Evidence Based Library and Information Practice

It's What's on the Inside That Counts: Analyzing Student Use of Sources in Composition Research Papers

James W. Rosenzweig, Frank Lambert and Mary C. Thill

Cite this article

Article abstract

Objective – This study is designed to discover what kinds of sources are cited by composition students in the text of their papers and to determine what types of sources are used most frequently. It also examines the relationship of bibliographies to in-text citations to determine whether students "pad" their bibliographies with traditional academic sources not used in the text of their papers.

Methods – The study employs a novel method grounded in multidisciplinary research, which the authors used to tally 1,652 in-text citations from a sample of 71 student papers gathered from English Composition II courses at three universities in the United States. These data were then compared against the papers' bibliographic references, which had previously been categorized using the WHY Method.

Results – The results indicate that students rely primarily on traditional academic and journalistic sources in their writing, but also incorporate a significant and diverse array of other kinds of source material. The findings identify a strong institutional effect on student source use, as well as the average number and type of in-text citations, which demographic characteristics do not explain. Additionally, the study demonstrates that student bibliographies are highly predictive of in-text source selection, and that students do not exhibit a pattern of "padding" bibliographies with academic sources.

Conclusion – The data warrant the conclusions that an understanding of one's own institution is vitally important for effective work with students regarding their source selection, and that close analysis of student bibliographies gives an unexpectedly reliable picture of the types and proportions of sources cited in student writing.

Evidence Based Library and Information Practice

Research Article

It's What's on the Inside That Counts: Analyzing Student Use of Sources in Composition Research Papers

James W. Rosenzweig
Education Librarian
JFK Library
Eastern Washington University
Cheney, Washington, United States of America
Email: jrosenzweig@ewu.edu

Frank Lambert
Assistant Professor & MLS Program Coordinator
College of Education
Middle Tennessee State University
Murfreesboro, Tennessee, United States of America
Email: frank.lambert@mtsu.edu

Mary C. Thill
Humanities Librarian
Ronald Williams Library
Northeastern Illinois University
Chicago, Illinois, United States of America
Email: m-thill@neiu.edu

Abstract

Objective – This study is designed to discover what kinds of sources are cited by composition students in the text of their papers and to determine what types of sources are used most frequently. It also examines the relationship of bibliographies to in-text citations to determine whether students "pad" their bibliographies with traditional academic sources not used in the text of their papers.

Methods – The study employs a novel method grounded in multidisciplinary research, which the authors used to tally 1,652 in-text citations from a sample of 71 student papers gathered from English Composition II courses at three universities in the United States. These data were then compared against the papers' bibliographic references, which had previously been categorized using the WHY Method.

Results – The results indicate that students rely primarily on traditional academic and journalistic sources in their writing, but also incorporate a significant and diverse array of other kinds of source material. The findings identify a strong institutional effect on student source use, as well as the average number and type of in-text citations, which demographic characteristics do not explain. Additionally, the study demonstrates that student bibliographies are highly predictive of in-text source selection, and that students do not exhibit a pattern of "padding" bibliographies with academic sources.

Conclusion – The data warrant the conclusions that an understanding of one's own institution is vitally important for effective work with students regarding their source selection, and that close analysis of student bibliographies gives an unexpectedly reliable picture of the types and proportions of sources cited in student writing.

Introduction

Many librarians may recognize the scenario in which an undergraduate student consults the reference desk shortly before their assignment is due, with a draft paper and bibliography already in hand, looking for a few more articles to reach the quota of peer-reviewed scholarship required by their course instructor. But how common is this scenario, really? And are these articles appearing only as bibliographic window dressing, or are they fully incorporated into the papers' final text?

It is difficult to measure student reliance on a source. When is a student "citing" a source in the text of their paper? As novice researchers are not yet proficient in citation standards, authentic student writing is often messy and imprecise.

Incomplete citations, run-on sentences, and other errors in usage and formatting are abundant. Moreover, student voice is often ambiguous, leaving the reader uncertain about what basis the student is using to make their claims. Given this context, a consistent and accurate method is necessary for tallying in-text citations that is sufficiently flexible to handle the vagaries of student writing.

This study presents a new and rigorous method for counting citations in student writing. This method was applied to actual papers written by composition students, and those data were compared to the picture of student source selection as shown through analysis of those papers' bibliographies using the WHY Method, a research-validated taxonomy designed for the classification of individual sources. This

comparison illuminates whether attention to in-text citations supplies insights that are unavailable from bibliographic analysis, and whether students' bibliographies are reliable indicators of the sources used in the text of their papers.

Background

This study is part of a multi-year, multi-institutional research project investigating student source use in academic writing, which has yielded multiple, previously published journal articles (Lambert et al., 2021; Rosenzweig et al., 2019). The research team is comprised of three librarians, whose collaboration began in 2013. Three public universities from across the United States, designated with the pseudonyms Pacific Coast University (PCU), Midwest State University (MSU), and Southeast University (SEU), provided the most recent collection of student data in 2019. PCU and MSU are Master's level institutions with M1 Carnegie classifications, while SEU is a doctoral-level institution with a D/PU Carnegie classification. The universities were selected through convenience sampling, as we needed to leverage existing relationships with English teaching faculty to gain access to students for recruitment.

We collected research papers from English composition students at all three universities in order to subject them to an initial analysis of their bibliographic references. Once student research papers had been collected and de-identified, the research team analyzed a representative sample of 71 student bibliographies using the WHY Method. The WHY Method, which stands for Who, How, and whY, consists of three facets that are the building blocks of source authority: 1) the credentials of the author or authoring organization as they pertain to the topic of the source; 2) the editorial process that the source underwent; and 3) the source's publication purpose. Each of the three facets is then divided into seven subfacets (see Appendix A for a complete list and description of all subfacets). In combination, each source's three subfacets provide a more nuanced description of the kind of authority that source claims.

For example, a piece in *The Economist* by a professor of political science discussing the history of the filibuster would receive three subfacets. First, as a person holding a postgraduate degree in a field relevant to the subject at hand, the Author Identity is WF (Academic professional). Second, as *The Economist* is edited by professional journalists, the Editorial Process is HE (Editor & editorial staff). Lastly, since *The Economist* is a for-profit publication, receiving both subscription and advertising revenue, the Publication Purpose is YB (Commercial). The source's full classification of WFHEYB can be used to group it with similar sources, and provides insight into what kinds of authorities students trust. These classifications are value-neutral, and do not depend on document format: they represent characteristics that occur in both traditional and non-traditional sources, and therefore are flexible in describing the landscape of source material currently used by university students. Materials for implementing the WHY Method are available freely online (Thill et al., 2021).

The process of coding the sources in student bibliographies took place in 2019 and 2020. We concluded that student source selection in research bibliographies is affected most powerfully by the variables of which institution a student attends, student age, and whether the student is a first-generation university student. Moreover, the two categories most closely associated with library resources, WFHFYF (Academic professional; Peer-reviewed; Higher education) and WEHEYB (Applied professional; Editor & editorial staff; Commercial), account for 55% of all references in student bibliographies across the three universities, while the remaining 45% came from a wide range of sources.

Subsequent to the 2019–2020 study, which was published as a journal article in July 2021 (Lambert et al., 2021), we shifted our attention from student bibliographies to the texts of their final research papers, to see whether bibliographies offer an accurate portrait of student source use, or whether students rely more heavily on some source types over others within the text of their papers.

