abbreviations authorized by the style manual.

Edition: The edition statement will be compared to the edition statement on the document, and will be considered to be erroneous if its meaning has been changed. Because an edition statement may be expressed in various combinations of alphanumeric characters, exact transcription is not mandatory.

Publisher: The publisher's name in the citation must correspond to that in the original document. The abbreviation of a publisher's name is accepted if it is permitted by the style manual.

University (used in thesis citation): The form of the name of the university must be the same as that appearing in the source document.

Volume number, Issue number: These numbers must correspond to the information stated in the original source. The issue number will be evaluated if it appears in the citation, even if it is not required by

the criteria for citation completeness. Because publishers may express the numbers in various combinations of alphanumeric characters, exact transcription is not mandatory.

Pagination: The pagination mentioned in the citation must correspond to the pagination of the document. If the citation does not mention the entire span of pages, it must mention a page or pages within the span.

Date of publication: The year of publication in the citation should be the same as that appearing in the document. If the style manual does not distinguish between the publication date and the copyright date, and these dates differ, either date in the citation will be accepted. The entire date appearing in the citation, not just the year, will be evaluated. Because publishers may express numbers in various combinations of alphanumeric characters, exact transcription is not mandatory.

Supplement number: This number must correspond to the supplement number in the original source. Because publishers may express numbers in various

combinations of alphanumeric characters, exact transcription is not mandatory.

Document number: This number in the citation must match the document number in the original source.

Year of graduation (used in thesis citation): The date must be the same as that appearing in the source document.

Independent Variable

The independent variable of this study was the emphasis placed on citation accuracy and purposes in the graduate instruction of a discipline. This variable was studied by examining a sample of graduate course descriptions in college catalogs. Specific catalogs with program descriptions in chemistry, psychology, library science and English and American literature were chosen to reflect the educational backgrounds of the authors whose citations were selected for the study. This approach was based on the assumption that each discipline has norms which are taught in graduate coursework. It was also assumed that college catalog course descriptions reflect the major topics stressed in the courses.

The overall score for each discipline was the average number of required courses which pertained to citation accuracy and purposes in each master's level graduate

program. A course description was considered to pertain to citation accuracy and purposes if it mentioned cataloging, descriptive bibliography, or the documentation of scholarly papers. Other terms considered to pertain to citation accuracy and purposes are listed in appendix C.

Identification of Graduate Programs

At the time that the bibliographic references from an article were photocopied for the citation verification phase of this study, the author information appearing in conjunction with the article was also photocopied. A separate author information sheet was prepared for each author, because many articles had multiple authors. The sheet listed the author's name, any biographical information about the author which appeared in the journal, and the identification number of the journal from which the information was taken. As the search for degree information progressed, the findings were recorded on the sheet.

Identification of Biographical Information

Extensive searching was done to identify the educational backgrounds of the authors of the journal articles selected for the study. The primary objective was to identify the master's degree program and the graduation date of each author. The secondary objective was to

identify the doctoral degree program and graduation date if no information could be found on the master's degree program.

If the biographical information accompanying an article stated that the author was affiliated with an American college or university, the catalog of that institution was consulted. This search was done in College Catalog Collection (1976-1990), a microfiche collection of catalogs from American colleges and universities. Many catalogs contained appendices which listed faculty members, their degrees, and the institutions that had granted the degrees.

Additional searching was done in biographical sources unique to each discipline. The availability of these sources varied considerably by discipline. A recent biographical source in the field of chemistry was not identified. The names of some of the authors in the chemistry sample were found in the International Chemistry Directory, 1969-70. The names of many of the authors in the psychology sample were searched in the Directory of the American Psychological Association (1985). Many biographical sources in the discipline of library science were searched. These sources included the Directory of Library and Information Professionals (1988), Who's Who in Library and Information Services (1982), A Biographical Directory of Librarians in the United States and Canada

(1970), Who's Who in Library Service (1966) and Who's Who in Library Service (1955). The Centennial Alumni Directory (1987) of the Columbia University School of Library Service and the Alumni Directory (1988) of the University of Illinois at Urbana-Champaign Graduate School of Library and Information Science also were searched. Finally, a recent biographical source pertaining to the discipline of English and American literature was not found.

The OCLC Online Union Catalog was searched for bibliographic records of authors' theses or dissertations. Several cumulated dissertation indexes were also searched for degree information. These indexes included Comprehensive Dissertation Index: 1861-1972 (1973), Comprehensive Dissertation Index: Ten Year Cumulation: 1973-1982 (1984), Comprehensive Dissertation Index: 1983 Supplement (1984), Comprehensive Dissertation Index: 1984 Supplement (1985), and Dissertation Abstracts OnDisc (1985-1990).

After the searching was completed, a summary of author information was compiled for each discipline. Graduate degree information was found for 85 percent of the chemistry authors, 92 percent of the psychology authors, 74 percent of the library science authors, and 99 percent of the English and American literature authors. Because the percentage for library science was much lower than the percentages for the other disciplines, the decision was

made to contact individual library science authors for information about their educational backgrounds.

Directories issued by library science professional associations were searched for addresses of the 29 library science authors whose educational backgrounds were not identified. These directories were ALA Handbook of Organization and Membership Directory (1989), American Library Directory (1990), Directory of the Association for Library and Information Science Education (1990), Directory of Library & Information Professionals (1988), Directory of the Medical Library Association (1989), and Who's Who in Special Libraries (1989). Addresses were found for fourteen of the authors. Each of these authors was sent a letter which briefly described the research project. The author was asked to complete and return an enclosed postcard. The postcard contained questions about the author's graduate education. Copies of the form letter and postcard appear in appendix D.

Completed postcards were received from twelve of the fourteen library science authors who were contacted. A revised summary of library science author information was compiled which showed that degree information had been found for 86 percent of the authors. Appendix E contains summaries of the colleges and universities associated with the authors in each discipline.

Checking of Graduate Program Descriptions
Associated With Authors in the Study

Master's degree program descriptions were checked in College Catalog Collection (1976-1990), a microfiche collection of catalogs from American universities. The 1974-75 school year was the earliest year consistently represented in the collection. If an author graduated with a master's degree in 1974 or later from a graduate program which was identified, the requirements of that program were examined in a catalog in effect at the time of the graduation. For example, if an author graduated in 1977, the 1976-77 catalog was checked.

If a master's degree program was identified for an author who had an undetermined graduation date or a graduation date before 1974, the requirements of that program were examined in the 1974-75, 1979-80 and 1984-85 catalogs.

If a master's degree program was identified for an author who graduated after 1986, the corresponding college catalog was not checked. Considering the design of the study, it was thought that courses offered after 1986 would not be relevant to the educational background of an author in this category.

If only a doctoral program was identified for a particular author who had a graduation date of 1974 or later, the requirements of the master's degree program at

the same university were examined in the catalog corresponding to the date of graduation.

If only a doctoral program was identified for a particular author who had an undetermined graduation date or a graduation date before 1974, the requirements of the master's degree program at the same university were examined in the 1974-75, 1979-80 and 1984-85 catalogs.

If a doctoral program was identified for an author who graduated between 1986 and 1988, the requirements of the master's degree program at the same university were examined in the corresponding catalog. If an author was found to have graduated after 1988, no catalogs were checked. Considering the design of the study, it was thought that courses offered after 1988 would not be relevant to the educational background of an author in this category.

Sampling of Other Programs

Given the limitations of the biographical sources available, it was not possible to identify the programs from which some of the authors graduated. This was not a concern for the discipline of English and American literature in which degree information was found for 99 percent of the authors studied. However, plans were developed to compensate for missing degree program information in the other three disciplines. The objective

was to draw a stratified random sample of graduate programs from the first three categories of universities listed in the Carnegie Classification (Carnegie Council on Policy Studies in Higher Education 1976, 1-10).

Separate stratified random samples were selected for graduate programs in chemistry and psychology in the following manner. First, a list was made of institutions in the first three categories in the Carnegie Classification. Institutions from which authors in the particular discipline had earned graduate degrees were eliminated from the list. A table of random numbers was used to select a sample consisting of half of the remaining institutions listed in each category. Graduate program descriptions of these institutions were examined in catalogs pertaining to the 1974-75, 1979-80 and 1984-85 school years. If it was found that a particular university chosen in this manner did not offer a graduate degree in the discipline concerned, then another university was randomly selected from the same category in the Carnegie Classification.

The sampling was done in a different way for the discipline of library science. This discipline was treated in an exceptional manner because of the comparatively small number of institutions which had master's degree programs in library science, and because of the emphasis placed on the accreditation of master's degree programs by the

American Library Association. A list was made of all of the universities with master's degree programs accredited by the American Library Association in 1974. Universities which did not appear in the first three categories in the Carnegie Classification were deleted from the list. Universities with programs from which authors in the study had earned graduate degrees were deleted from the list. The programs remaining on the list were then studied. Descriptions of requirements for the master's degree were examined for these programs in catalogs for the 1974-75, 1979-80 and 1984-85 school years.

Procedures for Data Collection

A file of index cards was developed to use in checking college catalogs. A separate card was made for each program description to be examined. Each card was color-coded for the appropriate discipline and marked with the name of the program and the date of the catalog to be examined. The cards were organized chronologically by school year, alphabetically by the state, and then alphabetically by the institution to correspond to the arrangement of the college catalog collection. The cards were checked against indexes to the college catalog collection and annotated with the numbers of the microfiche bearing the appropriate program descriptions.

When a program description was examined, the corresponding card was annotated to show the number of courses required for a master's degree which pertained to citation accuracy and purposes. If a course description pertained to citation accuracy and purposes, the words which conveyed this concept were copied onto the index card.

If a catalog described more than one master's degree program pertaining to the discipline under consideration, only the program leading to an academic degree was considered. If several academic degree programs were described, only the degree program with the most rigorous academic requirements was considered for data collection purposes. If a catalog described no master's degree program but a doctoral degree program in the discipline under consideration, the requirements of that program were examined. If a catalog described no master's degree program but two or more doctoral degree programs in the discipline under consideration, only the program with the most rigorous academic requirements was considered for data collection purposes. Appendix F lists the universities associated with the programs that were examined in each discipline, and the number of courses required by each program that were judged to pertain to citation accuracy and purposes.

If a catalog for a particular year was not available in the collection, the catalog for the following year was examined. If that catalog was not available, a letter was sent to the institution. The letter contained a brief description of the research project and a request for information about a particular program. A copy of the letter appears in appendix G. Responses were received from 28 of the 34 institutions contacted.

The design of the study called for the examination of catalogs at five-year intervals if an author's graduation date was unknown, or if a program was not associated with a particular author. If a catalog in one of these categories did not contain a particular program description because the program had been eliminated, the catalog was not included in the summary presented in appendix F.

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CHAPTER IV

ANALYSIS OF THE DATA

This chapter contains an analysis of the data collected for the study. The data used to measure the dependent and independent variables will be described. The findings related to the hypothesis of the study will be presented. Other variables which may be related to the dependent variable will be discussed. Finally, the appearance of errors in specific citation fields will be examined.

Dependent Variable

The dependent variable of the study was the average number of errors found in a sample of bibliographic citations from a discipline. As described in the previous chapter, a random sample of citations was selected from the journal literature of chemistry, psychology, library science, and English and American literature.

The citation verification procedure consisted of comparing each citation to its cited document. A citation was considered to be correct if it included accurate information, and it if contained all of the information needed to identify and access the cited document. (For a complete discussion of the verification procedure, see

chapter 3.) The results of the citation verification procedure are presented in Table 4.1. Of the 1,280 citations selected, 69.69 percent were found to be correct, and 29.06 percent were found to be incorrect. Incorrect citations within a discipline ranged from 24.69 percent in chemistry to 33.75 percent in psychology.

Table 4.1.--Citation Verification Summary

	Chem (N=320) (%)	Psych (N=320) (%)	LS (N=320) (%)	Lit (N=320) (%)	Total (N=1280) (%)
Correct citations	74.06	65.63	67.81	71.25	69.69
Incorrect citations	24.69	33.75	30.31	27.50	29.06
Unverified citations	1.25	0.63	1.88	1.25	1.25

Sixteen citations were not verified. The breakdown of these citations by discipline and format of document cited is recorded in Table 4.2. Citations to two books, one journal article and one technical report were not verified because the existence of the cited documents was never ascertained, despite extensive searching in reference sources. Citations to one book and one technical report were verified in reference sources, but the cited documents were never located. Citations to five journal articles were not verified because the photocopies received through interlibrary loan did not contain sufficient information

for complete verification. Citations to five other journal articles were not verified. The photocopies for these articles were available through interlibrary loan for a fee. However, the investigator decided not to pay for these photocopies because it was unknown if they would contain enough information to completely verify the citations.

Table 4.2.--Unverified Citations by Format of Document Cited

	Chem	Psych	LS	Lit	Total
Journal article	3	2	3	3	11
Book	0	0	2	1	3
Technical report	1	0	1	0	2
Total	4	2	6	4	16

A summary of verified citations is presented in Table 4.3. Within each discipline, the citations are grouped according to the number of erroneous fields they contained. The percentage of correct citations in each discipline ranged from 66.04 in psychology to 75 in chemistry. The number of erroneous fields in the incorrect citations ranged from one to four. Overall, 22.23 percent of the citations contained one erroneous field. Less than six percent of the citations included two erroneous fields. Only 1.5 percent of the citations had three erroneous

fields. Less than one percent of the citations contained four erroneous fields.

Table 4.3.--Number of Erroneous Fields in Citations

	Chem (N=316) (%)	Psych (N=318) (%)	LS (N=314) (%)	Lit (N=316) (%)	Total (N=1264) (%)
No erroneous fields	75.00	66.04	69.11	72.15	70.57
One erroneous field	20.89	24.84	21.66	21.52	22.23
Two erroneous fields	3.48	6.60	6.69	5.38	5.54
Three erroneous fields	0.32	2.52	2.55	0.63	1.50
Four erroneous fields	0.32	0.00	0.00	0.32	0.16

Note: Values for unverified citations were not used in the calculation of this table.

The average number of erroneous fields in the citations of each discipline ranged from 0.30 in chemistry to 0.46 in psychology. This information is provided in Table 4.4.

Table 4.4.--Mean Number of Erroneous Fields in Citations

Discipline	Mean
Chemistry	0.30
Psychology	0.46
Library Science	0.43
Eng. & Am. Literature	0.35

Independent Variable

The independent variable of the study was the emphasis placed on citation accuracy and purposes in the graduate instruction of a discipline. Graduate program requirements were examined in college catalogs which were chosen to reflect the educational backgrounds of the authors whose citations were selected for the study. The terms which were judged to pertain to citation accuracy and purposes are presented in appendix C. The institutions which were associated with the authors' educational backgrounds are summarized in appendix E. The results of checking individual graduate program requirements are shown in appendix F. The overall score for each discipline was the average number of required courses pertaining to citation accuracy and purposes in each master's level graduate program examined. These scores, presented in Table 4.5, ranged from 0.00 in chemistry to 1.20 in library science.

Table 4.5.--Required Courses Pertaining to Citation Accuracy and Purposes

Discipline	Mean
Chemistry	0.00
Psychology	0.00
Library Science	1.20
Eng. & Am. Literature	0.08

Testing the Hypothesis

The following hypothesis was used in the study. The greater the emphasis a discipline places on citation accuracy and purposes in its graduate instruction, the lesser will be the number of errors in the bibliographic citations in the journal literature of the discipline.