Literature Review

In seeking to better understand source use in undergraduate research writing, we had already conducted and published previous analyses of bibliographies from final papers submitted in first-year composition courses (Lambert et al., 2021; Rosenzweig et al., 2019) using a three-facet classification method modified from a taxonomy developed by Leeder, Markey, and Yakel (2012). We hoped to uncover an analogous citation tallying method that had been previously published to use as a basis for this present study.

It was immediately evident that the library literature, which is rife with studies examining the contents of student research bibliographies, has relatively few articles explicitly counting and classifying the use of these bibliographic sources in the text of the written assignments themselves. Scharf et al. (2007) addressed the integration of bibliographic sources into the body of the paper, but used a holistic scoring rubric as opposed to a more granular approach. Knight-Davis and Sung (2008) established that in-text citations must be present in a paper to make it eligible for their sample, but they did not analyze these citations directly. A study by Clark and Chinburg in 2010 was the first article published by librarians to both count in-text citations and group them by source type. Their work was an important precursor to our present study, but as their article did not include a rubric describing how they defined an in-text citation for counting purposes, it was not possible to model this study on their approach. Furthermore, Clark and Chinburg grouped their

bibliographic sources by broad categories, rather than classifying them by a more detailed method such as that used in this present study, which allows for more potential insight into the types of sources being used.

Since Clark and Chinburg's study, little further has been done to advance this kind of close analysis of in-text citations in the library literature. Cappello and Miller-Young's (2020) recent article did engage in a serious classification of in-text citations. However, their sample was composed of journal articles produced by highly trained scholars, which had a substantial impact on the methods they used to categorize and analyze the use of sources in that material. For our present study to be grounded on good research practice, it was necessary to look beyond the library literature to other disciplines in order to devise a plan for analyzing in-text citations in papers written by novice researchers in first-year composition courses.

Literacy and language educators have made serious efforts to examine student citation behaviour. In 2010, Ling Shi worked with undergraduates who analyzed their own citation behaviour in their written work. She found that students make decisions about what to cite and when to cite it based on many factors. Shi's (2010) analysis did not, however, attempt to count citations or classify source types, focusing instead on the students' stated rationales for their citation behaviour (p. 21). In their 2017 study, List, Alexander, and Stephens adopted a more quantitative approach by offering undergraduates a curated collection of six sources connected with an assigned question and counting how frequently students cited each source in writing a response to that question. Their work is crucially relevant to this present study for several reasons: In it, they established a simple protocol for tallying both direct and parenthetical citations, and they examined student engagement with both traditional and non-traditional texts (List et al., 2017, pp. 89–91). Although the writing task their

study participants completed was artificial (and their list of sources necessarily limited by the nature of that task), the implication is clear that it is possible to gain insight into student behaviour by counting citations and comparing the use of different types of sources.

One important strand in this literature is the collection of studies published by the researchers working on the Citation Project. The Citation Project is a long-term, multi-institutional project that collects and analyzes cited material in the papers submitted by first-year undergraduates. As Sandra Jamieson (2017a) describes it, "The Citation Project is concerned with the ways students USE [sic] material from the sources they cite" (p. 48). To facilitate this analysis, Citation Project researchers developed coding procedures that included specific instructions about what constituted an in-text citation for their purposes (Jamieson and Howard, 2011). Their criterion for marking a citation was the presence of a "signal phrase identifying the source in some way (author, title, etc.)," a parenthetical citation, or both (Jamieson and Howard, 2011, p. 1). A number of studies followed their coding system, but did not examine either how closely the citations in the text matched the references in the bibliography or what types of sources were most commonly cited in the text (Gocsik et al., 2017; Scheidt et al., 2017).

Jamieson's (2017b) study, however, classified sources from research papers in first-year writing courses into 14 categories that reflected different combinations of format and type of content and examined how often sources from each category appeared in the bibliography and how often sources from each category were cited in the text. Jamieson (2017b), in analyzing those data, concluded that first-year writing students rely largely on traditionally acceptable sources, and that students cite most of their sources only once in their paper's text (pp. 127–128). While Jamieson's work bears many similarities to this present study, the WHY Method's system of source classification is both more objective and

more granular, which may provide added insight into patterns of student source use. Moreover, while Jamieson's (2017b) study commendably drew on a multi-institutional sample, that study's data were gathered from so many different institutions—16 in total—that no statistical comparisons were possible between individual institutions (pp. 117–118), leaving open the question of what insights might be possible from such a comparison. The overall impact of the Citation Project's work is undeniably significant and usefully guides our study to more meaningful levels of analysis.

The other important element from outside of the library literature is linguistic research into the various approaches authors take in referring to sources in their writing. Howard Williams (2010), in addressing the ways authors imply and readers infer source attribution, breaks down attribution into four categories: direct citation, textual phoric devices, free and quasi-free indirect speech, and implicit attribution (pp. 620–622). The first of these categories roughly corresponds to the methods of attribution counted in Jamieson's (2017b) study, and the final two categories are dependent enough on subjective impressions and subtle rhetorical indications that it is difficult for readers to agree regarding whether a given statement was being attributed to an external source (Williams, 2010, pp. 621–624). The second category, however, was of a different kind: The use of phoric devices like pronouns to refer to a source is so consistent that Williams (2010) describes the reader's understanding of attribution as "practically guarantee[d]" (p. 621). Although the example Williams provides in his article is the use of a pronoun, other kinds of noun phrases also ordinarily serve as phoric devices in student writing—phrases such as 'this article' or 'these scholars'—that act as a kind of in-text citation with relative unambiguity. As a result, we concluded that the citation counting procedure described by Jamieson and Howard (2011) could be improved by the inclusion of a thoughtfully constructed standard for tallying phoric devices, in addition to more formal

citations. While Williams (2010) was interested in both anaphoric (referring back to something previously identified) and cataphoric (referring to something not yet identified) devices, to avoid ambiguity we chose to focus solely on anaphoric devices.

Aims

For the present study, our aim was to bridge from student bibliographies into the text of the associated research papers, to see if certain types of sources were more or less prevalent in the body of the paper than their proportion of each bibliography would predict. We developed an approach to facilitate this analysis, grounded in the available literature on accurately counting student in-text citations. If successful, this project would answer the following research questions:

1. What kinds of sources do students in first-year English composition classes view as authoritative, based on how often sources from their bibliographies are cited within their research papers?
2. To what extent do demographic characteristics and institutional differences influence student citation behaviour?

Methods

The study participants are students enrolled in English Composition II, a standard course at institutions across the United States that prepares students to write college-level research papers. English department faculty offer composition courses to students from a variety of intended and declared disciplinary majors. Students of English composition are often in their freshman or sophomore year of university, meeting the ACRL Framework's definition of a "novice learner," in that they are "developing their information literate abilities" (Association of College & Research Libraries, 2016).

After obtaining IRB approval from their respective universities, as well as permissions from supportive teaching faculty at the three universities, members of the research team visited in-person sections of English Composition II in spring of 2019 to enlist student participants. Participants agreed to share the following items with members of the research team: a clean, ungraded copy of their final research paper and bibliography; selected personal information held in the Office of Institutional Research at their university, including their age, their class standing, and their cumulative GPA; and a completed survey with additional demographic questions about gender, race/ethnicity, and first-generation status. We collected 239 English composition papers from 32 sections from all universities: 167 papers from 17 sections at PCU, 53 papers from 10 sections at MSU, and 19 papers from 5 sections at SEU.

In fall of 2020, the research team began our examination of student in-text citations. We planned to count each time a student cited a source from the bibliography in the course of their research paper in order to determine which sources students might view as the most authoritative. In conducting this new study, we used the same systematic sample of references obtained from 71 student papers whose bibliographies had been previously analysed using the WHY Method so that we could track what types of sources were cited most frequently in the text. By institution, PCU contributed 35 papers and 954 of the citations in our sample, MSU contributed 19 papers and 518 citations, and SEU contributed 17 papers and 179 citations. Developing a reliable method for counting student references, given the irregularities in the writing and citation practices of novice learners, was a first objective of this analysis. We considered employing the method used by Jamieson and Howard (2011) of tallying parenthetical citations and direct mentions of sources in the text but were concerned that some source use would go unrecorded, given the variations in how

students approach written argument. The use of anaphoric phrasing to refer to sources, as described by Williams (2010), was frequent enough in the sample that a more comprehensive model for citation counting was necessary.

Ultimately, we created a flowchart and guidelines that combined the Jamieson/Howard and Williams approaches (Appendix B). The tallying method captures three different kinds of in-text citations: direct, parenthetical, and anaphoric. In direct citations, students reference a source from their bibliography by providing some piece of identifying information (such as the source's author, authoring organization, title, or publisher) within the text of a sentence. In parenthetical citations, students provide identifying information within parentheses at the end of a sentence. In anaphoric citations, students use personal pronouns or noun phrases to refer to a source already cited (directly or parenthetically) in that paragraph. When a student used both direct and parenthetical conventions to reference the same source within a single sentence, we tallied that sentence as a single, direct citation. When a student used either a direct or a parenthetical convention in addition to an anaphoric device in one sentence, we tallied that sentence as either direct or parenthetical and did not tally it as anaphoric.

Following the established flowchart, two members of the research team jointly counted the number of times each source from a student's bibliography was cited within the student's research paper. The third member of the research team tallied in-text citations from a systematic sample of 10% of the papers in our overall sample to validate the counting method. The third member matched the counts of the two research team members for 96.14% of all citations, 97.6% of direct citations, 97.08% of parenthetical citations, and 73.9% of anaphoric citations. These high rates of agreement demonstrate the rigorous method we developed to classify these citations, while indicating the greater challenge of determining what

constitutes an anaphoric citation. We also tracked sources from student bibliographies that never appear within the text of the papers. This study refers to this phenomenon as "ghost sources"—sources whose presence in the paper is ephemeral and potentially misleading.

The citation count data analysed here is novel, but the demographic characteristics of the student authors are necessarily the same as those reported in the previous bibliographic analysis study (Lambert et al., 2021). For that reason, detailed demographic information is already available in our previously published research, but key characteristics are repeated here for the convenience of the reader. The mean average age of our sample population was 20.33 years old. The majority of student participants described themselves as female (70%) with a freshman class standing (73.1%). Sophomores comprised 19.1% of the study's sample, with juniors and seniors making up the small remainder. Forty percent of participants self-identified as first-generation students. The self-reported racial/ethnic origins for students in this sample were 59.4% White, 18.8% Hispanic, and 10.1% Asian (with biracial, Black, and Pacific Islanders comprising the remaining 11.6% of the sample).

Findings

This study presents descriptive and inferential statistical findings of the citing characteristics and behaviours of the sample population.

Overall, there was a mean of 2.69 citations (SD = 2.515) per bibliographic source in our sample. A plurality of these citations were parenthetical citations (mean = 1.18, SD = 1.361), followed by direct citations (mean = 1.17, SD = 1.641), and then anaphoric citations (mean = 0.34, SD = 3.328). In all cases, these data had a positive skew in excess of 2.479, with phoric citations having the greatest skew (3.328) due to two or three outliers. As with most citation data, our data's distributions match the distribution of a power curve (Brzezinski, 2015). The team's

Table 1

Number of Citations Per Paper, by Type, and by Institution

	Mean, All Citations/Source	Mean, Direct Citations/Source	Mean, Parenthetical Citations/Source	Mean, Phoric Citations/Source
PCU	3.49	1.67	1.27	0.57
MSU	2.09	1.45	0.37	0.27
SEU	2.03	0.55	1.36	0.12

hypothesis that these data are non-normally distributed is confirmed by the use of a single-sample Komogorov-Smirnov (KS) test on all citations and on each citation type. Each of these four variables (total citations; direct citations; parenthetical citations; and anaphoric citations) have distributions that match a Poisson distribution (Z = 4.136; 2.332; 3.718; and 1.722, respectively, p < 0.001). Based on these large numbers of variability and skew, using non-parametric inferential statistical tests that focus on the median as the measure of central tendency will result in more accurate calculations of the test statistic.

A Mann–Whitney independent samples test, which compares the mean rank of two separate ordinal or non-normally distributed distributions, reveals that the student's gender predicts certain citation behaviours. Overall, females were significantly more likely than males to cite their sources (Z = -1.964, p = 0.05) and to use parenthetical citations (Z = -2.4, p < 0.01).

The types of citations vary considerably between universities, as may be seen in Table 1. A Kruskal–Wallis test, which compares three or more independent variables all at once, thus increasing the power of the test result, reveals significant differences between institutions for all citations (PCU papers having significantly more on average; H = 46.476, p < 0.001) and direct citations (PCU having considerably more direct citations on average per paper; H = 24.084, p < 0.001).

The writer's first-generation status has a significant impact on the number of anaphoric citations found in each paper, with non-first-generation students using anaphoric citations far more than first-generation students (Z = -2.586, p < 0.05). Student class (freshman, sophomore, junior, and senior) is predictive of the type of citation used in their papers. A Kruskal-Wallis test reveals there were significant differences in all citations (H = 8.410, p < 0.05), direct citations (H = 6.777, p < 0.05), and parenthetical citations (H = 15.836, p < 0.01) based on the respective student's class. In all citations, freshmen and sophomores had considerably more citations in their papers compared to juniors and seniors (with the caveat that upperclassmen comprised only 7.1% of our sample). Juniors used significantly more direct citations than either freshmen or sophomores. Sophomores, juniors, and seniors used significantly more parenthetical citations than did freshmen.