The values of the independent and dependent variables are presented in Table 4.6. Values for the independent variable, the average number of required courses pertaining to citation accuracy and purposes in each master's level graduate program examined, ranged from 0.00 in chemistry to 1.20 in library science. However, values for the dependent variable, the average number of erroneous fields in a citation, ranged from 0.30 in chemistry to 0.46 in psychology. The hypothesis was not supported by this evidence because no relationship was found to exist between low error rates and an emphasis on citation instruction.

Table 4.6.--Independent and Dependent Variables

Discipline	Independent Variable	Dependent Variable
Chemistry	0.00	0.30
Psychology	0.00	0.46
Library Science	1.20	0.43
Eng. & Am. Literature	0.08	0.35

A one-way analysis of variance procedure was used to compare the mean scores of the groups measured by the dependent variable, which pertained to citation error. The results of this procedure, illustrated in Table 4.7, indicated that a significant difference among the groups was found ($p=0.0162$).

Table 4.7.--Analysis of Variance on Citation Error Scores

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between	4.69347	3	1.56449	3.444*
Within	572.44261	1260	0.45432	
Total	577.13608	1263		

* $P=0.0162$

The Newman-Keuls multiple comparison test was used to determine the identity of the group means that differed significantly from one another (Snedecor and Cochran 1980, 235-237; Hinkle, Wiersma and Jurs 1988, 367-374). The results of this test are presented in Table 4.8. The group

means for citations from chemistry and psychology were found to differ significantly from each other on this measure of citation error ($p=0.023$). This evidence does not support the hypothesis which indicated that differences among groups would be related to the discipline's emphasis on citation instruction. If the hypothesis were supported, the groups of chemistry and psychology would not differ on the variable of citation error because their scores on the variable of citation instruction were the same.

Table 4.8.--Results of the Newman-Keuls Multiple Comparison Test for the Mean Number of Erroneous Fields in Citations from Four Disciplines

Discipline	Chem	Lit	LS	Psych
	(N=316)	(N=316)	(N=314)	(N=318)
Mean	0.301	0.354	0.427	0.456

Groups over a common line do not differ at the 0.05 level.

Other Variables

Other variables were analyzed to discern possible relationships to citation error. These variables included journal publication frequency and format of document cited.

Journal Publication Frequency

An analysis was conducted to determine if a relationship existed between errors in the citations from a journal and the journal's publication schedule which might allow a certain amount of time for the editors to scrutinize citations. The verified citations taken from each journal were analyzed, and the percentages of incorrect citations per journal as well as the mean number of erroneous fields per citation were calculated. This information is summarized in Tables 4.9-4.12. The mean number of erroneous fields per citation ranged from 0.16 to 0.52 in chemistry journals, from 0.25 to 0.61 in psychology journals, from 0.25 to 0.70 in library science journals, and from 0.19 to 0.69 in English and American literature journals. The publication frequency of each journal in the study is recorded under the journal title in these tables.

The number of issues published in 1986 by each journal included in the study ranged from two to 26. The publication frequencies for the journals in each discipline are summarized in Table 4.13. The most common publication frequencies were monthly in chemistry, bimonthly in psychology, and quarterly in library science and in English and American literature.

Table 4.9.--Incorrect Citations in Chemistry Journals

	Citations Verified (N)	Incorrect Citations (%)	Erroneous Fields per Citation (Mean)
Accounts of Chemical Research (N=12)	32	18.75	0.28
Analytical Chemistry (N=14)	31	25.81	0.32
Chemical Reviews (N=6)	31	25.81	0.29
Environmental Science ... (N=12)	31	38.71	0.52
J. of Agric. and Food Chemistry (N=6)	32	37.50	0.41
J. of Chem. Education (N=12)	32	28.13	0.31
J. of Organic Chemistry (N=26)	32	18.75	0.22
J. of Physical Chemistry (N=26)	31	22.58	0.26
Macromolecules (N=12)	32	21.88	0.25
Organometallics (N=12)	32	12.50	0.16

Note: Values for unverified citations were not used in the calculation of this table.

The number of journal issues published in 1986 is indicated in parentheses after the journal title.

Table 4.10.--Incorrect Citations in Psychology Journals

	Citations Verified (N)	Incorrect Citations (%)	Erroneous Fields per Citation (Mean)
American Psychologist (N=12)	32	37.50	0.47
Behavior Neuroscience (N=6)	31	45.16	0.61
Developmental Psychology (N=6)	32	40.63	0.56
J. of Applied Psychology (N=4)	32	37.50	0.50
J. of Educ. Psychology (N=6)	32	31.25	0.44
JEP: Animal Behavior ... (N=4)	32	18.75	0.25
JEP: General (N=4)	32	21.88	0.34
JEP: Human Percept. ... (N=4)	32	43.75	0.47
Professional Psychology (N=6)	32	28.13	0.31
Psychological Bulletin (N=6)	31	35.48	0.61

Note: Values for unverified citations were not used in the calculation of this table.
The number of journal issues published in 1986 is indicated in parentheses after the journal title.

Table 4.11.--Incorrect Citations in Library Science Journals

	Citations Verified (N)	Incorrect Citations (%)	Erroneous Fields per Citation (Mean)
College & Research Lib. (N=6)	32	25.00	0.31
Info. Tech. and Libraries (N=4)	31	38.71	0.61
J. of Educ. for Library ... (N=4)	32	25.00	0.28
J. of Library History (N=4)	31	22.58	0.26
Library Res. & Tech. Svcs. (N=4)	32	25.00	0.28
Library Quarterly (N=4)	32	18.75	0.25
Med. Lib. Assoc. Bulletin (N=4)	30	43.33	0.70
RQ (N=4)	32	40.63	0.59
School Library Media Q. (N=4)	32	28.13	0.38
Special Lib. (N=4)	30	43.33	0.63

Note: Values for unverified citations were not used in the calculation of this table.
The number of journal issues published in 1986 is indicated in parentheses after the journal title.

Table 4.12.--Incorrect Citations in English and American Literature Journals

	Citations Verified (N)	Incorrect Citations (%)	Erroneous Fields per Citation (Mean)
American Literature (N=4)	32	15.63	0.19
Contemporary Literature (N=4)	31	19.35	0.23
ELH (N=4)	32	34.38	0.41
ESQ (N=4)	31	29.03	0.32
English Lang. Notes (N=4)	32	18.75	0.25
MELUS (N=2)	32	25.00	0.25
Studies in Am. Fiction (N=2)	32	40.63	0.69
Studies in Eng. Literature (N=4)	32	28.13	0.34
Studies in Short Fiction (N=4)	30	23.33	0.23
Twentieth Century Lit. (N=3)	32	43.75	0.63

Note: Values for unverified citations were not used in the calculation of this table.
The number of journal issues published in 1986 is indicated in parentheses after the journal title.

Table 4.13.--Publication Frequencies of the Journals From Which Citations Were Taken

Journal Issues Per Year (N)	Chem (N)	Psych (N)	LS (N)	Lit (N)	Total (%)
2	--	--	--	2	5.00
3	--	--	--	1	2.50
4	--	4	9	7	50.00
6	2	5	1	--	20.00
12	5	1	--	--	15.00
14	1	--	--	--	2.50
26	2	--	--	--	5.00

The average number of erroneous fields per citation was calculated for journals of each publication frequency in each discipline. This information is provided in Table 4.14. Only two publication frequencies were associated with more than two disciplines, and these were the frequencies of quarterly and bimonthly. The average number of erroneous fields per citation for quarterly publications varied from 0.28 in English and American literature to 0.44 in library science. The average number of erroneous fields per citation for bimonthly publications ranged from 0.35 in chemistry to 0.51 in psychology. This evidence does not indicate a relationship between publication frequency and citation error.

Table 4.14.--Average Number of Erroneous Fields Per Citation and Publication Frequencies of the Journals From Which the Citations Were Taken

Journal Issues Per Year (N)	Chem (Mean)	Psych (Mean)	LS (Mean)	Lit (Mean)	Total (Mean)
2	--	--	--	0.47	0.47
3	--	--	--	0.63	0.63
4	--	0.39	0.44	0.28	0.37
6	0.35	0.51	0.31	--	0.44
12	0.30	0.47	--	--	0.33
14	0.32	--	--	--	0.32
26	0.24	--	--	--	0.24

A Kruskal-Wallis one-way analysis of variance by ranks procedure was conducted to study this problem. The citations, grouped by the publication frequencies of the journals from which they were taken, were compared on the variable of the mean number of erroneous fields per citation. The results of the test indicated no significant difference among groups ($p < 0.1127$).

An analysis of the mean number of issues published per year by the journals of a discipline and the mean number of erroneous fields per citation is provided in Table 4.15. Chemistry journals were published most frequently with an average of 13.8 issues a year and had the lowest error rate (0.30). English and American literature journals were published least frequently with an average of 3.5 issues a

year, but had the second lowest error rate (0.35). There appears to be no relationship between publication frequency and citation error in this sample.

Table 4.15.--Publication Frequencies of Journals by Discipline and Average Number of Erroneous Fields

Discipline	Journal Issues Per Year (Mean)	Erroneous Fields Per Citation (Mean)
Chemistry	13.8	0.30
Psychology	5.8	0.46
Library Science	4.2	0.43
Literature	3.5	0.35

Formats of Documents Cited

The formats cited most often in all of the disciplines studied were journal articles, books, and book chapters. Most of the citations in chemistry, psychology and library science referred to journal articles, whereas most of the citations in English and American literature referred to books. A breakdown of the citations by discipline and format is shown in Table 4.16.

Table 4.16.--Percentage of Citations by Format of Document Cited

	Chem (N=320) (%)	Psych (N=320) (%)	LS (N=320) (%)	Lit (N=320) (%)	Total (N=1280) (%)
Journal article	82.19	68.75	60.31	24.38	58.91
Book	8.13	17.19	25.94	59.38	27.66
Book chapt.	4.06	8.13	5.00	10.31	6.88
Book in set	--	0.31	0.63	4.69	1.41
Conference paper	2.19	1.88	2.50	--	1.64
Other*	3.43	3.75	5.63	1.25	3.52

Note: Document formats included in this table were cited in more than one percentage of the entire sample.

* "Other" includes the following formats: journal supplement, article in journal supplement, special issue of journal, chapter in book in set, conference proceedings, paper in book in set of conference proceedings, entry in Dissertation Abstracts International, technical or research report, annual, article in annual, newspaper article.

Most errors occurred in citations to journal articles, books, book chapters and conference papers. Table 4.17 contains a summary of document formats associated with the citation errors found in the study. The total number of erroneous citations counted in each discipline appears under the abbreviated name of the discipline in the column heading. A number in the column below represents the percentage of erroneous citations in the discipline that pertained to a certain document format.

Table 4.17.--Percentage of Incorrect Citations by Format of Document Cited

	Chem (N=79) (%)	Psych (N=108) (%)	LS (N=97) (%)	Lit (N=88) (%)	Total (N=372) (%)
Journal article	73.42	57.41	59.79	26.14	54.03
Book	5.06	18.52	20.62	53.41	24.46
Book chapter	7.59	14.81	5.15	17.05	11.29
Chapter in book in set	5.06	2.78	--	2.27	2.42
Conference paper	6.33	3.70	8.25	--	4.57
Technical report	2.53	--	2.06	--	1.08
Other*	0.00	2.78	4.12	1.14	2.15

Note: Document formats were included in this table if they pertained to more than one percentage of the errors.

* "Other" includes the following formats: article in journal supplement, book in set, paper in book in set of conference proceedings, annual, article in annual, newspaper article.

Another view of citation error in relation to document format is presented in Table 4.18. Percentages of verified citations which were found to contain errors are arranged by discipline, and subarranged by format. Overall, the percentage of incorrect citations was highest for conference papers, followed by book chapters, journal articles and books. The percentage of erroneous citations to conference papers varied from 66.67 in psychology to 100

in library science. The percentage of erroneous citations to books ranged from 15.38 in chemistry to 36.36 in psychology.

Table 4.18.--Percentage of Verified Citations Which Were Incorrect, by Format of Document Cited

	Chem (%)	Psych (%)	LS (%)	Lit (%)	Total (%)
Journal article (N=743)	22.31	28.44	30.53	30.67	27.05
Book (N=351)	15.38	36.36	24.69	24.87	25.93
Book chapter (N=88)	46.15	61.54	31.25	45.45	47.73
Conference paper (N=21)	71.43	66.67	100.00	--	80.95

The mean number of erroneous fields per citation is presented in Table 4.19 for citations to journal articles, books, book chapters and conference papers. Overall, the error rate was highest in citations to conference papers, followed by book chapters, journal articles and books. The mean number of erroneous fields per citation to conference papers ranged from 0.67 in psychology to 2.38 in library science. The mean number of erroneous fields per citation to books varied from 0.19 in chemistry to 0.44 in psychology.

Table 4.19.--Mean Number of Erroneous Fields Per Citation, by Format of Document Cited

	Chem	Psych	LS	Lit	Total
Journal article (N=743)	0.26	0.36	0.41	0.40	0.34
Book (N=351)	0.19	0.44	0.30	0.29	0.31
Book chapter (N=88)	0.54	1.12	0.38	0.73	0.75
Conference paper (N=21)	1.14	0.67	2.38	--	1.48

Note: Missing values were not used in the calculation of this table.

The number of fields required for each citation format may be considered in relation to the mean number of erroneous fields per citation, as well as the percentage of incorrect citations. This information is summarized in Table 4.20. The error rates were highest for conference papers and book chapters, which were the formats requiring the greatest number of fields per citation.

Errors in citations to a given format also may be considered in relation to the frequency that such a format was cited. This information is included in Table 4.20. Error rates were highest for conference papers and book chapters, which were the formats cited least often.

Perhaps these errors resulted from the authors' lack of familiarity with the requirements for certain citation formats.

Table 4.20.--Fields Required per Citation and Citation Errors for Documents in Various Formats

	Fields Required per Citation*	Erroneous Fields per Citation	Incorrect Citations
	(N)	(Mean)	(%)
Journal article (N=743)	6-7	0.34	27.05
Book (N=351)	4-5	0.31	25.93
Book chapter (N=88)	7-8	0.75	47.73
Conference paper (N=21)	6-8	1.48	80.95

* The number of fields required for a citation was taken from the section of chapter 3 entitled "Criteria for Citation Completeness." This section listed the fields that were required for citations pertaining to each document format. These requirements were waived if they were contradicted by a style guide that was prescribed by the journal from which the citations were taken.

A Kruskal-Wallis test was conducted to compare the groups of book, journal article, book chapter and conference paper citations on the variable of the mean number of erroneous fields per citation. The Kruskal-Wallis one-way analysis of variance by ranks, a non-parametric procedure, was considered to be an appropriate

test in this situation because of the disparate sizes of the groups to be analyzed (Siegel 1988, 206-216). The results of this test indicated a significant difference among groups ($p < 0.0001$).