The complete citation count data (as seen in Appendix C) show that approximately 75% of all in-text citations are represented by just eight source types, consistent with the bibliographic reference data from our previous study (Lambert et al., 2021). A substantial plurality of citations came from WFHFYF (Academic professional; Peer-reviewed; Higher education) sources. When we analyzed source use separately by university, however, each institution's data diverge significantly from the overall pattern. For example, at PCU, 61.2% of cited resources were classified as WFHFYF (Academic professional; Peer-reviewed; Higher

Table 2
Pacific Coast University's (PCU's) Eight Most Frequently Occurring Citation Types

Citation Type	Frequency	Percent	Cumulative Percent
WFHFYF	584	61.2	61.2
WEHEYB	51	5.3	66.6
WEHFYF	40	4.2	70.8
WEHEYF	29	3.0	73.8
WFHEYF	27	2.8	76.6
WFHEYC	20	2.1	78.7
WBHEYB	17	1.8	80.5
WFHDYF	17	1.8	82.3

Table 3
Southeast University's (SEU's) Eight Most Frequently Occurring Citation Types

Citation Type	Frequency	Percent	Cumulative Percent
WFHFYF	40	22.3	22.3
WEHEYB	24	13.4	35.8
WFHEYB	19	10.6	46.4
WBHEYB	14	7.8	54.2
WBHEYC	14	7.8	62.0
WCHAYC	10	5.6	67.6
WFHEYF	8	4.5	72.1
WFHEYD	6	3.4	75.4

Table 4
Midwest State University's (MSU's) Eight Most Frequently Occurring Citation Types

Citation Type	Frequency	Percent	Cumulative Percent
WFHFYF	134	25.8	25.8
WEHEYB	117	22.5	48.4
WBHEYB	44	8.5	56.8
WCHAYE	28	5.4	62.2
WEHEYC	22	4.2	66.5
WFHDYC	14	2.7	69.2
WCHAYC	13	2.5	71.7
WFHEYB	13	2.5	74.2

education). At the other two universities, students use these types of resources far less. SEU students cited WFHFYF sources 22.3% of the time, whereas MSU students cited this same resource type 25.8% of the time. Each individual university's top eight most cited source types are presented in Tables 2–4.

Table 5 documents the sources listed in the bibliographies that were never cited in the text,

grouped by source type. The research team calls these sources "ghost sources" due to their evanescent presence in the students' papers. The research team identified exactly 100 ghost sources, which comprised 14% of the 712 bibliographic references in the sample, with the largest proportion being WFHFYF (Academic professional; Peer-reviewed; Higher education) sources.

Table 5
Facet Combination in Bibliographies, Not Cited in Papers, Most Frequent to Least Frequent

| Facet Combination	Facet Translation	Number of Occurrences
WFHFYF	Academic professional; Peer-reviewed; Higher education	47
WEHEYB	Applied professional; Editor & editorial staff; Commercial	16
WFHEYB	Academic professional; Editor & editorial staff; Commercial	5
WCHAYC	Corporate author; Self-published; Nonprofit	4
WFHEYF	Academic professional; Editor & editorial staff; Higher education	3
WZHAYF	Source unknown; Self-published; Higher education	3
WFHDYC	Academic professional; Moderated submission; Nonprofit	3
WEHEYC	Applied professional; Editor & editorial staff; Nonprofit	3
WBHEYB	Layperson; Editor & editorial staff; Commercial	2
WZHZYZ	All sources unknown	1
WFHEYC	Academic professional; Editor & editorial staff; Nonprofit	1
WFHDYE	Academic professional; Moderated submission; Government	1
WEHFYF	Applied professional; Peer reviewed; Higher education	1
WEHEYF	Applied professional; Editor & editorial staff; Higher education	1
WDHEYC	Professional amateur; Editor & editorial staff; Nonprofit	1
WCHFYF	Corporate authorship; Peer reviewed; Higher education	1
WCHEYC	Corporate authorship; Editor & editorial staff; Nonprofit	1
WCHEYB	Corporate authorship; Editor & editorial staff; Commercial	1
WBHFYF	Layperson; Peer reviewed; Higher education	1
WBHDYF	Layperson; Moderated submission; Higher education	1
WBHAYF	Layperson; Self-published; Higher education	1
WAHCYC	Unknown authorship; Collaborative editing; Non-profit	1
WAHAYB	Unknown authorship; Self-published; Commercial	1
Total		100
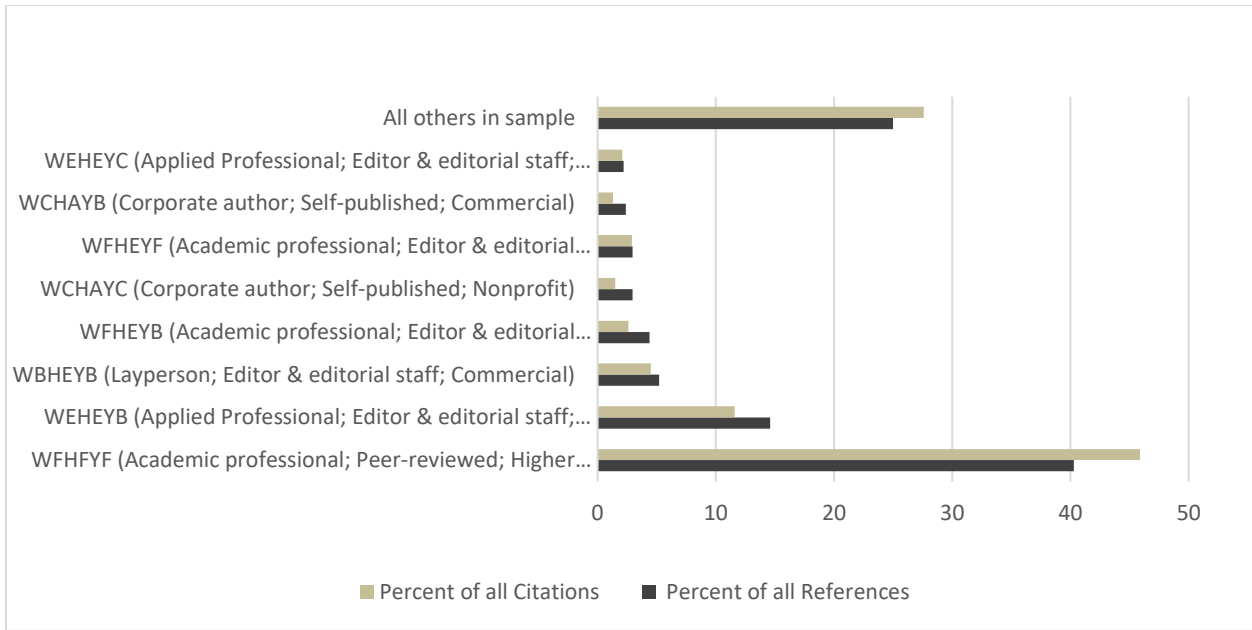
Figure 1
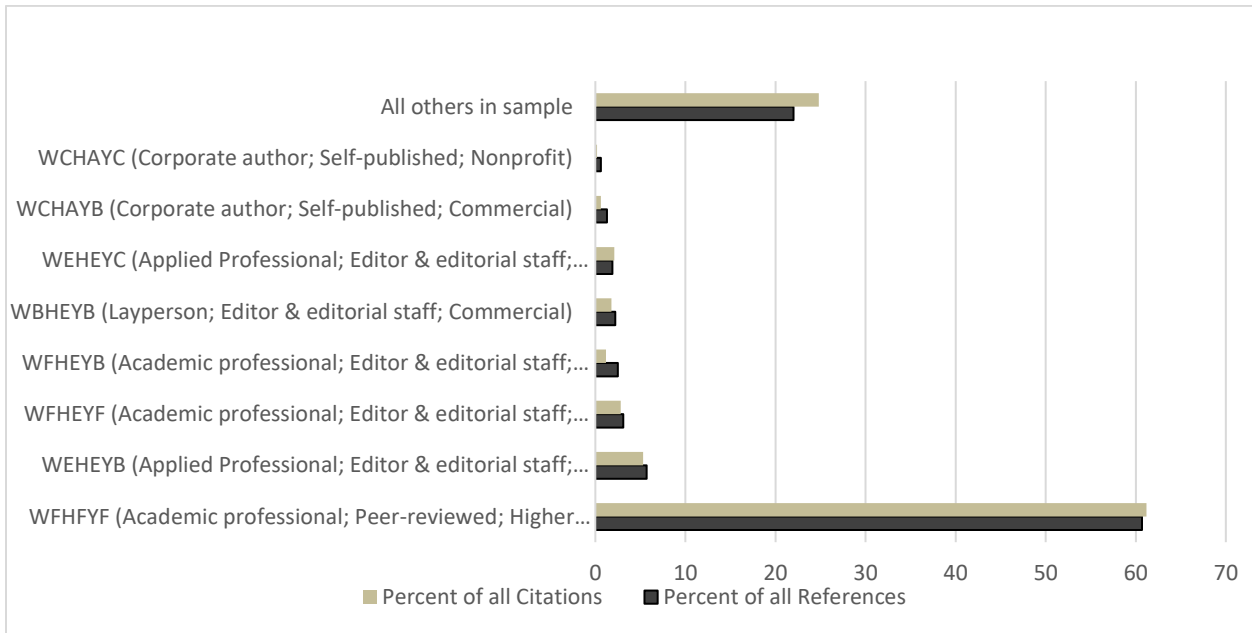All universities, percent of all citations and percent of all references compared.