A multiple comparison procedure was used to determine the identity of the group means that differed significantly from one another. The results of this procedure are given in Table 4.21. It was found that the mean for conference paper citations was significantly greater than the mean for book chapter citations. In addition, the mean for book chapter citations was significantly greater than the means for book and journal article citations.

Table 4.21.--Results of the Kruskal-Wallis Multiple Comparison Test for the Mean Number of Erroneous Fields in Citations to Various Document Formats

Format	Book	Journal Article	Book Chapter	Conference Paper
	(N=351)	(N=743)	(N=88)	(N=21)
Mean	0.305	0.341	0.750	1.476

Groups over a common line do not differ at the 0.05 level.

The Kruskal-Wallis procedure was used to test for differences in the mean number of erroneous fields per citation for document formats in each discipline studied. In addition, a multiple comparison procedure was used to

determine the identity of the group means that differed significantly from one another.

The results of the Kruskal-Wallis test with chemistry citations indicated a significant difference among groups ($p < 0.003$). A multiple comparison procedure revealed that the means for conference paper and book chapter citations were greater than the means for journal article and book citations. The results of this procedure are recorded in Table 4.22.

Table 4.22.--Results of the Kruskal-Wallis Multiple Comparison Test for the Mean Number of Erroneous Fields in Chemistry Citations to Various Document Formats

Format	Book	Journal Article	Book Chapter	Conference Paper
	(N=26)	(N=260)	(N=13)	(N=7)
Mean	0.192	0.258	0.538	1.143

Groups over a common line do not differ at the 0.05 level.

Differences among psychology citations grouped by document format were found to be statistically significant ($p < 0.0003$). A multiple comparison procedure indicated that the mean for book chapter citations was greater than the means for book and journal article citations. These results are given in Table 4.23.

Table 4.23.--Results of the Kruskal-Wallis Multiple Comparison Test for the Mean Number of Erroneous Fields in Psychology Citations to Various Document Formats

Format	Journal Article	Book	Conference Paper	Book Chapter
	(N=218)	(N=55)	(N=6)	(N=26)
Mean	0.362	0.436	0.667	1.115

Groups over a common line do not differ at the 0.05 level.

The results of the Kruskal-Wallis test with library science citations indicated a significant difference among groups ($p < 0.0001$). A multiple comparison procedure revealed that the mean for conference paper citations was greater than the means for journal article, book chapter and book citations. The results of this procedure are presented in Table 4.24.

Table 4.24.--Results of the Kruskal-Wallis Multiple Comparison Test for the Mean Number of Erroneous Fields in Library Science Citations to Various Document Formats

Format	Book	Book Chapter	Journal Article	Conference Paper
	(N=81)	(N=16)	(N=190)	(N=8)
Mean	0.296	0.375	0.405	2.375

Groups over a common line do not differ at the 0.05 level.

Finally, differences among English and American literature citations grouped by document format were found to be statistically significant ($p < 0.01$). Results of a multiple comparison procedure indicated that the mean for book chapter citations was greater than the mean for book citations. These findings are provided in Table 4.25.

Table 4.25.--Results of the Kruskal-Wallis Multiple Comparison Test for the Mean Number of Erroneous Fields in English and American Literature Citations to Various Document Formats

Format	Book	Journal Article	Book Chapter
	(N=189)	(N=75)	(N=33)
Mean	0.286	0.400	0.727

Groups over a common line do not differ at the 0.05 level.

In all of the disciplines studied, significant differences among erroneous citations grouped by document format were found. Overall, error rates were lowest in citations to books and journal articles. Error rates were highest in citations to conference papers and book chapters, the formats which required a greater number of fields per citation. It appears that citation error may increase with the complexity or the length of the citation.

In examining the association between document format and citation error, the distribution of document formats cited in the sample should be reviewed (Table 4.1). The journal article format was by far the most frequently cited document format. Over 82 percent of chemistry citations in the sample pertained to the journal article format. This was the greatest percentage of documents in any discipline to pertain to one format. Fewer errors were found in chemistry citations than in citations from other disciplines. It is important to realize that fewer fields were required for journal article citations in chemistry than in other disciplines. The ACS Style Guide, prescribed by all chemistry journals in the sample, did not require the inclusion of the journal article title field in citations to journal articles (Dodd 1986, 107).

The legitimacy of considering journal article title fields in a citation accuracy study has been debated before. Poyer (1979) did not include journal article title fields in his study because they were not required by many of the science journals in his sample. He also argued that it would be difficult to determine how an error in the journal article title field would impact document retrieval (Poyer 1979, 397). Although White agreed that the journal article title was not needed for document retrieval, he contended that this field might provide words to use in a topical key word search (White 1986a, 7-8). Elsewhere, he

asserted that accuracy in this field is important because the reader considers key words in the cited title of an article when making a decision about how useful the article is likely to be (White 1986b, 7).

The criteria for citation accuracy in this study included the journal article title field. The decision to include this field was made after finding that journal article title indexing was supported by a variety of periodical citation databases, including those loaded into online systems in libraries (Potter 1989). However, it is important to note that the chemistry journal article citations included in this study did not contain the journal article title field. The implications of this discrepancy must be considered in analyzing the data.

In an attempt to compensate for this crucial difference in citation requirements, the mean number of erroneous fields per citation in each discipline was calculated, excluding all errors in journal article title fields. Means ranged from 0.30 in chemistry to 0.37 in psychology (Table 4.26). Results of an analysis of variance procedure, presented in Table 4.27, indicate that the groups did not differ significantly on this variable.

Table 4.26.--Number of Erroneous Fields in Citations
(Excluding Errors in Journal Article Title Fields)

Discipline	Mean
Chemistry	0.30
Psychology	0.37
Library Science	0.35
Eng. & Am. Literature	0.34

Table 4.27.--Analysis of Variance on Citation Error Scores
(Excluding Errors in Journal Article Title Fields)

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between	0.92457	3	0.30819	0.766
Within	507.11261	1260	0.40247	
Total	508.03718	1263		

P=0.5133

In sum, it appears that the number of fields required for a citation, or the length of a citation, may be related to how likely it is that the citation will have errors. The lower percentage of incorrect citations in chemistry may be related to the prevalence of shorter citations in that discipline.

Errors in Specific Citation Fields

As discussed earlier, an error in a citation may affect the identification and retrieval of the cited document. The impact that an error may have on document retrieval depends to some extent on the citation field in

which the error occurred. With these concerns in mind, it was decided to conduct an analysis to identify the citation fields associated with errors in the sample of citations studied. The citation fields that were of greatest interest in this analysis were access points. For the purposes of this discussion, an access point is defined as a citation field which may be used to retrieve a bibliographic record for the cited document. For example, the access points for a book by one author include the name of the author and the title of the book.

A breakdown of errors by specific citation field and discipline is presented in Table 4.28. The highest percentage of errors occurred in author fields. Over 11 percent of all verified citations contained errors in author fields. Among the disciplines, the percentage of citations with author errors ranged from 10.13 in English and American literature to 12.97 in chemistry.

Table 4.28.--Percentages of Erroneous Fields in Citations

	Chem (N=316) (%)	Psych (N=318) (%)	LS (N=314) (%)	Lit (N=316) (%)	Total (N=1264) (%)
Author	12.97	12.58	11.15	10.13	11.71
Chapter author	0.63	1.57	0.32	0.00	0.63
Title	2.53	11.95	12.42	6.96	8.47
Chapter title	0.32	2.52	1.27	1.27	1.34
Journal title	6.01	2.20	2.23	1.58	3.01
Edition	0.95	0.94	1.91	1.58	1.34
Publisher	0.63	0.94	1.91	4.43	1.98
Volume	1.58	3.77	3.50	0.63	2.37
Issue	0.32	1.26	2.23	2.22	1.50
Pages	2.85	6.60	3.18	3.16	3.96
Date	1.27	0.94	2.55	3.48	2.06
Supplement number	--	0.31	--	--	0.08

Note: A number in the column heading represents the number of verified citations in the category specified. A number in the column below represents the percentage of verified citations that had errors in the field specified.

Errors in specific citation fields were analyzed in book, journal article, book chapter and conference paper citations. As discussed earlier, these document formats were associated with the greatest number of citation errors.

Errors in Book Citation Fields

A summary of erroneous fields in book citations is presented in Table 4.29. Overall, there were more errors in author fields than in title fields. More than 11 percent of all author fields contained errors, whereas 6.55 percent of all title fields contained errors. Similar results were reported in two earlier studies of citations searched in library catalogs. One study, conducted at the library of the Atomic Weapons Research Establishment in Aldermaston, England, concerned the accuracy of book citations brought by users to the catalog (Ayers et al. 1968). Of the 450 citations examined, title information was accurate in more than 90 percent of the sample, whereas author information was accurate in more than 75 percent of the sample. In another study, Tagliacozzo, Rosenberg and Kochen (1970) considered catalog use at the Ann Arbor Public Library and at three University of Michigan libraries. They found that title information was accurate in 70 percent of 1588 cases, whereas author information was accurate in 41.9 percent of 1367 cases.

Table 4.29.--Percentages of Erroneous Fields in Book Citations

	Chem (N=26) (%)	Psych (N=55) (%)	LS (N=81) (%)	Lit (N=189) (%)	Total (N=351) (%)
Author	3.85	21.82	8.64	10.05	11.11
Title	7.69	9.09	6.17	5.82	6.55
Edition	7.69	3.64	7.41	1.59	3.70
Publisher	0.00	5.45	3.70	6.88	5.41
Date	0.00	3.64	3.70	4.23	3.70

Note: A number in the column heading represents the number of verified citations in the category specified. A number in the column below represents the percentage of verified citations that had errors in the field specified.

The pattern of a greater percentage of errors in author fields than in title fields occurred in the disciplines of psychology, library science and English and American literature. The pattern was particularly striking in psychology, in which 21.82 percent of the author fields and 9.09 percent of the title fields were erroneous. The pattern was repeated in English and American literature, in which 10.05 percent of the author fields and 5.82 percent of the title fields were incorrect. The pattern was less distinct in library science, in which 8.64 percent of the author fields and 6.17 percent of the title fields were erroneous. The pattern did not occur in chemistry, in which 3.85 percent of the author fields and 7.69 percent of the title fields were incorrect.

Errors in Journal Article Citation Fields

Erroneous fields in journal article citations are summarized in Table 4.30. The citation fields that are most important for journal article retrieval vary with the approach taken by the library user. The journal title field is crucial if the journal title is abbreviated, and the library user must first consult a guide to journal title abbreviations. The journal title, volume and issue fields are important if the library user takes the citation to a catalog to determine if the library holds the journal issues needed. If the library user takes the citation to an online periodical index, the author, title and journal title fields may be of primary importance. This depends, of course, on the indexing that is provided in the system. If the library user takes the citation directly to a periodical collection which is shelved by title and which is known to hold the journal cited, the most important citation fields are journal title, volume, issue, pages and dates.

Table 4.30.--Percentages of Erroneous Fields in Journal Article Citations

	Chem (N=260) (%)	Psych (N=218) (%)	LS (N=190) (%)	Lit (N=75) (%)	Total (N=743) (%)
Author	12.31	9.17	9.47	10.67	10.50
Title	*0.00	11.93	12.11	8.00	7.40
Journal title	6.92	3.21	3.68	6.67	4.98
Volume	1.92	5.05	5.26	2.67	3.77
Issue	0.38	1.83	3.68	9.33	2.56
Pages	3.08	4.59	4.21	2.67	3.77
Date	1.15	0.46	2.11	0.00	1.08

Note: A number in the column heading represents the number of verified citations in the category specified. A number in the column below represents the percentage of verified citations that had errors in the field specified.

* This field was not required by the style manual.

In any journal article verification strategy, the journal title field is crucial. The percentage of erroneous journal title fields ranged from 3.21 in psychology to 6.92 in chemistry. It is important to note that these errors in chemistry citations occurred in abbreviated journal titles. The requirement for abbreviated journal titles is stipulated in The ACS Style Guide (Dodd 1986, 107), the style guide prescribed by all of the chemistry journals in the study. Many researchers have argued that there is a relationship between the

practice of abbreviating journal titles and citation errors (Place 1915; Place 1916; Richmond 1965; Kinney 1967; Hanson 1972; Garfield 1977b).

The percentage of erroneous journal title fields in chemistry citations was 6.92. Although this may not seem to be a very large percentage, the implications of these errors in chemistry journals should be considered. In several of the verification scenarios outlined earlier, the journal title was the primary access point. If the journal title abbreviation is flawed, the library user may not be able to ascertain the identity of the journal title in order to check the catalog for holdings, or to retrieve the volume from the shelf. The user must try to find some other clue in the citation to compensate for the flawed journal title field. This is a serious problem in chemistry because The ACS Style Guide does not require the inclusion of the journal article title field in citations (Dodd 1986, 107). Even though it is not used as an access point in some systems, the journal article title field may provide some idea of the subject content which would help in locating the cited document. If this field is missing, the user's only option may be to conduct a search in a periodical index or database, using one or more of the author names given in the citation. The citations retrieved by this search strategy would then have to be compared to the flawed citation to find some match in

volume number, pages or date. This strategy is problematic because author access points in chemistry citations are not always correct.

Errors in Book Chapter Citation Fields

Erroneous fields in book chapter citations are recorded in Table 4.31. Overall, the percentage of citations with erroneous author fields (14.77) was slightly higher than the percentage of citations with erroneous title fields (13.64).

Table 4.31.--Percentages of Erroneous Fields in Book Chapter Citations

	Chem (N=13) (%)	Psych (N=26) (%)	LS (N=16) (%)	Lit (N=33) (%)	Total (N=88) (%)
Author	23.08	19.23	6.25	12.12	14.77
Chapter author	15.38	15.38	6.25	0.00	7.95
Title	0.00	23.08	6.25	15.15	13.64
Chapter title	7.69	26.92	6.25	12.12	14.77
Edition	7.69	0.00	0.00	3.03	2.27
Publisher	0.00	0.00	6.25	3.03	2.27
Pages	0.00	26.92	6.25	21.21	17.05
Date	0.00	0.00	0.00	6.06	2.27

Note: A number in the column heading represents the number of verified citations in the category specified. A number in the column below represents the percentage of verified citations that had errors in the field specified.

Errors in Conference Paper Citation Fields

Errors in fields comprising conference paper citations are shown in Table 4.32. The highest error rates in access points were found in library science citations, in which 75 percent of all author fields and 87.5 percent of all title fields contained errors. Overall, 38.10 percent of all author fields contained errors, and 47.62 percent of all title fields contained errors. No errors were found in chapter author fields.

Many authors have discussed strategies to use in verifying conference papers (Alldredge 1981; Bell and Schultis 1981; Colbert 1981; Grimes 1981; Hintner 1981; Hlava 1981). The evidence provided by the sample of citations analyzed in this study indicates that there is a definite need for information on verification strategies for conference paper citations.

Table 4.32.--Percentages of Erroneous Fields in Conference Paper Citations

	Chem (N=7) (%)	Psych (N=6) (%)	LS (N=8) (%)	Total (N=21) (%)
Author	14.29	16.67	75.00	38.10
Chapter author	0.00	0.00	0.00	0.00
Title	42.86	0.00	87.50	47.62
Chapter title	0.00	16.67	37.50	19.05
Journal title	14.29	0.00	0.00	4.76
Edition	0.00	0.00	0.00	0.00
Publisher	14.29	0.00	25.00	14.29
Volume	0.00	0.00	0.00	0.00
Issue	0.00	0.00	0.00	0.00
Pages	14.29	33.33	0.00	14.29
Date	14.29	0.00	12.50	9.52

Note: A number in the column heading represents the number of verified citations in the category specified. A number in the column below represents the percentage of verified citations that had errors in the field specified. There is no column for English and American Literature in this table because conference papers were not cited in the references selected from the journals of that discipline.