Figure 2
Pacific Coast University (PCU), percent of all citations and percent of all references compared.
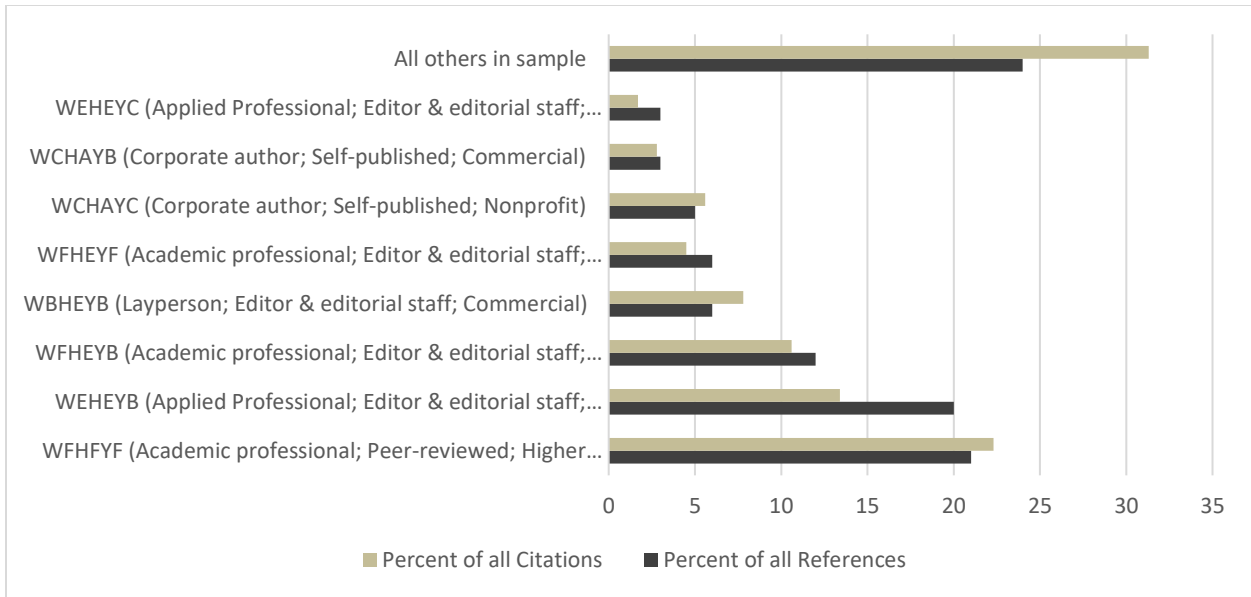
Figure 3
Southeast University (SEU), percent of all citations and percent of all references compared.
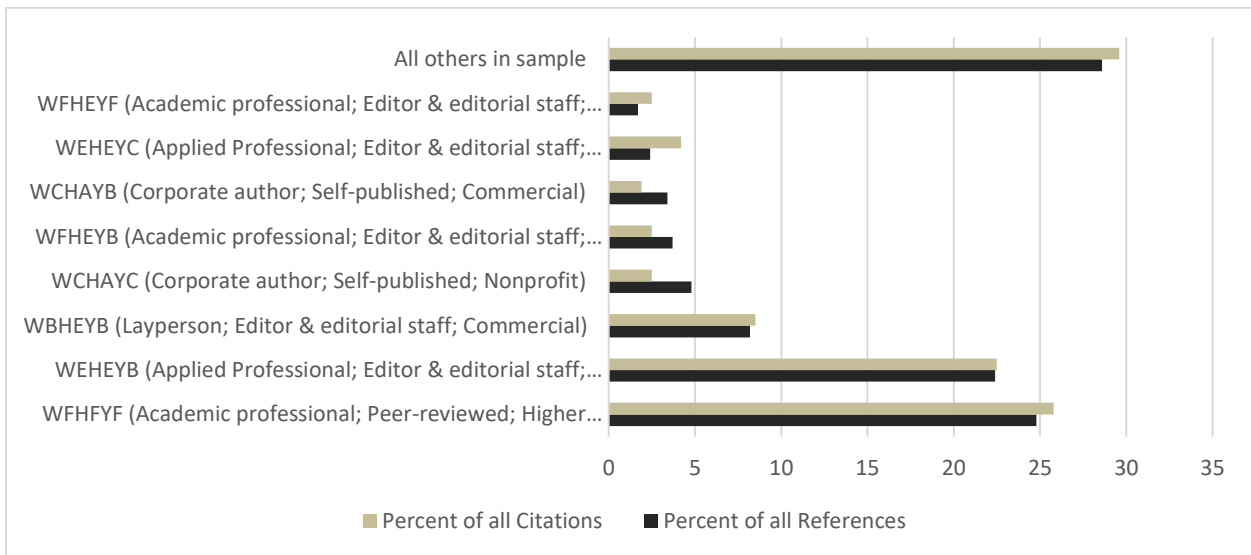
Figure 4
Midwest State University (MSU), percent of all citations and percent of all references compared.

Lastly, the four bar charts (Figures 1–4) display the eight source types appearing most frequently in the student bibliographies, along with a category for all other types. The light bar represents the percentage of all in-text citations for that source type; the dark bar represents the percentage of all bibliographic references for that source type. As is evident in each chart, at both the aggregate and individual university level, there was considerable consistency between reference and citation data.

Discussion

Given that the study's citation counting method was novel (though grounded in literature from other disciplines), it was encouraging to see the very high rates of interrater agreement for total citations, direct citations, and parenthetical citations. These data bolster our confidence in our method and suggest that it has potential for use in subsequent research in librarianship. While the interrater agreement regarding anaphoric citations lagged behind the other citation types, it nevertheless reached an acceptable level for analysis. Anaphoric citations are, by their very nature, more subject to interpretation than the other kinds of citation measured. We suspect that there will always be a higher level of variation between raters in tallying anaphoric citations, but the successful rate of agreement realized in this initial use of the citation counting method is a good indication that these anaphoric citations can be analyzed meaningfully.