Summary

The hypothesized relationship between an emphasis on citation instruction in a discipline and the occurrence of citation errors in the journal literature of the discipline was not supported. Although a statistically significant difference in error rate was found among citations grouped by discipline, this difference was not explained by the variable of citation instruction.

Citation errors were analyzed in relation to two other variables. No relationship was found to exist between journal publication frequency and citation error. Statistically significant differences among erroneous citations grouped by document format were found. Overall, errors were highest in citations to conference papers, followed by citations to book chapters. Errors were lower in citations to journal articles and books. Error rates were higher for document formats which required more fields than others, and for document formats which were cited less often than others. Because the error rate was lowest in the citations from chemistry journals, the distribution of formats cited in the sample was examined. Most of the chemistry citations in the sample referred to journal articles. Unlike journal article citations in other fields, chemistry citations were not required to include the journal article title field. A one-way analysis of variance procedure was used to compare errors in citations grouped by discipline, excluding all journal article title errors. No significant difference among groups was found.

Errors in specific citation fields in book, journal article, book chapter and conference paper citations were analyzed. Errors in author access points occurred more often than errors in title access points in book and

journal article citations. Conference paper and book chapter citations contained the highest concentration of errors in access points.

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CHAPTER V

SUMMARY, DISCUSSION AND IMPLICATIONS

This chapter includes a summary of the study and a discussion of the results. Implications of the results are considered, and suggestions for further research are given.

Summary of the Study

The primary purpose of this study was to test the following hypothesis: The greater the emphasis a discipline places on citation accuracy and purposes in its graduate instruction, the lesser will be the number of errors in the bibliographic citations in the journal literature of the discipline.

Dependent Variable

The dependent variable of the study was the average number of errors found in a sample of bibliographic citations from a discipline. A random sample of 1,280 citations was selected from 40 scholarly journals in the disciplines of chemistry, psychology, library science, and English and American literature. The citation verification procedure consisted of comparing each citation to its cited document. A citation was considered to be correct if it included accurate information, and if it contained all of

the information needed to identify and access the cited document. Of the 1,280 citations selected for the study, 1,264 were verified. The average number of erroneous fields per citation was least in citations from chemistry, followed by English and American literature, library science and psychology. A one-way analysis of variance procedure was used to compare the citations from each discipline on the average number of erroneous fields per citation. A statistically significant difference was found ($p=0.0162$). The Newman-Keuls multiple comparison test was used to determine that chemistry citations differed significantly from psychology citations.

Independent Variable

The independent variable of the study was the emphasis placed on citation accuracy and purposes in the graduate instruction of a discipline. Graduate program requirements were examined in college catalogs which were chosen to reflect the educational backgrounds of the authors whose citations were selected for the study. The average number of required courses pertaining to citation instruction in each program was highest in library science (1.20), followed by English and American literature (0.08). No requirements pertaining to citation instruction were found in chemistry or psychology program descriptions.

Hypothesis

The hypothesis of the study was not supported because no relationship was found to exist between low citation error rates in a discipline and an emphasis on citation instruction in the discipline. Although a statistically significant difference in error rates was found among the citations grouped by discipline, this difference was not explained by the variable of citation instruction.

Other Variables

Citation errors were analyzed in relation to two additional variables which were not included in the hypothesis. These variables were journal publication frequency and document format.

Journal Publication Frequency

An analysis was conducted to determine if a relationship existed between errors in the citations from a journal and the journal's publication schedule which might allow a certain amount of time for the editors to scrutinize citations. No relationship was found to exist between the average number of errors per citation from a journal and the number of issues published per year by the journal.

Formats of Documents Cited

Citation errors also were analyzed in relation to the formats of the documents cited. Overall, errors were highest in citations to conference papers, followed by citations to book chapters, journal articles and books. A Kruskal-Wallis test revealed that statistically significant differences existed among erroneous citations grouped by document format ($p < 0.0001$). Conference paper citations were found to contain significantly more errors than book chapter citations. Furthermore, book chapter citations were found to contain significantly more errors than journal article and book citations.

Because the error rate was lowest in citations from chemistry journals, the distribution of formats cited in that sample was examined. Over 82 percent of the chemistry citations referred to journal articles. Chemistry journal article citations were not required to include the journal article title field, unlike journal article citations in the other disciplines studied. A one-way analysis of variance procedure was used to compare errors in citations grouped by discipline, excluding all journal article title errors. No significant difference among groups was found.

Errors in Citation Fields

Errors in specific citation fields of books, journal articles, book chapters and conference papers were

examined. In book and journal article citations, errors in author fields occurred more often than errors in title fields. The highest concentration of errors in all access points was found in conference paper citations. The next highest concentration of errors in access points was found in book chapter citations.

Discussion

Many errors were found in citations from each discipline. Considering only verified citations, the percentage of correct citations in the journal literature of a discipline ranged from 66.04 in psychology to 75.00 in chemistry. Although a statistically significant difference in error rate was found among citations grouped by discipline, this difference was not explained by the variable of citation instruction. Thus, the hypothesis of the study was not supported.

If one assumes that citation accuracy reflects citation instruction, then it appears that citation instruction is deficient in all of the disciplines studied. No evidence was found that citation instruction exists at the graduate level in the disciplines of chemistry and psychology. Only a few English and American literature course descriptions pertained to citation instruction. Although library science had the highest value on the variable of citation instruction, this discipline had the

second highest value on the variable of citation error. Judging by course descriptions in college catalogs, most of the citation instruction in library science was presented in the context of bibliographic control in libraries. It seems that library science authors did not transfer what they were taught about the importance of accuracy in catalog entries to the context of their own bibliographic citation practices.

An analysis of document formats revealed that error rates were higher in citations to conference papers and book chapters, and lower in citations to journal articles and books. Error rates were higher for document formats which required more fields than others, and for document formats which were cited less often than others.

The journal article was the most frequently cited document format in the study. Error rates were lowest in chemistry citations, and most of these citations referred to journal articles. However, there was an important difference between journal article citations in chemistry and those in other disciplines. Because chemistry journal article citations were not required to include the journal article title field, they were shorter than journal article citations from other disciplines. The lower percentage of incorrect citations in chemistry may be related to the prevalence of shorter citations in that discipline.

Implications

The results of this research have implications for authors, journal editors, style manuals, and citation instruction. Other implications pertain to information storage and retrieval.

Authors

The results of this research indicate that authors should be more concerned about preventing citation errors in their published writings. An author should follow the instructions of the appropriate style manual to ensure that the form of each citation is correct. The author also should verify each citation against its original source to ensure citation accuracy.

An author should check the citations in a work at two stages during the publication process (Putterman and Lossos 1991, 111). First, the citations in the manuscript should be checked before it is submitted for publication. Second, the citations in the galley proofs should be checked for any transcription errors made during the typesetting process.

Editorial Policies of Journals

Although authors bear primary responsibility for the accuracy of their citations, editors should enforce this responsibility. The role of editors in relation to this responsibility was not clear in the journals used in this

study. However, the results of the study indicate that more attention should be given to this matter.

If editors were to check all citations in each paper accepted for publication, the citation error rate would be very low. However, many publishers may not consider this practice to be feasible. De Lacey, Record and Wade (1985, 885) suggested that editors should verify a sample of citations from each paper accepted for publication. If errors are found, the paper should be returned to the author with instructions to recheck all citations and make the necessary corrections.

Editors may take other measures to prevent articles in their journals from being miscited. Poyer (1979, 398) suggested that citation errors would be reduced if the journal title, volume, date and pagination of the article were printed on the first page of each article.

Style Manuals

Specific rules in the style manuals used in this study have implications for citation accuracy and purposes. Some instructions may have interfered with the construction of accurate citations. Other rules made the resulting citations more difficult to verify.

Rules for the Abbreviation of Information

Rules for the abbreviation of information made citations more difficult to verify. The fields most

affected by these instructions were the journal title field, the journal article title field, and the author field.

In this study, the abbreviated journal titles took more time to verify than the unabbreviated journal titles. This was because the verification process for an abbreviated journal title included the extra step of consulting a key to journal title abbreviations. In addition, an association between abbreviated journal titles and errors was found. Errors in journal title fields were highest in citations from chemistry journals. These journals prescribed The ACS Style Guide which required the abbreviation of journal titles (Dodd 1986, 107). Other researchers have associated citation errors with the practice of abbreviating journal titles (Place 1915; Place 1916; Richmond 1965; Kinney 1967; Hanson 1972; Garfield 1977b).

Names of personal authors were usually shortened in chemistry and psychology citations. The prescribed form of the name consisted of the surname and the initials of the given names. This information usually did not provide the basis for a precise bibliographic search and therefore complicated the verification process.

Chemistry citations were also shortened by the omission of journal article titles. A citation is quite difficult to verify if it lacks a journal article title

field and has a flawed journal title field. This is because the journal article title field is the only part of the citation that might provide some indication of the subject content of the article. This field might provide the basis for a subject search in a periodical index or database. If the journal article title field is missing, the user's only option may be to conduct an author search in a periodical index or database, using one or more of the author names given in the citation. The citations retrieved by this search strategy then would have to be compared to the flawed citation to find some match in volume number, pages and date. This strategy is problematic, however, because author access points in chemistry citations cannot be assumed to be completely correct.

The practice of abbreviating information in citations has been discussed in the context of citation verification by Garfield (1977a). He wrote about the time-consuming research that is needed to verify abbreviated citations. Garfield made the point that some redundancy of information in a citation is needed to compensate for any errors that the citation might contain. If there is an error in one field of the citation, information from the other fields might be used in the verification search. However, if the information in another citation field has been omitted, the

verification search becomes more difficult because there are fewer clues to use.

Deficiencies of Style Manuals

Some instructions of style manuals were confusing. For example, most style manuals specified the citation fields required for many different document formats besides books and journal articles. However, The ACS Style Guide (Dodd 1986, 107) gave the following instructions: "For material other than books and journals, enough information must be provided so that the source can be identified and located." Unfortunately, these instructions may be interpreted in many ways.

Another example of unclear instructions may be found in The MLA Style Sheet. The reader is instructed to give the author's name in "the fullest form known to you, or at least the most usual form" (Modern Language Association of America 1971, 17). No guidance is provided to help the reader establish the most common form of the author's name.

A third example of confusing instructions is found in the Publication Manual of the American Psychological Association. The list of citation fields used to document a book include the term of "date of publication." Instead of an explanation of this term, the reader is referred to the list of citation fields used to document a journal article. In this list, "date of publication" is defined as

the copyright date (American Psychological Association 1983, 120, 124). The reader is given the false impression that a publication date is the same as a copyright date.

Multiplicity of Style Manuals

Researchers have argued that writers are confused by the multiplicity of style manuals and the lack of a commonly accepted standard for citation practice (Freimer and Perry 1986; Rudolph and Brackstone 1990). Even the journals within the same discipline may not prescribe the same style manual, as was the case in this study.

There were six style manuals prescribed by the 40 journals included in the study. Journals in chemistry prescribed one style guide, as did journals in psychology. All of the chemistry journals prescribed The ACS Style Guide (Dodd 1986). All of the psychology journals prescribed The Publication Manual of the American Psychological Association (American Psychological Association 1983). However, it should be noted that all of the chemistry journals were published by the American Chemical Society, and all of the psychology journals were published by the American Psychological Association.

Among the ten English and American literature journals used, a total of four style manuals were prescribed. The Chicago Manual of Style for Authors, Editors and Copywriters (University of Chicago Press 1982) was

prescribed by two journals. The MLA Handbook for Writers of Research Papers, Theses and Dissertations (Gibaldi and Achtert 1979) was prescribed by two journals. The MLA Style Manual (Achtert and Gibaldi 1985) was prescribed by one journal. Finally, The MLA Style Sheet (Modern Language Association of America 1971) was prescribed by five journals.

Most of the library science journals included instructions to authors which contained information on style. Eight library science journals prescribed The Chicago Manual of Style for Authors, Editors and Copywriters (University of Chicago Press 1982). However, some of these journals listed exceptions to this style manual in their instructions to authors. One journal included instructions to authors which did not refer to a style manual. However, these instructions included style information, and stated that periodical title abbreviations should follow Index Medicus and American National Standard for the Abbreviation of Titles of Periodicals. The remaining journal included style instructions, and indicated that the use of any general style manual would be acceptable.

Citation Instruction

The results of this study indicate that citation instruction is needed in higher education. Students should

be taught how to construct accurate bibliographic citations to document sources of information. Students also should be taught how to compensate for citation errors in their bibliographic search strategies.

Citation construction

Students should be taught the importance of constructing complete citations. They should understand that each field in a citation provides information to the person who uses the citation to locate the cited document. An omission of a citation field may complicate or prevent the retrieval of the cited document. Students should know which fields are required for citations to the document formats cited most often in the discipline. This instruction should not be limited to the book and journal article formats.

Students should be taught the significance of accuracy in citations. Once again, they should understand that each field in a citation provides information to the person who uses the citation to locate the cited document. An error in a citation field may complicate or prevent the retrieval of the cited document. Students should be taught that accuracy in citation construction is ensured only by verifying the citation against the original source, because a secondary source may contain errors (Rudolph and Brackstone 1990).

Students also should be made aware of the issue of citation accuracy within the context of ethics in scholarship. According to Roland (1976, 717) and Hartmann (1984), the author of a publication has the responsibility of providing accurate information, including accurate citations. Students should understand that their credibility as researchers may be affected by the accuracy of their citations (American Psychological Association 1983, 112).

Citation instruction may be more of a challenge now that computer programs are available to manage, format and print files of citations in many different bibliographic styles. Students may believe that producing a bibliography is just a matter of using the "right" program. Students should be made aware that although such a program may produce citations which appear to be formatted correctly, it cannot correct inaccuracies in citation content.

Term paper bibliographies provide an important opportunity for citation instruction. In their study of citation completeness in undergraduate term papers, St. Clair and Magrill (1990, 80) noted that few teachers corrected their students' bibliographies. Teachers should critique their students' bibliographies because they represent a significant aspect of the research process.

Students might pay more attention to their citation practices if their bibliographies were scrutinized by their teachers.

Bibliographic Searching

A citation that is used as the basis for a bibliographic search may contain errors. Therefore, students should be taught how to compensate for such errors in their bibliographic search strategies. Students should understand the importance of using a variety of search strategies for one item. For example, a student may use an author's name in a search for a bibliographic record. If this search does not retrieve the desired record, the student should not conclude that the record is not in the system. Instead, the student should use several alternate search strategies, which may include searching by the title, searching by a truncated key word in the title, or searching by a string of words in the title.