While demographic characteristics such as gender, class level, and first-generation status show modest impacts on certain elements of student citation behaviour, the institution the student attends was the factor with the broadest range of impact, affecting every student citation behaviour we recorded. Each institution's students favoured different source types in their in-text citations. For instance, sources by non-professional authors in professionally edited commercial publications (WBHEYB) made up 8.5% of MSU's citations and 7.8% of SEU's citations, while only 1.8% of PCU's citations fell into this category. Many of these institutional dissimilarities were already evident in the papers' bibliographies (Lambert et al., 2021), but they are even more pronounced in the findings presented here. With no clear demographic explanation for these divergences, a reasonable explanation lies in elements of institutional culture and pedagogy, such as required textbooks or Carnegie classification, which are beyond the scope of this study. To be effective in supporting students, librarians must arrive at a

deeper understanding of how sources are actually used in academic writing at their own institution. This may involve analysis of student work, as in this study, and it may also require engagement with classroom instructors or program administrators.

There were other institutional patterns in the citation data, as well: PCU students cited each source notably more often, on average, than either MSU or SEU students did. Furthermore, while MSU and SEU students had a nearly identical mean average number of citations per source, the underlying citation behaviour showed a wide divergence. SEU students largely relied on parenthetical citations, which MSU students used only sparingly, and an inverse pattern is evident with direct citations. We had not anticipated these inter-institutional variances, and believe that it is possible the different approaches to in-text citations may be indicative of differing relationships between students and source texts at each institution. Our feeling is that it is likely no accident that PCU, the university whose students cited by far the most traditional academic sources, is also the university whose students cite their work most extensively in the text, and that the same underlying factors causing one behaviour may cause the other. But we remain curious about the less explicable differences between the behaviours exhibited at MSU and SEU, and wonder if institutional culture and pedagogy alone could be responsible for establishing highly dissimilar expectations for citation practices.

In spite of the profound effect of institution on source selection, this study reveals that students, regardless of institution, do broadly share some general attitudes about source authority. Most notably, they rely heavily on those sources traditionally recommended by librarians and composition instructors, namely peer-reviewed journal articles by academic professionals (WFHFYF) and professionally edited work for commercial publications by journalists or other skilled professionals (WEHEYB), which

comprise 57.5% of all in-text citations (as seen in Appendix C). In an era when many express fears that young people are susceptible to "fake news," these data indicate that college students remain reliant on sources that have long been trusted within the academy. While this finding may reassure those who value these traditional expectations, it is not clear from the data that this reliance on dense, scholarly material in particular is well-advised for the level of argument employed by composition students, particularly given available reports on literacy levels for American high school graduates (Goodman et al., 2013; Kutner et al., 2006). It is also unclear whether students are learning to select WFHFYF sources in compliance with an obligation demanded by instructors, or whether they are savvy consumers of information who recognize when these highly-credentialed sources are most appropriate.

These citation data reveal a larger information literacy challenge in the less traditional materials appearing in student papers across all three institutions. The 42.5% of in-text citations that do not refer to WFHFYF or WEHEYB sources encompass a total of 54 other source types, including works by untrained or anonymous authors, articles edited by people who lack journalistic experience, and even personal blogs. We want to emphasize that authoritative knowledge is disseminated in more settings than peer-reviewed journals; podcasts, Twitter feeds, and video essays (to name a few examples) are all appropriate media through which to share knowledge in the 21st century. Composition papers encompass such a range of subjects and questions that none of this non-traditional material can be automatically ruled out as inappropriate. But have students been equipped to assess the credibility of this array of sources? What expectations do librarians and instructors have—or should they have—about non-traditional material? The Framework for Information Literacy charges librarians not only with promoting the high-quality traditional sources available through our subscriptions, but also with preparing students

to navigate an increasingly complex information environment online (Association of College & Research Libraries, 2016). The WHY Method illuminates the salient characteristics of the diverse array of material being used by students in their papers. Librarians and instructors are therefore strongly encouraged to leverage the WHY Method and its clear, consistent terminology in their teaching to make students more critically aware of the building blocks of source authority (Thill et al., 2021).

The most surprising conclusions in the data came from the relationships we discovered between student bibliographies and student citation behaviour. Based on our anecdotal experiences working with students, we had expected to see that students relied on some types of sources disproportionately in the text of their papers, citing those source types far more often than their presence in the bibliography had suggested. Instead, we found that the proportions for each source type in the student bibliographies were excellent predictors of how often each source type would be cited in the text. Similarly, we had expected that composition students would "pad" their bibliographies with traditional materials such as peer-reviewed journal articles and journalistic pieces in order to please professors or meet minimum assignment requirements but would fail to cite these sources in the text. Instead, when we reviewed the ghost sources appearing in the bibliography but not the text, we found no evident pattern: The ghosts comprised a wide array of bibliographic sources that proportionally resembled the source types in the bibliographies as a whole. These discoveries lead us to a single overarching conclusion: that students do not make the kind of secondary judgments about source use that we had anticipated. The decision to include a source in their bibliography and the decision to cite a source in the text are a single choice. Therefore, although our analysis of student in-text citations did yield useful insights, it also suggests that future studies can rely principally on bibliographic analysis, since the contents of

those bibliographies will be a good indicator of what students employ in the text.

Limitations and Future Research

While this study produced clear answers to its research questions, there remain several potentially interesting avenues for future research inquiry. The richest area for investigation is the evident institutional effect on student source selection and use. The data collected by this study do not indicate any demographic trends that would explain these differences. The explanation may lie in student demographic differences unexplored by this study, or it may more likely lie in institutional decisions made by instructors or administrators, whether explicit or implicit. Future research will either need to collect additional student demographic data, perhaps using qualitative approaches like interviews or focus groups, or else collect documentation of instructor and administrator expectations, which may reside in syllabi, assignment descriptions, or departmental or programmatic guidelines. These same data might also yield insights into the unusual divergences between institutions in the average number of in-text citations per source and the types of citation that are most prevalent at each university.

There are in fact two types of "ghost sources" — this study addressed just one type, what the authors call "downstairs ghosts," which are sources appearing in the bibliography but uncited in the text. It leaves as yet unaddressed the other type, the "upstairs ghosts," which are sources cited in the text yet absent from the bibliography: Exploring and analyzing this phenomenon requires that these source materials be sought out, to the extent that they can be found using the student's in-text citation information, and therefore that research would take time.

Because the institutions providing data for this study are broadly similar as public universities described by the Carnegie classifications of

D/PU (Doctoral/Professional Universities) or M1 (Master's Colleges & Universities - Larger programs), it might be revealing to repeat this study using data from a major research university classified as R1 (Doctoral Universities - Very high research activity) or from a smaller institution, such as a Baccalaureate College or Associate's College. These data might show even starker differences between institutions or uncover cases in which student citation and bibliographic reference data are not as closely linked as they are in this study.