Sources of Instruction

Researchers have recommended several sources of citation instruction. According to Rudolph and Brackstone (1990), "every faculty member should make sure students use and cite sources correctly, whether in a literature class or a physical-science seminar." Faculty members are responsible for teaching students how to conduct research. The practice of documenting sources of information is an

important part of the research process, and therefore should be included in research instruction. Faculty members may evaluate their students' citation practices by evaluating the bibliographies that are included in most term papers.

Freimer and Perry (1986, 354) suggested that academic librarians offer citation training through bibliographic instruction, and proposed the following approaches. Librarians may teach citation construction in bibliographic instruction courses. They may distribute guides to different citation styles. They also may hold faculty seminars on the importance of citation instruction, and the problems caused by inadequate citation instruction. Thus, librarians may make important contributions in citation instruction, even though their opportunities for instruction are different from those of the teaching faculty.

Basefsky (1982a; 1982b, 90), Freimer and Perry (1986, 354) and Sweetland (1989, 302) wrote about the distinct need for citation instruction in the education of librarians. Librarians need citation instruction because they are expected to interpret citations from all disciplines. Citation interpretation is a complex skill because there are many different standards for citation construction, and because many published citations contain errors. Citation interpretation is a part of many

different library activities, including reference, acquisitions, collection development and interlibrary loan.

Information Storage and Retrieval

The findings of this study have implications for many aspects of information storage and retrieval systems. The implications discussed here relate to the design and use of bibliographic databases, and the use of citation indexes.

Designing Systems to Reduce Errors in Data Entry

The results of this study indicate that many types of citations are likely to contain errors. The implications of this finding extend to the bibliographic record, which is a particular type of citation. Therefore, the information storage and retrieval system designer should implement certain measures to prevent errors from appearing in the bibliographic records of a database. Meadow (1973, 169) suggested that data entry errors may be decreased or at least identified through "properly designed data forms, training programs, and machine validation of input data."

One application of machine validation pertains to spelling (Peterson 1980). Computer programs are used to check the spelling of each word entered into the system. These programs notify the data entry operator if a word does not appear in the system's dictionary. Some of these programs also provide for the automatic correction of certain misspellings.

Another application of machine validation concerns authority control. Authority control is used to ensure consistency among name headings in a database (Young 1983, 16). For example, an authority record for a particular author will contain the authorized heading for the author's name. Variant forms of the author's name will be included in the authority record as cross references to the authorized heading. All bibliographic records for works by this author will contain the same authorized heading. This operation groups related records together and makes them more accessible to the searcher. Some authority control programs automatically check each name in a new bibliographic record against an authority file which contains authorized name headings. If the bibliographic record contains a variant form of a name, and if this form matches a cross reference to an authorized heading in the authority file, the program will change the variant form to the authorized form. Furthermore, if any change is made to an authorized heading in an authority record, the change will be reflected in every bibliographic record which contains the same heading.

Other applications of machine validation relate to the conventions used by the information storage and retrieval system to organize data. These factors are important because they affect how the data in the bibliographic record may be displayed and accessed. For example, the

OCLC PRISM service uses machine validation to check bibliographic records for valid tags, indicators, subfield codes, and fixed field values (Cataloging user guide 1990, 89).

Designing Systems to Compensate for Errors in Search Keys

A searcher may use a citation as the basis for a bibliographic search. If the citation contains errors that are not obvious to the searcher, the search key based on the citation may be flawed. For example, a searcher may not realize that an author's surname in a citation is misspelled. Consequently, the searcher may construct a flawed author search on the basis of the information given in the citation. Therefore, the information retrieval system should include some features to compensate for errors in user input.

An information retrieval system uses certain algorithms to determine which bibliographic records match the search key. If the algorithms require an exact match between the search key and the bibliographic record, many searches will fail to retrieve any records. To offset errors in search keys, the algorithms should retrieve records that partially match the search keys (Gerrie 1983, 112). The algorithms should be designed to compensate for a variety of errors in user input, including errors in

punctuation, spelling and spacing (Lancaster and Fayen 1973, 362, 415).

System designers should give some attention to the content of the bibliographic records in the system and how they are indexed. To maximize opportunities for information retrieval, the system should contain complete bibliographic records which are thoroughly indexed. Furthermore, the system should accommodate a variety of search strategies. These strategies should include searching by word stems, key words, and word strings. A system which allows for word stem searching will compensate for some misspelled words in user input (Bourne 1977, 10). Key word searching and string searching will counterbalance some word transposition errors in search keys.

Recommended Search Keys

This section includes recommendations for search keys to be used in bibliographic searches that are based on citations to books, journal articles, book chapters, and conference proceedings. These recommendations are supported by the results of this study which indicated that certain citation fields may be more reliable than others in providing the correct information for search keys.

Books

A title search key should be used to search for bibliographic records for books in the disciplines of

psychology, library science, and English and American literature. A search key based on an author's surname and a key word in the title is recommended in searching for bibliographic records for chemistry books.

Journal Articles

In searching a bibliographic database for a specific journal article citation, a journal article title search key is recommended for English and American literature citations. However, an author search key is recommended in searching library science journal article citations.

Author searching is not recommended for psychology citations because the authors' names are abbreviated in the citations of this discipline. In searching an article written by more than one author, it would be best to use a search key that combines several author names. Another approach would be to use key words from the journal article title.

Author searching is not recommended for chemistry citations because the authors' names are abbreviated in the citations of this discipline. In addition, a chemistry journal article citations is not likely to contain a journal article title field. It may be best to use a search key that combines several author names if the article was written by more than one individual.

Book Chapters

Title fields were almost as likely to contain errors as author fields in the book chapter citations collected in this study. Therefore, the searcher should be prepared to use a variety of search strategies, including key word searching, word stem searching, and word string searching. Because the sample of book chapter citations collected in this study was very small, recommendations for search strategies in each discipline will not be given.

Conference Papers

In the conference paper citations collected for this study, the citation field for the author of a specific conference paper was least likely to be erroneous. Therefore, a searcher should consult a database which indexes conference paper authors, and should use a search key based on the name of the conference paper author. Because the sample of conference papers collected in this study was very small, recommendations for search strategies in each discipline will not be given.

Using Citation Indexes

The results of this study indicate that many citations taken from journals are likely to contain errors. These errors may eventually be reproduced in citation index

entries (Garfield 1983, 26). Therefore, the citation index user should view the content of each entry with some skepticism.

The user should understand that the way an author's name was cited in a journal article bibliography will affect the way the name is indexed in a citation index. The user should be aware that an author's name may appear in several forms in the index due to possible spelling errors or variations in the fullness of the name.

The consequences of errors in a citation index depend on the use that is made of the index. Concerns about the accuracy of citations in Science Citation Index and the implications for citation analysis have been discussed by Boyce and Funk (1978), Oppenheim and Renn (1978), Thompson (1978), Broadus (1983), MacRoberts and MacRoberts (1989), and Moed and Vriens (1989). Personal names errors in citation indexes and the implications of using these indexes for the evaluation of researchers have been considered by Edmonds and Harris (1977), Rosenberg (1979), and Swartz (1979). Problems in using citation indexes to locate current works that have cited a specific title or author known to the user have been written about by Garfield (1983) and Rudolph and Brackstone (1990).

Suggestions for Further Research

A relationship between citation format and citation error was found in this research. A higher concentration of errors was found in conference paper and book chapter citations than in journal article and book citations. It appears that citation errors increase with the number of fields required in a citation, or the length of the citation. Another citation accuracy study should be conducted to determine more precisely the nature of any relationship between citation length and citation error. Citation length might be measured by counting the number of characters in each citation.

More descriptive research of citation errors should be done with citations from a variety of disciplines to determine the types of errors that occur most often in each citation field. This information would be helpful in designing information storage and retrieval systems to compensate for errors in user input. This information also would provide a more precise basis for recommended search strategies.

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APPENDIX A
SCHOLARLY JOURNALS SELECTED FOR THE STUDY

SCHOLARLY JOURNALS SELECTED FOR THE STUDY

Journals are grouped by discipline and then alphabetized by title in this list. Each journal title is followed by the name of the issuing body. The publishing frequency of the journal in 1986 is indicated in parentheses at the end of the entry.

Chemistry

Accounts of Chemical Research / American Chemical Society (monthly)

Analytical Chemistry / American Chemical Society (monthly except twice a month in April and August)

Chemical Reviews / American Chemical Society (bimonthly)

Environmental Science and Technology / American Chemical Society (monthly)

Journal of Agricultural and Food Chemistry / American Chemical Society (bimonthly)

Journal of Chemical Education / American Chemical Society (monthly)

Journal of Organic Chemistry / American Chemical Society (biweekly)

Journal of Physical Chemistry / American Chemical Society (biweekly)

Macromolecules / American Chemical Society (monthly)

Organometallics / American Chemical Society (monthly)

Psychology

American Psychologist / American Psychological Association (monthly)

Behavioral Neuroscience / American Psychological Association (bimonthly)

Developmental Psychology / American Psychological Association (bimonthly)

Journal of Applied Psychology / American Psychological Association (quarterly)

Journal of Educational Psychology / American Psychological Association (bimonthly)

Journal of Experimental Psychology: Animal Behavior Processes / American Psychological Association (quarterly)

Journal of Experimental Psychology: General / American Psychological Association (quarterly)

Journal of Experimental Psychology: Human Perception and Performance / American Psychological Association (quarterly)

Professional Psychology: Research and Practice / American Psychological Association (bimonthly)

Psychological Bulletin / American Psychological Association (bimonthly)

Library Science

College & Research Libraries / American Library Association (bimonthly)

Information Technology and Libraries / American Library Association (quarterly)

Journal of Education for Library and Information Science / Association for Library and Information Science Education (quarterly)

Journal of Library History / University of Texas at Austin (quarterly)

Library Quarterly / University of Chicago Press (quarterly)

Library Resources & Technical Services / American Library Association (quarterly)

Medical Library Association Bulletin / Medical Library Association (quarterly)

RQ / American Library Association (quarterly)

School Library Media Quarterly / American Library Association (quarterly)

Special Libraries / Special Libraries Association (quarterly)

English and American Literature

American Literature / Duke University Press (quarterly)

Contemporary Literature / University of Wisconsin Press (quarterly)

ELH / Johns Hopkins University Press (quarterly)

ESQ: A Journal of the American Renaissance / Washington State University Press (quarterly)

English Language Notes / University of Colorado (quarterly)

MELUS / Society for the Study of the Multi-Ethnic Literature of the United States (quarterly; however, in 1986 this periodical was published twice, and each time two issues were combined)

Studies in American Fiction / Northeastern University (biannual)

Studies in English Literature / Rice University (quarterly)

Studies in Short Fiction / Newberry College (quarterly)

Twentieth Century Literature / Hofstra University Press (quarterly; however, in 1986 this periodical was published three times: two issues were published separately, and the remaining two issues were published together)

APPENDIX B
DATA COLLECTION FORM

- =====
Case number: _____
=====
1. Discipline (DISCIP):
1=Chemistry 2=Psychology 3=Library Science
4=English and American Literature

 2. Format of document cited (FORMAT):
1=Journal or serial article
2=Journal supplement
3=Article in journal supplement
4=Special issue of journal
5=Book
6=Book chapter
7=Book in set
8=Chapter in book in set
9=Conference proceedings
10=Paper in conference proceedings
11=Paper in book in set of conference proceedings
12=Entry in Dissertation Abstracts International
13=Technical or research report
14=Annual
15=Article in annual
16=Newspaper article

 3. Journal identification number (JRNLID):

 4. Verification (VER1): 1=Verified: Correct
2=Verified: 1 or more errors 3=Unverified

 5. Verification: Number of fields with errors: (VER2):
0=No errors 1=One field 2=Two fields, etc.
99=missing data

 6. Author or editor error (AUTHOR):
0=missing data 1=no 2=yes

 7. Chapter author error (CAUTHOR):
0=missing data 1=no 2=yes

 8. Title error (TITLE):
0=missing data 1=no 2=yes

 9. Chapter title error (CTITLE):
0=missing data 1=no 2=yes

 10. Error in title of journal/annual/serial (JRNLTI):
0=missing data 1=no 2=yes

-
11. Edition error (EDITION):
0=missing data 1=no 2=yes
-
12. Error in Publisher (PUBLISH):
0=missing data 1=no 2=yes
-
13. Error in name of university (UNIV):
0=missing data 1=no 2=yes
-
14. Error in volume number (VOLUME):
0=missing data 1=no 2=yes
-
15. Error in issue number (ISSUE):
0=missing data 1=no 2=yes
-
16. Error in pagination (PAGES):
0=missing data 1=no 2=yes
-
17. Error in publication date (DATE):
0=missing data 1=no 2=yes
-
18. Error in supplement number (SUPPL):
0=missing data 1=no 2=yes
-
19. Error in document number (DOCU):
0=missing data 1=no 2=yes
-
20. Error in year of graduation (YEAR):
0=missing data 1=no 2=yes
-

APPENDIX C

TERMS PERTAINING TO CITATION ACCURACY AND PURPOSES

TERMS PERTAINING TO CITATION ACCURACY AND PURPOSES

The following terms pertaining to citation accuracy and purposes were taken from graduate course descriptions according to the procedure specified in chapter 3. Terms are arranged alphabetically under discipline. Institutions and dates following a term indicate the college catalogs in which the term appeared. Institutions are arranged alphabetically by state, and then alphabetically by institution.

Chemistry

No terms pertaining to citation accuracy and purposes were found in the course descriptions reviewed.

Psychology

No terms pertaining to citation accuracy and purposes were found in the course descriptions reviewed.

Library Sciencebibliographic construction

"bibliographic compilation"

North Texas State University: 1984-85

"technique of constructing bibliographies"

Catholic University: 1975-77

bibliographic control / bibliographical control

University of California, Los Angeles: 1977-78 (term appeared in two separate course descriptions), 1979-80 (term appeared in two separate course descriptions), 1984-85

University of Hawaii, Manoa: 1985-87

Emporia State University: 1984-85

University of Maryland, College Park: 1976-77

Rutgers University: 1975-77, 1979-81, 1984-86

State University of New York, Albany: 1974-76

University of Washington: 1974-75, 1978-80, 1984-86

bibliographic description / bibliographical description

University of California, Berkeley: 1974-75, 1978-79

State University of New York, Albany: 1984-85

bibliographic organization

Louisiana State University: 1984-85

University of Tennessee at Knoxville: 1979-81, 1983-85

University of Wisconsin, Madison: 1985-87

bibliographic verification

"searching and verification" [in bibliographic tools]

North Texas State University: 1979-80, 1984-85

bibliography, theory and purpose

"theory and purpose of bibliography as a form of access to information"

Indiana University: 1975-76, 1979-80, 1984-86

catalog / catalogs

"the catalog, its function and the principles of its construction"

University of Denver: 1979-81, 1983-85

"control of catalog as retrieval instrument"

University of Denver: 1973-75

"the development and application of standards and rules to the construction and use of catalogs in libraries"

Columbia University: 1984-85

"function and construction of the catalog"

University of Denver: 1973-75

cataloging / cataloguing

University of Arizona: 1974-75

University of California, Berkeley: 1978-79, 1984-85

University of California, Los Angeles: 1977-78, 1979-80, 1984-85

University of Southern California: 1975-77, 1979-80

Catholic University: 1975-77

Florida State University: 1979-80, 1984-85

Emory University: 1974-75, 1979-81

University of Hawaii, Manoa: 1973-74, 1979-80, 1985-87

Northern Illinois University: 1975-76

Rosary College: 1978-79

University of Chicago: 1973-75, 1978-80, 1980-82, 1982-84

University of Illinois: 1976-78, 1978-80, 1980-82, 1982-84, 1984-86

Indiana University: 1975-76, 1979-80, 1984-86

University of Iowa: 1976-78

Emporia State University: 1979, 1984-85 (term appeared in two separate course descriptions)

University of Kentucky: 1975-76, 1978-79, 1984-85

Louisiana State University: 1974-75, 1979-80

University of Maryland, College Park: 1976-77

cataloging / cataloguing (continued)

Simmons College: 1974-75, 1976-78, 1978-80, 1984-86
 University of Michigan: 1974-76, 1979-81, 1984-86
 Wayne State University: 1974-75, 1979-80, 1984-86
 Western Michigan University: 1974-75, 1979-81, 1984-86
 University of Missouri, Columbia: 1974-76, 1980-81 (term
 appeared in two separate course descriptions), 1984-85
 Long Island University: 1978-80
 State University of New York, Albany: 1974-76, 1978-80
 State University of New York, Buffalo: 1977-79
 Case Western Reserve University: 1974-75, 1977-79
 Kent State University: 1979-80
 University of Oklahoma: 1979-80, 1984-85
 University of Oregon: 1974-75
 University of Pittsburgh: 1975-77, 1978-80
 University of Rhode Island: 1975-76, 1979-80, 1984-85
 George Peabody College for Teachers: 1974-75, 1979-80,
 1984-85
 University of Tennessee at Knoxville: 1979-81, 1983-85
 North Texas State University: 1974-75, 1979-80, 1984-85
 University of Texas at Austin: 1978-80
 Brigham Young University: 1982-83
 University of Washington: 1974-75 (term appeared in two
 separate course descriptions), 1978-80 (term
 appeared in two separate course descriptions)
 University of Wisconsin, Madison: 1973-75, 1979-81, 1985-87

descriptive bibliography

University of California, Los Angeles: 1977-78, 1979-80,
 1984-85
 State University of New York, Albany: 1978-80

organization of information

"organization and control of library collections"
 Emory University: 1977-78

"organization and dissemination of resources"
 Emory University: 1984-85

"organization of information for document and information
 retrieval"
 Rutgers University: 1984-86

"organization of information ... in bibliographies, library
 catalogs and machine-based systems"
 University of Minnesota: 1974-75, 1978-80, 1984-86

"organization of libraries" [as opposed to administration]
 University of Illinois: 1982-84, 1984-86

organization of information (continued)

"organization of library materials"

Northern Illinois University: 1979-80, 1984-85

"the study of how information is ... organized, retrieved, managed and used"

University of North Carolina: 1986-87

"technical services in libraries ... organization and preparation of the collections"

Florida State University: 1979-80

providing access to library materials

"The role of media centers, libraries and information centers in supplying, providing access to, servicing, interpreting, and preserving media."

Columbia University: 1973-74, 1979-80

record creation

"analysis of the means by which the availability and content of graphic materials are recorded"

University of Hawaii, Manoa: 1973-74, 1979-80

English and American Literatureanalytical bibliography

Bowling Green State University: 1974-76, 1978-80, 1984-86

descriptive bibliography

University of California, Los Angeles: 1974-75, 1980-81, 1982-83

Catholic University: 1975-77, 1979-81, 1983-85

documentation of scholarly papers

University of Kansas: 1975-76, 1976-77

APPENDIX D

LETTER AND POSTCARD SENT TO LIBRARY SCIENCE AUTHORS

October 23, 1990

[Author's name]
[Address]

Dear [Author's name]:

Your article entitled [title of article] is included in a sample of articles selected for a citation analysis study being conducted at the University of North Texas School of Library and Information Sciences. The study concerns articles published in 1986 in the scholarly journals of several disciplines, including library science.

One aspect of the study pertains to the educational backgrounds of the authors of these articles. We have not been able to determine the discipline, graduation date or degree-granting institution associated with your master's degree and therefore are asking for your cooperation in completing the enclosed form. It would be appreciated if you would mail the form prior to November 6. Your responses will be held in strictest confidence.

Thank you for your cooperation.

Sincerely yours,

Catherine Sassen

Name: [Author's surname]

Discipline in which master's degree was granted:

Date of graduation: _____

Degree-granting institution:

APPENDIX E
SUMMARY OF INSTITUTIONS ASSOCIATED WITH AUTHORS

SUMMARY OF INSTITUTIONS ASSOCIATED WITH AUTHORS

The following summary was compiled from reference sources according to the procedure specified in chapter 3. Each table represents a separate discipline. Within a table, institutions are grouped by state, and then listed alphabetically by title.

The column labeled "Carnegie class" contains abbreviated Carnegie classifications for institutions. Each classification which consists of a term and a number has been abbreviated to the first letter of the first distinctive word, followed by the number. For example, "Research Universities I" has been abbreviated to "R1". Classifications which consist of terms without numbers have been abbreviated to the first three letters of the first distinctive word. For example, "Schools of Engineering and Technology" has been abbreviated to "ENG".

Table E.1.--Institutions Associated With Chemistry Authors

Institution	Carnegie class	Degree	Year
<u>California</u>			
Calif. Inst. of Tech.	R1	Ph.D.	1964
		Ph.D.	1965
		Ph.D.	1965
		Ph.D.	1980
UC Berkeley	R1	Ph.D.	1945
		Ph.D.	1967
UC Los Angeles	R1	M.S.	NA
		Ph.D.	1950
		Ph.D.	1950
		Ph.D.	1989
UC Riverside	D1	M.S.	1980
<u>Colorado</u>			
Univ. of Colorado	R1	Ph.D.	1948

Institution	Carnegie class	Degree	Year
Univ. of Colorado (cont.)		Ph.D.	1966
		Ph.D.	1981
<u>Connecticut</u>			
Wesleyan Univ.	L1	Ph.D.	1984
Yale Univ.	R1	M.S.	NA
		Ph.D.	1966
<u>Florida</u>			
Florida Atlantic Univ.	C1	M.S.	1980
Florida State Univ.	R2	Ph.D.	1975
Univ. of Florida	R1	Ph.D.	1970
<u>Illinois</u>			
Northern Ill. Univ.	D1	Ph.D.	1977
Southern Ill. Univ.		M.S.	1968
		M.S.	1981
Univ. of Chicago	R1	Ph.D.	1953
		Ph.D.	1956
		Ph.D.	1958
		Ph.D.	1980
Univ. of Illinois	R1	Ph.D.	1960
		Ph.D.	1968
		Ph.D.	1970
<u>Indiana</u>			
Indiana Univ.	R2	Ph.D.	1961
Purdue Univ.	R1	Ph.D.	1975

Institution	Carnegie class	Degree	Year
<u>Iowa</u>			
Iowa State Univ.	R2	Ph.D.	1952
		Ph.D.	1956
		Ph.D.	1976
		Ph.D.	1979
		M.S.	1984
		Ph.D.	1987
<u>Louisiana</u>			
Northeast La. Univ.	C1	M.S.	1981
<u>Maryland</u>			
Johns Hopkins Univ.	R1	Ph.D.	1966
U. Md., College Park	R1	Ph.D.	1958
		Ph.D.	1985
<u>Massachusetts</u>			
Boston Univ.	R1	Ph.D.	1970
Brandeis Univ.	R2	Ph.D.	1974
		Ph.D.	1987
Harvard Univ.	R1	M.A.	1955
		Ph.D.	1963
		Ph.D.	1965
		Ph.D.	1966
		Ph.D.	1973
Mass. Inst. of Tech.	R1	Ph.D.	1950
		Ph.D.	1961
		Ph.D.	1963
		Ph.D.	1975

Institution	Carnegie class	Degree	Year
Northeastern Univ.	D1	Ph.D.	1968
Univ. of Massachusetts	R2	Ph.D.	1978
<u>Michigan</u>			
Michigan State Univ.	R1	Ph.D.	1979
		Ph.D.	1983
Univ. of Michigan	R1	Ph.D.	1951
		M.A.	1965
		Ph.D.	1975
Wayne State Univ.	R2	M.S.	1955
<u>Minnesota</u>			
Univ. of Minnesota	R1	M.S.	1951
		Ph.D.	1966
		Ph.D.	1968
		Ph.D.	1970
		Ph.D.	1976
		Ph.D.	1982
		Ph.D.	1983
<u>Missouri</u>			
U. Mo., Columbia	R1	Ph.D.	1979
<u>Nebraska</u>			
Univ. of Neb., Lincoln	R2	Ph.D.	1988
<u>New Jersey</u>			
Princeton Univ.	R1	Ph.D.	1969

Institution	Carnegie class	Degree	Year
Rutgers Univ.	R2	M.S.	NA
		Ph.D.	1983
Stevens Inst. of Tech.	ENG	M.S.	NA
<u>New York</u>			
Columbia Univ.	R1	Ph.D.	1985
		Ph.D.	1986
Cornell Univ.	R1	M.S.	NA
		Ph.D.	1966
		M.S.	1974
Poly. Inst. of Brooklyn	D1	Ph.D.	1964
Poly. Inst. of New York	D1	Ph.D.	1981
Rensselaer Poly. Inst.	D1	Ph.D.	1987
SUNY Buffalo	R2	Ph.D.	1985
Univ. of Rochester	R1	Ph.D.	1968
<u>North Carolina</u>			
Duke Univ.	R1	A.M.	1944
N.C. State Univ.	R1	M.S.	1986
Univ. of N.C.	R1	Ph.D.	1969
		Ph.D.	1980
<u>North Dakota</u>			
Univ. of N.D.	D1	Ph.D.	1976
<u>Ohio</u>			
Bowling Green St. Univ.	D2	M.S.	1982
Cleveland State Univ.	C1	M.S.	1970
Univ. of Cincinnati	R2	Ph.D.	1979

Institution	Carnegie class	Degree	Year
Univ. of Dayton	C1	M.S.	1986
Ohio State Univ.	R1	Ph.D.	1963
<u>Oregon</u>			
Oregon Grad. Center	SP	Ph.D.	1986
Oregon State Univ.	R1	M.S.	1969
		M.S.	1970
Univ. of Oregon	R2	Ph.D.	1973
<u>Pennsylvania</u>			
Penn. State Univ.	R1	Ph.D.	1967
Univ. of Penn.	R1	Ph.D.	1957
		Ph.D.	1972
<u>Tennessee</u>			
Vanderbilt Univ.	R2	Ph.D.	1982
<u>Texas</u>			
Rice Univ.	D1	Ph.D.	1960
U. Texas at Austin	R1	M.S.	1975
		Ph.D.	1977
<u>Utah</u>			
Univ. of Utah	R1	Ph.D.	1978
<u>West Virginia</u>			
West Virginia Univ.	R2	Ph.D.	1967
		M.S.	1985

Institution	Carnegie class	Degree	Year
<u>Wisconsin</u>			
Univ. of Wis., Madison	R1	Ph.D.	1944
		Ph.D.	1960
		Ph.D.	1975
		Ph.D.	1985
		Ph.D.	1985
		Ph.D.	1986
<u>Wyoming</u>			
Univ. of Wyoming	D1	Ph.D.	1968

Table E.2.--Institutions Associated With Psychology Authors

Institution	Carnegie class	Degree	Year
<u>California</u>			
CSU, Fullerton	C1	M.A.	NA
Claremont Univ.	R2	Ph.D.	1972
Fuller Theol. Seminary	THE	Ph.D.	1985
San Jose State Univ.	C1	M.S.	1979
Stanford Univ.	R1	Ph.D.	1951
		Ph.D.	1967
		Ph.D.	1971
		Ph.D.	1979
		Ph.D.	1983
UC Berkeley	R1	Ph.D.	1947
		Ph.D.	1969
		Ph.D.	1976
		Ph.D.	1984
UC Los Angeles	R1	Ph.D.	1964
UC Santa Barbara	D1	Ph.D.	NA
		Ph.D.	1979
<u>Connecticut</u>			
Univ. of Conn.	R2	M.A.	1982
		M.A.	1983
Yale Univ.	R1	M.A.	NA
		M.S.	NA
		Ph.D.	1956
		Ph.D.	1959

Institution	Carnegie class	Degree	Year
Yale Univ. (cont.)		Ph.D.	1969
		Ph.D.	1970
		Ph.D.	1978
		Ph.D.	1984
<u>Delaware</u>			
Univ. of Delaware	D1	Ph.D.	1985
<u>District of Columbia</u>			
Howard Univ.	R2	M.A.	1970
<u>Florida</u>			
Florida Atlantic Univ.	C1	M.A.	1981
Florida State Univ.	R2	M.S.	1980
Univ. of Florida	R1	M.A.	1965
		M.A.	1965
<u>Georgia</u>			
Emory Univ.	R2	Ph.D.	1988
Ga. Inst. of Tech.	R2	M.S.	1982
		M.S.	1986
Ga. State Univ.	D1	Ph.D.	1977
		Ph.D.	1982
<u>Illinois</u>			
Illinois State Univ.	D2	M.S.	1976
Northwestern Univ.	R1	Ph.D.	1952
		Ph.D.	1973

Institution	Carnegie class	Degree	Year
Univ. of Chicago	R1	Ph.D.	1959
		Ph.D.	1977
Univ. of Illinois	R1	Ph.D.	1970
		Ph.D.	1974
		M.A.	1978
		M.A.	1979
<u>Indiana</u>			
Butler Univ.	C1	M.S.	NA
Indiana Univ.	R2	Ph.D.	1961
		Ph.D.	1974
		Ph.D.	1987
Purdue Univ.	R1	Ph.D.	1972
<u>Kentucky</u>			
Univ. of Louisville	D1	M.A.	1983
<u>Maryland</u>			
Johns Hopkins Univ.	R1	Ph.D.	1988
U. Md., College Park	R1	Ph.D.	1986
<u>Massachusetts</u>			
Brandeis Univ.	R2	Ph.D.	1987
Clark Univ.	D2	Ph.D.	1971
Harvard Univ.	R1	Ph.D.	1967
		Ph.D.	1977
		Ph.D.	1977
		Ph.D.	1983

Institution	Carnegie class	Degree	Year
Mass. Inst. of Tech.	R1	Ph.D.	1968
		Ph.D.	1979
Univ. of Massachusetts	R2	Ph.D.	1980
		Ph.D.	1981
<u>Michigan</u>			
Michigan State Univ.	R1	M.A.	1983
		M.A.	1985
		M.A.	1986
Univ. of Detroit	D2	Ph.D.	1973
Univ. of Michigan	R1	M.S.	NA
		Ph.D.	1959
		Ph.D.	1969
		Ph.D.	1970
		Ph.D.	1973
		Ph.D.	1976
Univ. of Michigan	R1	Ph.D.	1986
		Ph.D.	1986
		Ph.D.	1986
		Ph.D.	1986
<u>Minnesota</u>			
Univ. of Minnesota	R1	Ph.D.	1955
		Ph.D.	1965
		Ph.D.	1970
		Ph.D.	1975
<u>Missouri</u>			
U. Mo., Columbia	R1	Ph.D.	1963
		M.A.	1971
		Ph.D.	1977