Conclusion

We embarked on this study after a multi-year focus on bibliographic analysis, curious to see how observing and understanding in-text citation behaviour would add to our understanding of student ideas about source authority. What we found helped to broaden our understanding of student relationships to sources, as well as to reaffirm the insights gained from bibliographic analysis. The citation counting method was effective and showed high rates of agreement. The data indicate that the institution variable has a more pervasive relationship to citation behaviour, both in what source types are cited in the text and how they are cited, than any other demographic factors we collected. Furthermore, across all three universities, students cited sources in direct proportion to each source type's presence in their bibliographies. This conclusion dispels the notion that procrastinating students might select scholarly sources strictly to impress their writing instructor and with no intention of incorporating the source into their final paper. Likewise, it indicates that, if poor quality resources appear in a student's bibliography, these resources are as likely to be cited as more credible materials. The fundamental takeaways are that an understanding of one's own institution is vitally important for effective work with students regarding their source selection, and that attention to student bibliographies gives a reliable picture of the landscape of sources used in student writing. Given these

realities, librarians and composition instructors are advised to conduct bibliographic analysis of student work using the WHY Method as an expeditious measure of the types and proportions of sources trusted by student writers, and to do so, whenever possible, by gathering data from multiple institutions for comparison.

Author Contributions

James Rosenzweig: Conceptualization, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Frank Lambert:** Conceptualization, Formal analysis, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Mary Thill:** Conceptualization, Investigation, Methodology, Writing – original draft, Writing – review & editing.

References

Association of College & Research Libraries. (2016). *Framework for information literacy for higher education*. https://www.ala.org/acrl/standards/ilframework

Brzezinski, M. (2015). Power laws in citation distributions: Evidence from Scopus. *Scientometrics, 103*, 213–228. https://doi.org/10.1007/s11192-014-1524-z

Cappello, A., & Miller-Young, J. (2020). Who are we citing and how? A SoTL citation analysis. *Teaching & Learning Inquiry, 8*(2), 3–16. https://doi.org/10.20343/teachlearninqu.8.2.2

Clark, S., & Chinburg, S. (2010). Research performance in undergraduates receiving face to face versus online library instruction: A citation analysis. *Journal of Library Administration, 50*(5–6), 530–542. https://doi.org/10.1080/01930826.2010.488599

Gocsik, K., Braunstein, L. R., & Tobery, C. E. (2017). Approximating the university: The information literacy practices of novice researchers. In B. J. D'Angelo, S. Jamieson, B. Maid, & J. R. Walker (Eds.), *Information literacy: Research and collaboration across disciplines* (pp. 163–184). University Press of Colorado. https://doi.org/10.37514/PER-B.2016.0834.2.08

Goodman, M., Finnegan, R., Mohadjer, L., Krenzke, T., & Hogan, J. (2013). *Literacy, numeracy, and problem solving in technology-rich environments among U.S. adults: Results from the Program for the International Assessment of Adult Competencies 2012. First Look* (NCES 2014-008). National Center for Education Statistics. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014008

Jamieson, S. (2017a). The evolution of the Citation Project: Developing a pilot study from local to translocal. In T. Serviss & S. Jamieson (Eds.), *Points of departure: Rethinking student source use and writing studies research methods* (pp. 33–61). Utah State University Press. https://doi.org/10.7330/9781607326250.c001

Jamieson, S. (2017b). What the Citation Project tells us about information literacy in college composition. In B. J. D'Angelo, S. Jamieson, B. Maid, & J. R. Walker (Eds*.*), *Information literacy: Research and collaboration across disciplines* (pp. 115–138). University Press of Colorado. https://doi.org/10.37514/PER-B.2016.0834.2.06

Jamieson, S., & Howard, R. M. (2011). *Procedures for source coders*. The Citation Project. http://www.citationproject.net/wp-content/uploads/2018/04/SOURCE-CODE-PROCEDURES-2011.pdf

Knight-Davis, S., & Sung, J. S. (2008). Analysis of citations in undergraduate papers. *College & Research Libraries, 69*(5), 447–458. https://doi.org/10.5860/crl.69.5.447

Kutner, M., Greenberg, E., & Baer, J. (2006). *A first look at the literacy of America's adults in the 21st century* (NCES 2006-470). National Center for Education Statistics. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2006470

Lambert, F., Thill, M., & Rosenzweig, J. W. (2021). Making sense of student source selection: Using the WHY Method to analyze authority in student research bibliographies. *College & Research Libraries, 82*(5), 642–661. https://doi.org/10.5860/crl.82.5.642

Leeder, C., Markey, K., & Yakel, E. (2012). A faceted taxonomy for rating student bibliographies in an online information literacy game. *College & Research Libraries, 73*(2), 115–133. https://doi.org/10.5860/crl-223

List, A., Alexander, P. A., & Stephens, L. A. (2017). Trust but verify: Examining the association between students' sourcing behaviors and ratings of text trustworthiness. *Discourse Processes, 54*(2), 83–104. https://doi.org/10.1080/0163853X.2016.1174654

Rosenzweig, J. W., Thill, M., & Lambert, F. (2019). Student constructions of authority in the Framework era: A bibliometric pilot study using a faceted taxonomy. *College & Research Libraries, 80*(3), 401–420. https://doi.org/10.5860/crl.80.3.401

Scharf, D., Elliot, N., Huey, H. A., Briller, V., & Joshi, K. (2007). Direct assessment of information literacy using writing portfolios. *The Journal of Academic Librarianship, 33*(4), 462–477. https://doi.org/10.1016/j.acalib.2007.03.005

Scheidt, D., Carpenter, W., Fitzgerald, R., Kozma, C., Middleton, H., & Shields, K. (2017). Writing information literacy in first-year composition: A collaboration among faculty and librarians. In B. J. D'Angelo, S. Jamieson, B. Maid, & J. R. Walker (Eds.), *Information literacy: Research and collaboration across disciplines* (pp. 211–233). University Press of Colorado. https://doi.org/10.37514/PER-B.2016.0834.2.08

Shi, L. (2010). Textual appropriation and citing behaviors of university undergraduates. *Applied Linguistics, 31*(1), 1–24. https://doi.org/10.1093/applin/amn045

Thill, M., Lambert, F., & Rosenzweig, J. (2021, July 23). *The WHY Method: An updated approach to source evaluation*. Eastern Washington University Libraries. https://research.ewu.edu/thewhymethod

Williams, H. (2010). Implicit attribution. *Journal of Pragmatics, 42*(3), 617–636. https://doi.org/10.1016/j.pragma.2009.07.013

Appendix A
WHY Attribute Codes for Coding Paper References

Resources related to this study, including the full coding taxonomy that includes scope notes, may be found at the following online libguide: https://research.ewu.edu/thewhymethod

Author (Who) Identity Attribute

Author Identity Category	Brief Description
WA: Unknown Authorship	No identification is possible.
WB: Layman	A person without demonstrated expertise in the area being written about
WC: Corporate Authorship	No single author identified on a work issued by an organization
WD: Professional Amateur	A person with a degree in another field, but demonstrating interest, dedication, and experience in the area being written about
WE: Applied Professional	A person with relevant experience, training or credentials relevant to the area being written about (i.e., journalist with journalism degree OR substantive professional experience)
WF: Academic Professional	A person with a Master's or Doctoral degree in the area being written about, which they held at the time the content was published.
WZ: Source Unknown	No information on the category could be found

Editorial (How) Process Attribute

Editorial Process Category	Brief Description
HA: Self-Published	Material made public directly by the author
HB: Vanity Press	Material the author paid to publish, generally as self-promotion
HC: Collaborative Editing	Material that is reviewed or edited by multiple possibly anonymous collaborators
HD: Moderated Submissions	Contributed content that has been accepted or approved by someone other than the author
HE: Editor and Editorial Staff	Professionally reviewed and approved by editor/editorial staff
HF: Peer Reviewed	Evaluated by members of the scholarly community before acceptance and publication
HZ: Source Unknown	No information on the category could be found

Publication (wh<u>Y</u>) Purpose Attribute

Publication Purpose Category	Brief Description
YA: Personal	Material is published without commercial aims
YB: Commercial	Material is published for commercial gain
YC: Non-Profit	Material is published by a non-profit organization
YD: K-12 Education	Material is published for educational purposes
YE: Government	Material is published by the government
YF: Higher Education	Material is published for an academic audience
YZ: Source Unknown	No information on the category could be found

Appendix B
Citation Counting Method Flowchart

Tallying Citations: Does the reference count?

Start Here:

1. Is this a "sentence"?
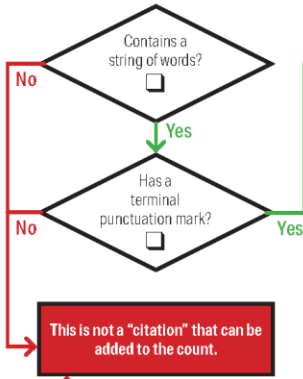
2. Does the "sentence" directly reference a source from the bibliography?

Contains a string of words?
☐
No
Yes

Names the author(s) of a source?
☐
No
Yes

Has a terminal punctuation mark?
☐
No
Yes

Uses any part of an authoring organization's name?
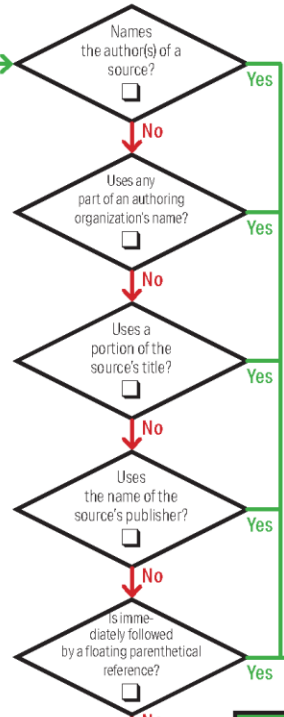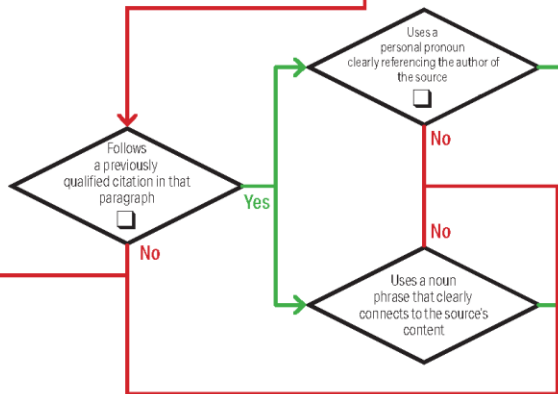☐
No
Yes

This is not a "citation" that can be added to the count.

Uses a portion of the source's title?
☐
No
Yes

Uses the name of the source's publisher?
☐
No
Yes

Is immediately followed by a floating parenthetical reference?
☐
No
Yes

3. Does the "sentence" use an anaphoric device to reference a source?

This is a "citation" to be added to the count, once for each source referenced.

Uses a personal pronoun clearly referencing the author of the source
☐
No
Yes

Follows a previously qualified citation in that paragraph
☐
No
Yes

Uses a noun phrase that clearly connects to the source's content
☐
No
Yes

Glossary and Notes

Authoring organization: A corporate author, named in either the bibliographic citation or the text of the paper.

Floating parenthetical reference: A source's author, authoring organization, title, or publisher is named within parentheses immediately following a sentence.

Anaphoric device: A part of speech or phrase that clearly identifies an antecedent, in this case, a previously cited source (e.g., pronouns, noun phrases clearly meant to stand in for the source)

Noun phrase: A group of two or more words that is headed by a noun (person, place, or thing) and includes modifiers (e.g., this article, these data) and for which the source title can be substituted with the sentence meaning being unchanged (e.g., from "The book further argues…" to "Principles of American Government further argues…").

Terminal punctuation: The period, the question mark, the exclamation point, and the interrobang provide terminal punctuation. When there is confusion about whether a period is used for a full stop or for an abbreviation, the period will not count as terminal punctuation.

Method developed by J. Rosenzweig, M. Thill, and F. Lambert; CC BY-NC-SA 2021

Appendix C
Frequency of All Citations from All Universities' English Composition Classes

Citation Type	Frequency	Percent	Cumulative Percent
WFHFYF	758	45.9	45.9
WEHEYB	192	11.6	57.5
WBHEYB	75	4.5	62.0
WFHEYF	48	2.9	65.0
WEHFYF	43	2.6	67.6
WFHEYB	43	2.6	70.2
WCHAYE	40	2.4	72.6
WEHEYC	34	2.1	74.6
WEHEYF	34	2.1	76.7
WFHEYC	32	1.9	78.6
WFHDYC	30	1.8	80.4
WBHEYC	26	1.6	82.0
WCHAYC	25	1.5	83.5
WFHDYF	25	1.5	85.0
WCHAYB	21	1.3	86.3
WBHFYF	18	1.1	87.4
WBHDYB	16	1.0	88.4
WAHFYF	14	.8	89.2
WBHDYF	14	.8	90.1
WCHAYF	12	.7	90.8
WDHEYB	11	.7	91.5
WBHAYF	10	.6	92.1
WCHEYB	10	.6	92.7
WCHEYC	9	.5	93.2
WFHDYE	9	.5	93.8
WBHAYA	8	.5	94.2
WDHFYF	8	.5	94.7
WBHAYB	6	.4	95.1
WFHEYD	6	.4	95.5
WBHEYF	5	.3	95.8
WCHEYF	5	.3	96.1
WEHDYC	5	.3	96.4

Citation Type	Frequency	Percent	Cumulative Percent
WEHEYD	5	.3	96.7
WCHDYB	4	.2	96.9
WCHEYD	4	.2	97.2
WDHEYD	4	.2	97.4
WFHDYB	4	.2	97.6
WZHEYB	4	.2	97.9
WZHZYZ	4	.2	98.1
WBHEYA	3	.2	98.3
WDHDYC	3	.2	98.5
WEHAYB	3	.2	98.7
WFHAYB	3	.2	98.8
WAHDYB	2	.1	99.0
WAHDYF	2	.1	99.1
WCHFYF	2	.1	99.2
WEHAYA	2	.1	99.3
WEHFYC	2	.1	99.5
WFHEYE	2	.1	99.6
WBHDYC	1	.1	99.6
WBHEYD	1	.1	99.7
WCHEYE	1	.1	99.8
WDHDYB	1	.1	99.8
WEHDYE	1	.1	99.9
WEHDYF	1	.1	99.9
WEHEYE	1	.1	100.0
Total	1652	100.0	