Institution	Carnegie class	Degree	Year
U. Mo., Columbia (cont.)		M.A.	1979
		Ph.D.	1988
U. Mo., Kansas City	D1	M.A.	1979
<u>New Hampshire</u>			
Dartmouth College	D1	Ph.D.	1983
<u>New Jersey</u>			
Princeton Univ.	R1	Ph.D.	1967
		Ph.D.	1978
Rutgers Univ.	R2	Ph.D.	1988
<u>New York</u>			
Adelphi College	D2	Ph.D.	1958
Columbia Univ.	R1	Ph.D.	1983
Cornell Univ.	R1	M.A.	1958
		Ph.D.	1977
		Ph.D.	1985
CUNY	R2	Ph.D.	1976
Fordham Univ.	D1	M.A.	NA
Rensselaer Poly. Inst.	D1	M.S.	NA
		M.S.	NA
St. John's Univ.	D1	Ph.D.	1977
		Ph.D.	1983
SUNY Binghamton	D1	Ph.D.	1981
SUNY Cortland	C2	M.S.	1973
SUNY Stony Brook	R2	Ph.D.	1988

Institution	Carnegie class	Degree	Year
<u>North Carolina</u>			
Duke Univ.	R1	Ph.D.	1986
<u>Ohio</u>			
Kent State Univ.	D1	M.A.	1963
Miami Univ.	D2	M.S.	NA
Ohio State Univ.	R1	Ph.D.	1960
		Ph.D.	1984
<u>Oregon</u>			
Portland State Univ.	C1	M.A.	1981
Univ. of Oregon	R2	Ph.D.	1967
		M.A.	1981
<u>Pennsylvania</u>			
Penn. State Univ.	R1	Ph.D.	1982
Univ. of Pennsylvania	R1	M.A.	NA
		Ph.D.	1966
Univ. of Pittsburgh	R1	M.S.	1978
<u>Tennessee</u>			
Vanderbilt Univ.	R2	M.A.	1981
<u>Texas</u>			
Texas Christian Univ.	D2	Ph.D.	1981
Texas Tech Univ.	D1	Ph.D.	1972

<u>Institution</u>	<u>Carnegie class</u>	<u>Degree</u>	<u>Year</u>
<u>Utah</u>			
Univ. of Utah	R1	Ph.D.	1982
<u>Virginia</u>			
Univ. of Virginia	R2	Ph.D.	1967
<u>Washington</u>			
Univ. of Washington	R1	Ph.D.	1977
		Ph.D.	1982
<u>Wisconsin</u>			
Univ. of Wis., Madison	R1	M.A.	NA
		M.S.	1982
<u>Wyoming</u>			
Univ. of Wyoming	D1	M.S.	1977

Table E.3.--Institutions Associated With Library Science Authors

Institution	Carnegie class	Degree	Year
<u>Arizona</u>			
Univ. of Arizona	R1	M.L.S.	1974
<u>California</u>			
UC Berkeley	R1	M.L.S.	1963
		M.L.S.	1966
		M.L.S.	1972
		M.L.S.	1974
		Ph.D.	1974
UC Los Angeles	R1	M.L.S.	1973
		M.L.S.	1978
		M.L.S.	1984
<u>Colorado</u>			
Univ. of Denver	D1	M.A.	1951
<u>Florida</u>			
Florida State Univ.	R2	M.S.	1960
		M.S.	1964
		Ph.D.	1973
<u>Georgia</u>			
Emory Univ.	R2	M.Ln.	1954
		M.Ln.	1969
		M.Ln.	1977

Institution	Carnegie class	Degree	Year
<u>Illinois</u>			
Univ. of Chicago	R1	M.A.	1970
		M.A.	1973
		M.A.	1974
		M.A.	1982
Rosary College	L2	M.L.S.	1978
Univ. of Illinois	R1	M.S.	1940
		M.S.	1951
		M.S.	1957
		M.S.	1975
		M.S.	1978
		M.S.	1979
		M.S.	1982
		Ph.D.	1984
<u>Indiana</u>			
Indiana Univ.	R2	M.L.S.	1971
		M.L.S.	1974
		M.L.S.	1974
		M.L.S.	1976
		M.L.S.	1980
<u>Iowa</u>			
Univ. of Iowa	R1	M.L.S.	1977
<u>Kansas</u>			
Emporia State Univ.	C1	M.L.S.	1968

<u>Institution</u>	<u>Carnegie class</u>	<u>Degree</u>	<u>Year</u>
<u>Louisiana</u>			
Louisiana State Univ.	R2	M.S.	NA
<u>Maryland</u>			
U. Md., College Park	R1	M.L.S.	1977
<u>Massachusetts</u>			
Simmons College	C1	M.S.	1969
		M.S.	1969
		M.L.S.	1974
		M.L.S.	1977
<u>Michigan</u>			
Univ. of Michigan	R1	A.M.L.S.	1950
		A.M.L.S.	1952
		A.M.L.S.	1971
		A.M.L.S.	1972
		A.M.L.S.	1974
		A.M.L.S.	1976
W. Michigan Univ.	D2	M.L.S.	NA
		M.S.L.S.	1968
<u>Minnesota</u>			
Univ. of Minnesota	R1	M.A.L.S.	1967
<u>New Jersey</u>			
Rutgers Univ.	R2	M.L.S.	1959

Institution	Carnegie class	Degree	Year
<u>New York</u>			
Columbia Univ.	R1	M.L.S.	NA
		M.L.S.	NA
		M.S.L.S.	1956
		M.L.S.	1958
		M.S.L.S.	1964
		M.L.S.	1968
		D.L.S.	1969
		M.L.S.	1970
Long Island Univ.	C1	M.L.S.	1979
Queens, CUNY	C1	M.L.S.	1988
SUNY Albany	D1	M.L.S.	NA
SUNY Buffalo	R2	M.L.S.	1978
Syracuse Univ.	R2	M.S.L.S.	1967
		M.S.L.S.	1969
		M.S.L.S.	1969
<u>North Carolina</u>			
Univ. of N.C.	R1	M.L.S.	1976
		Ph.D.	1988
<u>Ohio</u>			
Kent State Univ.	D1	M.L.S.	1980
<u>Oklahoma</u>			
Univ. of Oklahoma	R2	M.L.S.	NA
		M.L.S.	1971

<u>Institution</u>	<u>Carnegie class</u>	<u>Degree</u>	<u>Year</u>
<u>Pennsylvania</u>			
Drexel Univ.	C1	M.S.	1970
		M.S.I.S.	1980
		M.S.I.S.	1985
		M.S.	1986
Univ. of Pittsburgh	R1	Ph.D.	1977
		M.L.S.	1980
<u>Tennessee</u>			
Geo. Peabody College	D1	M.A.L.S.	1951
<u>Texas</u>			
U. Texas at Austin	R1	M.L.S.	1965
<u>Utah</u>			
Brigham Young Univ.	D1	M.L.S.	1983
<u>Wisconsin</u>			
Univ. of Wis., Madison	R1	M.A.	1967

Table E.4.--Institutions Associated With English and American Literature Authors

Institution	Carnegie class	Degree	Year
<u>California</u>			
Claremont Univ.	R2	A.M.	NA
Stanford Univ.	R1	Ph.D.	1980
		Ph.D.	1981
UC Berkeley	R1	Ph.D.	1983
UC Irvine	R2	Ph.D.	1983
UC Los Angeles	R1	Ph.D.	NA
		M.A.	1951
		Ph.D.	1984
UC Riverside	D1	M.A.	1966
		Ph.D.	1976
<u>Colorado</u>			
Univ. of Colorado	R1	M.A.	NA
<u>Connecticut</u>			
Connecticut College	L1	M.A.	NA
Univ. of Connecticut	R2	Ph.D.	1981
Yale Univ.	R1	M.A.	NA
		M.Ph.	NA
		M.A.	1968
		Ph.D.	1980
		Ph.D.	1980
		Ph.D.	1982
		Ph.D.	1983
<u>Delaware</u>			
Univ. of Delaware	D1	Ph.D.	1981

Institution	Carnegie class	Degree	Year
<u>District of Columbia</u>			
Catholic Univ.	R2	M.A.	NA
<u>Florida</u>			
Florida State Univ.	R2	M.A.	NA
		Ph.D.	1979
<u>Illinois</u>			
Northwestern Univ.	R1	M.A.	NA
		Ph.D.	NA
		Ph.D.	1971
Univ. of Chicago	R1	M.A.	1967
		Ph.D.	1972
Univ. of Illinois	R1	M.A.	1962
		M.A.	1973
<u>Indiana</u>			
Indiana Univ.	R2	A.M.	1980
Purdue Univ.	R1	Ph.D.	1986
<u>Iowa</u>			
Univ. of Iowa	R1	Ph.D.	1983
<u>Kansas</u>			
Univ. of Kansas	R2	Ph.D.	1976
		Ph.D.	1977
Wichita State Univ.	C1	M.A.	1967

Institution	Carnegie class	Degree	Year
<u>Maryland</u>			
U. Md., College Park	R1	Ph.D.	1987
<u>Massachusetts</u>			
Boston Univ.	R1	Ph.D.	1983
Brandeis Univ.	R2	M.A.	NA
		Ph.D.	1973
Harvard Univ.	R1	A.M.	NA
		Ph.D.	1963
		M.A.	1971
Univ. of Massachusetts	R2	M.A.	NA
<u>Michigan</u>			
Michigan State Univ.	R1	Ph.D.	1981
<u>Minnesota</u>			
Univ. of Minnesota	R1	M.A.	1966
<u>New Jersey</u>			
Princeton Univ.	R1	M.A.	NA
		Ph.D.	1965
		Ph.D.	1986
		Ph.D.	1986
<u>New York</u>			
Columbia Univ.	R1	M.A.	NA
		Ph.D.	1971
		Ph.D.	1985
Cornell Univ.	R1	M.A.	NA

Institution	Carnegie class	Degree	Year
Cornell Univ. (cont.)		Ph.D.	1976
		Ph.D.	1982
SUNY Buffalo	R2	Ph.D.	1983
<u>North Carolina</u>			
Duke Univ.	R1	Ph.D.	1982
<u>Ohio</u>			
Bowling Green St. Univ.	D2	M.A.	NA
Ohio State Univ.	R1	M.A.	1968
		Ph.D.	1973
Xavier Univ.	C1	M.A.	NA
<u>Oklahoma</u>			
Univ. of Tulsa	D2	Ph.D.	1986
<u>Pennsylvania</u>			
Penn. State Univ.	R1	Ph.D.	1965
Univ. of Pennsylvania	R1	M.A.	NA
		M.A.	NA
<u>Rhode Island</u>			
Brown Univ.	R2	A.M.	NA
		Ph.D.	1987
<u>South Carolina</u>			
Univ. of S. Carolina	D1	M.A.	1975

<u>Institution</u>	<u>Carnegie class</u>	<u>Degree</u>	<u>Year</u>
<u>Texas</u>			
Baylor Univ.	D2	M.A.	1954
Sam Houston St. Univ.	C1	M.A.	1973
Texas A&M Univ.	R1	Ph.D.	1987
U. Texas at Austin	R1	Ph.D.	1969
<u>Virginia</u>			
Univ. of Virginia	R2	M.A.	NA
		M.A.	1981
<u>Washington</u>			
Univ. of Washington	R1	M.A.	NA

APPENDIX F
SUMMARY OF GRADUATE PROGRAMS EXAMINED

SUMMARY OF GRADUATE PROGRAMS EXAMINED

The following summary was compiled from college catalogs according to the procedure specified in chapter 3. Each table represents a separate discipline. Within a table, institutions are grouped by state, and then listed alphabetically by title.

Table F.1.--Chemistry Programs Examined

Institution	Catalogs examined	Pertinent courses	Mean
<u>Alabama</u>			
Auburn Univ.	3	0	0
<u>Arizona</u>			
Arizona State Univ.	3	0	0
Univ. of Arizona	3	0	0
<u>California</u>			
Calif. Inst. of Tech.	4	0	0
UC Berkeley	3	0	0
UC Davis	3	0	0
UC Los Angeles	3	0	0
UC Riverside	1	0	0
UC Santa Barbara	3	0	0
UC Santa Cruz	3	0	0
<u>Colorado</u>			
Univ. of Colorado	4	0	0
Univ. of Northern Colo.	3	0	0
<u>Connecticut</u>			
Univ. of Connecticut	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
Wesleyan Univ.	1	0	0
Yale Univ.	3	0	0
<u>Delaware</u>			
Univ. of Delaware	3	0	0
<u>District of Columbia</u>			
American Univ.	3	0	0
Howard Univ.	3	0	0
<u>Florida</u>			
Florida Atlantic Univ.	1	0	0
Florida State Univ.	1	0	0
Univ. of Florida	3	0	0
<u>Georgia</u>			
Georgia Inst. of Tech.	3	0	0
Georgia State Univ.	3	0	0
Univ. of Georgia	3	0	0
<u>Hawaii</u>			
Univ. of Hawaii, Manoa	3	0	0
<u>Idaho</u>			
Univ. of Idaho	3	0	0
<u>Illinois</u>			
Northern Ill. Univ.	1	0	0
Northwestern Univ.	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
Southern Ill. Univ.	4	0	0
Univ. of Chicago	4	0	0
Univ. of Illinois	3	0	0
U.I., Chicago Circle	3	0	0
<u>Indiana</u>			
Indiana Univ.	3	0	0
Purdue Univ.	1	0	0
<u>Iowa</u>			
Iowa State Univ.	6	0	0
Univ. of Iowa	3	0	0
<u>Kansas</u>			
Univ. of Kansas	3	0	0
<u>Kentucky</u>			
Univ. of Kentucky	3	0	0
<u>Louisiana</u>			
Northeast La. Univ.	1	0	0
<u>Maryland</u>			
Johns Hopkins Univ.	3	0	0
U. Md., College Park	3	0	0
<u>Massachusetts</u>			
Boston College	3	0	0
Boston Univ.	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
Brandeis Univ.	2	0	0
Harvard Univ.	3	0	0
Mass. Inst. of Tech.	4	0	0
Northeastern Univ.	3	0	0
Tufts Univ.	3	0	0
Univ. of Massachusetts	1	0	0
<u>Michigan</u>			
Michigan State Univ.	2	0	0
Univ. of Michigan	4	0	0
Wayne State Univ.	3	0	0
<u>Minnesota</u>			
Moorhead State Univ.	1	0	0
Univ. of Minnesota	6	0	0
<u>Mississippi</u>			
Mississippi State Univ.	3	0	0
Univ. of Mississippi	3	0	0
<u>Missouri</u>			
St. Louis Univ.	3	0	0
U. Mo., Columbia	1	0	0
U. Mo., Kansas City	3	0	0
<u>Montana</u>			
Montana State Univ.	3	0	0
Univ. of Montana	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Nebraska</u>			
Univ. of Neb., Lincoln	1	0	0
<u>New Hampshire</u>			
Dartmouth College	3	0	0
<u>New Jersey</u>			
Princeton Univ.	3	0	0
Rutgers Univ.	3	0	0
Stevens Inst. of Tech.	3	0	0
<u>New York</u>			
CUNY	3	0	0
Columbia Univ.	2	0	0
Cornell Univ.	3	0	0
New York Univ.	2	0	0
Poly. Inst. of New York	4	0	0
Rensselaer Poly. Inst.	1	0	0
St. John's Univ.	3	0	0
SUNY Buffalo	1	0	0
Syracuse Univ.	3	0	0
Univ. of Rochester	3	0	0
<u>North Carolina</u>			
Duke Univ.	2	0	0
N.C. State Univ.	1	0	0
Univ. of N.C.	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>North Dakota</u>			
Univ. of N.D.	1	0	0
<u>Ohio</u>			
Bowling Green St. Univ.	1	0	0
Case W. Res. Univ.	3	0	0
Cleveland State Univ.	3	0	0
Kent State Univ.	3	0	0
Ohio State Univ.	3	0	0
Ohio Univ.	3	0	0
Univ. of Cincinnati	1	0	0
Univ. of Dayton	1	0	0
Univ. of Toledo	3	0	0
<u>Oklahoma</u>			
Oklahoma State Univ.	2	0	0
<u>Oregon</u>			
Oregon Grad. Center	1	0	0
Oregon State Univ.	3	0	0
Univ. of Oregon	3	0	0
<u>Pennsylvania</u>			
Penn. State Univ.	3	0	0
Univ. of Penn.	2	0	0
<u>Rhode Island</u>			
Brown Univ.	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Tennessee</u>			
U. Tenn. at Knoxville	3	0	0
Vanderbilt Univ.	1	0	0
<u>Texas</u>			
Rice Univ.	3	0	0
Texas A&M Univ.	3	0	0
Texas Tech Univ.	3	0	0
U. Texas at Austin	2	0	0
<u>Utah</u>			
Brigham Young Univ.	3	0	0
Univ. of Utah	1	0	0
Utah State Univ.	3	0	0
<u>Vermont</u>			
Univ. of Vermont	3	0	0
<u>Virginia</u>			
Va. Commonwealth Univ.	3	0	0
Va. Poly. Univ.	3	0	0
<u>West Virginia</u>			
West Virginia Univ.	3	0	0
<u>Wisconsin</u>			
Marquette Univ.	3	0	0
Univ. of Wis., Madison	6	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Wyoming</u>			
Univ. of Wyoming	3	0	0

Table F.2.--Psychology Programs Examined

Institution	Catalogs examined	Pertinent courses	Mean
<u>Alabama</u>			
Auburn Univ.	3	0	0
<u>Arizona</u>			
Univ. of Arizona	3	0	0
<u>Arkansas</u>			
Univ. of Arkansas	3	0	0
<u>California</u>			
CSU, Fullerton	3	0	0
Claremont Univ.	3	0	0
Fuller Theol. Seminary	1	0	0
San Jose State Univ.	1	0	0
Stanford Univ.	5	0	0
UC Berkeley	5	0	0
UC Davis	3	0	0
UC Los Angeles	3	0	0
UC Riverside	3	0	0
UC San Diego	3	0	0
UC Santa Barbara	3	0	0
Univ. of S. Calif.	3	0	0
<u>Colorado</u>			
Univ. of Denver	3	0	0
<u>Connecticut</u>			
Univ. of Conn.	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
Yale Univ.	4	0	0
<u>Delaware</u>			
Univ. of Delaware	1	0	0
<u>District of Columbia</u>			
American Univ.	3	0	0
Geo. Washington Univ.	3	0	0
Howard Univ.	3	0	0
<u>Florida</u>			
Florida Atlantic Univ.	1	0	0
Florida State Univ.	1	0	0
Univ. of Florida	3	0	0
Univ. of Miami	3	0	0
<u>Georgia</u>			
Emory Univ.	1	0	0
Ga. Inst. of Tech.	2	0	0
Ga. State Univ.	2	0	0
Univ. of Georgia	3	0	0
<u>Hawaii</u>			
Univ. of Hawaii, Manoa	3	0	0
<u>Idaho</u>			
Univ. of Idaho	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Illinois</u>			
Illinois State Univ.	1	0	0
Northern Ill. Univ.	3	0	0
Northwestern Univ.	3	0	0
Univ. of Chicago	4	0	0
Univ. of Illinois	3	0	0
U.I., Chicago Circle	3	0	0
<u>Indiana</u>			
Ball State Univ.	3	0	0
Butler Univ.	2	0	0
Indiana Univ.	4	0	0
Purdue Univ.	3	0	0
<u>Iowa</u>			
Iowa State Univ.	3	0	0
<u>Kansas</u>			
Kansas State Univ.	3	0	0
<u>Kentucky</u>			
Univ. of Kentucky	3	0	0
Univ. of Louisville	1	0	0
<u>Louisiana</u>			
Louisiana State Univ.	3	0	0
<u>Maine</u>			
Univ. of Maine, Orono	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Maryland</u>			
Johns Hopkins Univ.	1	0	0
U. Md., College Park	1	0	0
<u>Massachusetts</u>			
Brandeis Univ.	1	0	0
Clark Univ.	3	0	0
Harvard Univ.	5	0	0
Mass. Inst. of Tech.	4	0	0
Northeastern Univ.	3	0	0
Univ. of Massachusetts	2	0	0
<u>Michigan</u>			
Michigan State Univ.	3	0	0
Univ. of Detroit	3	0	0
Univ. of Michigan	5	0	0
<u>Minnesota</u>			
Univ. of Minnesota	3	0	0
<u>Mississippi</u>			
Univ. of S. Miss.	3	0	0
<u>Missouri</u>			
St. Louis Univ.	3	0	0
U. Mo., Columbia	5	0	0
U. Mo., Kansas City	1	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Montana</u>			
Montana State Univ.	3	0	0
Univ. of Montana	3	0	0
<u>Nebraska</u>			
Univ. of Neb., Lincoln	3	0	0
<u>New Hampshire</u>			
Dartmouth College	1	0	0
Univ. of N.H.	3	0	0
<u>New Jersey</u>			
Princeton Univ.	4	0	0
Rutgers Univ.	1	0	0
<u>New Mexico</u>			
New Mexico State Univ.	3	0	0
Univ. of New Mexico	3	0	0
<u>New York</u>			
Adelphi Univ.	3	0	0
CUNY	1	0	0
Columbia Univ.	1	0	0
Cornell Univ.	4	0	0
Fordham Univ.	3	0	0
Rensselaer Poly. Inst.	3	0	0
St. John's Univ.	2	0	0
SUNY Albany	3	0	0
SUNY Binghamton	1	0	0

Institution	Catalogs examined	Pertinent courses	Mean
SUNY Buffalo	2	0	0
SUNY Cortland	3	0	0
SUNY Stony Brook	1	0	0
Yeshiva Univ.	2	0	0
<u>North Carolina</u>			
Duke Univ.	1	0	0
Univ. of N.C.	3	0	0
<u>Ohio</u>			
Kent State Univ.	3	0	0
Miami Univ.	3	0	0
Ohio State Univ.	4	0	0
Ohio Univ.	4	0	0
Univ. of Toledo	3	0	0
<u>Oklahoma</u>			
Univ. of Oklahoma	3	0	0
<u>Oregon</u>			
Portland State Univ.	1	0	0
Univ. of Oregon	4	0	0
<u>Pennsylvania</u>			
Carnegie-Mellon Univ.	2	0	0
Lehigh Univ.	3	0	0
Penn. State Univ.	1	0	0
Univ. of Pennsylvania	2	0	0
Univ. of Pittsburgh	1	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Rhode Island</u>			
Univ. of Rhode Island	3	0	0
<u>South Carolina</u>			
Univ. of S. Carolina	3	0	0
<u>Tennessee</u>			
U. Tenn. at Knoxville	3	0	0
Vanderbilt Univ.	1	0	0
<u>Texas</u>			
N. Texas State Univ.	3	0	0
Texas A&M Univ.	3	0	0
Texas Christian Univ.	1	0	0
Texas Tech Univ.	3	0	0
U. Texas at Austin	3	0	0
<u>Utah</u>			
Univ. of Utah	1	0	0
<u>Virginia</u>			
Univ. of Virginia	2	0	0
Va. Poly. Univ.	3	0	0
<u>Washington</u>			
Univ. of Washington	2	0	0
<u>West Virginia</u>			
West Virginia Univ.	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>Wisconsin</u>			
Univ. of Wis., Madison	4	0	0
<u>Wyoming</u>			
Univ. of Wyoming	1	0	0

Table F.3.--Library Science Programs Examined

Institution	Catalogs examined	Pertinent courses	Mean
<u>Arizona</u>			
Univ. of Arizona	1	1	1
<u>California</u>			
UC Berkeley	3	4	1.33
UC Los Angeles	3	11	3.67
Univ. of S. Calif.	2	2	1
<u>Colorado</u>			
Univ. of Denver	3	4	1.33
<u>District of Columbia</u>			
Catholic Univ.	3	2	0.67
<u>Florida</u>			
Florida State Univ.	3	3	1
<u>Georgia</u>			
Emory Univ.	4	4	1
<u>Hawaii</u>			
Univ. of Hawaii, Manoa	3	6	2
<u>Illinois</u>			
Northern Ill. Univ.	3	3	1
Rosary College	1	1	1
Univ. of Chicago	4	4	1
Univ. of Illinois	6	7	1.17

Institution	Catalogs examined	Pertinent courses	Mean
<u>Indiana</u>			
Indiana Univ.	3	6	2
<u>Iowa</u>			
Univ. of Iowa	1	1	1
<u>Kansas</u>			
Emporia State Univ.	2	4	2
<u>Kentucky</u>			
Univ. of Kentucky	3	3	1
<u>Louisiana</u>			
La. State Univ.	3	3	1
<u>Maryland</u>			
U. Md., College Park	1	2	2
<u>Massachusetts</u>			
Simmons College	4	4	1
<u>Michigan</u>			
Univ. of Michigan	3	3	1
Wayne State Univ.	3	3	1
W. Michigan Univ.	3	3	1
<u>Minnesota</u>			
Univ. of Minnesota	3	3	1

Institution	Catalogs examined	Pertinent courses	Mean
<u>Missouri</u>			
U. Mo., Columbia	3	4	1.33
<u>New Jersey</u>			
Rutgers Univ.	3	4	1.33
<u>New York</u>			
Columbia Univ.	3	3	1
Long Island Univ.	1	1	1
SUNY Albany	3	5	1.67
SUNY Buffalo	1	1	1
Syracuse Univ.	3	0	0
<u>North Carolina</u>			
Univ. of N.C.	2	1	0.5
<u>Ohio</u>			
Case W. Res. Univ.	2	2	1
Kent State Univ.	1	1	1
<u>Oklahoma</u>			
Univ. of Oklahoma	2	2	1
<u>Oregon</u>			
Univ. of Oregon	1	1	1
<u>Pennsylvania</u>			
Drexel Univ.	4	0	0
Univ. of Pittsburgh	2	2	1

<u>Institution</u>	<u>Catalogs examined</u>	<u>Pertinent courses</u>	<u>Mean</u>
<u>Rhode Island</u>			
Univ. of Rhode Island	3	3	1
<u>Tennessee</u>			
Geo. Peabody College	3	3	1
U. Tenn. at Knoxville	2	4	2
<u>Texas</u>			
N. Texas State Univ.	3	6	2
U. Texas at Austin	3	1	0.33
<u>Utah</u>			
Brigham Young Univ.	1	1	1
<u>Washington</u>			
Univ. of Washington	3	7	2.33
<u>Wisconsin</u>			
Univ. of Wis., Madison	3	4	1.33

Table F.4.--English and American Literature Programs Examined

Institution	Catalogs examined	Pertinent courses	Mean
<u>California</u>			
Claremont Univ.	3	0	0
Stanford Univ.	2	0	0
UC Berkeley	1	0	0
UC Irvine	1	0	0
UC Los Angeles	4	3	0.75
UC Riverside	3	0	0
<u>Colorado</u>			
Univ. of Colorado	3	0	0
<u>Connecticut</u>			
Connecticut College	2	0	0
Univ. of Connecticut	1	0	0
Yale Univ.	5	0	0
<u>Delaware</u>			
Univ. of Delaware	1	0	0
<u>District of Columbia</u>			
Catholic Univ.	3	3	1
<u>Florida</u>			
Florida State Univ.	4	0	0
<u>Illinois</u>			
Northwestern Univ.	3	0	0
Univ. of Chicago	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
Univ. of Illinois	3	0	0
<u>Indiana</u>			
Indiana Univ.	3	0	0
Purdue Univ.	1	0	0
<u>Iowa</u>			
Univ. of Iowa	1	0	0
<u>Kansas</u>			
Univ. of Kansas	2	2	1
Wichita State Univ.	3	0	0
<u>Maryland</u>			
U. Md., College Park	1	0	0
<u>Massachusetts</u>			
Boston Univ.	1	0	0
Brandeis Univ.	3	0	0
Harvard Univ.	3	0	0
Univ. of Massachusetts	3	0	0
<u>Michigan</u>			
Michigan State Univ.	1	0	0
<u>Minnesota</u>			
Univ. of Minnesota	3	0	0

Institution	Catalogs examined	Pertinent courses	Mean
<u>New Jersey</u>			
Princeton Univ.	4	0	0
<u>New York</u>			
Columbia Univ.	3	0	0
Cornell Univ.	4	0	0
SUNY Buffalo	1	0	0
<u>North Carolina</u>			
Duke Univ.	1	0	0
<u>Ohio</u>			
Bowling Green St. Univ.	3	3	1
Ohio State Univ.	4	0	0
Xavier Univ.	3	0	0
<u>Oklahoma</u>			
Univ. of Tulsa	1	0	0
<u>Pennsylvania</u>			
Penn. State Univ.	3	0	0
Univ. of Pennsylvania	1	0	0
<u>Rhode Island</u>			
Brown Univ.	4	0	0
<u>South Carolina</u>			
Univ. of S. Carolina	1	0	0

<u>Institution</u>	<u>Catalogs examined</u>	<u>Pertinent courses</u>	<u>Mean</u>
<u>Texas</u>			
Baylor Univ.	3	0	0
Sam Houston St. Univ.	3	0	0
Texas A&M Univ.	1	0	0
U. Texas at Austin	3	0	0
 <u>Virginia</u>			
Univ. of Virginia	3	0	0
 <u>Washington</u>			
Univ. of Washington	3	0	0

APPENDIX G
LETTER SENT TO UNIVERSITIES

July 8, 1991

[Name of administrative unit]
[Name of university]
[Address]

Dear Sir or Madam:

I am conducting a study to examine the relationship between the educational backgrounds of randomly selected authors in certain disciplines and their bibliographic citation practices. One aspect of the study involves determining if bibliographic citation practices are mentioned in the catalog descriptions of required graduate courses from a sample of universities offering master's degrees in these disciplines.

Although I have searched the College Catalog Collection published by the National Microfilm Library, I have been unable to find a statement of the courses required for a master's degree granted by your institution in the [range of dates] academic year. If you have this catalog on file, I would greatly appreciate a photocopy of the course requirements for a master's degree in [name of discipline] and a listing of the courses offered. I am willing to reimburse you for the cost of photocopying this information. It would be greatly appreciated if you would reply by Sept. 1, 1991. Thank you for your cooperation.

Sincerely yours,

Catherine Sassen

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