Citation Generators: Generating bibliographies for the next generation

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ABSTRACT

The proper use of appropriate citation formats to acknowledge the work of other researchers and writers is a standard theme in information literacy instruction. Faculty and graduate students have used pc-based personal bibliographic citation management programs, such as EndNote, to help with this task. Recently, free or inexpensive Web-based tools have been developed that create citations and format bibliographies. An analysis of citations generated by these programs shows that they are as accurate as EndNote and offer some advantages to undergraduates.

INTRODUCTION

There is a widely held perception among librarians and other educators that plagiarism is on the rise in both secondary and higher education, fueled in part by the realities of writing in the electronic age. No doubt the availability of Web-based term paper mills has made the more blatant forms of cheating easier, but subtle forms of plagiarism also appear to be more widespread. Whether from laziness or ignorance, the ease of copying and pasting from electronic documents can easily lead to academic dishonesty.

Institutions have dealt with the issue of plagiarism in several ways. The issue of academic dishonesty has received a more prominent position in standards of conduct or honor codes, which often clearly delineate what constitutes plagiarism and spell out consequences. Instructors and their institutions have taken advantage of the same digital technology that makes it easy to plagiarize by using anti-plagiarism software and database services to examine student writings. Teachers have been urged to design their
assignments to emphasize the research process over the final product, requiring students to demonstrate their progress through a series of intermediate steps.

Librarians participate in information literacy initiatives, in which a key objective is to teach students about the ethical use of information so that they will avoid plagiarism. In a typical information literacy course, students are taught how to correctly identify the intellectual contributions of others through the proper use of citations and bibliographies. Students are introduced to proper citation formats, and assignments often include an annotated bibliography or research paper requiring a specific citation style.

Applying proper citation format can be tedious for some students, since it requires meticulous attention to detail. To address this, many software packages have been developed that can help writers manage citations and generate bibliographies. Personal bibliographic citation management programs, such as ProCite, EndNote and Reference Manager have existed for many years, largely as tools for academics and researchers to manage their own personal collection of bibliographic references. These programs provide “a way to manage bibliographic citations, perform retrievals, and create bibliographies formatted in a variety of publication styles.”

In the past few years, several new Web-based citation generators, such as NoodleBib and EasyBib, have appeared. The target market for these programs, which are designed to be easy to use, seems to be secondary school and college students who need to generate citations and bibliographies. While these programs are often free or quite inexpensive, they do not offer as many functions as personal bibliographic citation management.
programs. For example, users cannot import citations but must enter them manually; the number of citation styles is limited; and citations cannot be stored indefinitely.

The emergence of these programs, especially the Web-based packages, raises the issue of their applicability to teaching citation style as part of an information literacy program. Creating bibliographies is not a popular activity with students, and as any academic librarian who provides reference services can attest, it is a process often accompanied by a great deal of student angst. Use of these tools might relieve some of the tedium from information literacy assignments. First, however, it is necessary to understand the accuracy of the programs and to examine them for suitability for undergraduate use. The focus of this study was to examine two Web-based programs and one PC-based program and compare them for accuracy and ease of use.

LITERATURE REVIEW

Personal bibliographic citation management software packages have been reviewed in the literature but very little has been written about Web-based citation generators. Perhaps this is because unlike the Web-based citation generators, the PC-based products require a significant financial investment. In addition, the PC-based products have a much longer established track record than the Web-based products.

Some academic libraries have taken an active role in providing access and support for personal bibliographic citation management software packages. East described the high level of support for users of the EndNote package by academic libraries in Australia. Most of the institutions in East’s survey provided EndNote instruction in the form of a
two to three hour training course. East noted “a trend towards a blurring of the
boundaries which have hitherto separated the domain of the university library from that
of the university’s information technology services unit, or its educational development
unit.”

Strube, Antoniewicz, Glick and Vandoorne Asu described class offerings at the Medical
College of Wisconsin designed to teach users how to use four different personal
bibliographic citation management packages, with a primary emphasis on the use of these
packages to manage personal reprint files. They encouraged librarians to embrace the
role of educator and consultant for these types of software packages both because they
saw it as a logical next step in information management, and also as a useful way to
publicize the role of the librarian as information technologists.

Siegler and Simboli described librarians’ experiences at Lehigh University in promoting
and supporting EndNote, including the teaching of instructional seminars. While these
seminars were open to the campus community, Sieglar and Simboli stressed that support
efforts fostered interaction with graduate students and faculty in particular.

Jennings compared EasyBib, a Web-based citation generator, and RefWorks, a Web-
based personal bibliographic management program similar to EndNote. She rated
EasyBib higher than RefWorks, in spite of RefWorks’s greater functionality, noting that
entering references manually is more difficult in RefWorks than EasyBib and that
undergraduates found RefWorks difficult to use and required more assistance from librarians.\textsuperscript{7}

A cornerstone of information literacy instruction involves teaching students the ethical use of information, including proper attribution of the work of others to avoid plagiarism. The American Library Association (ALA) has published \textit{Information Literacy Competency Standards for Higher Education}. Standard Five states, “The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.”\textsuperscript{8} One of the performance indicator outcomes for this standard states that the student: “Selects an appropriate documentation style and uses it consistently to cite sources.”\textsuperscript{9}

Despite the emphasis on the correct application of style guides in source citation, there is little in the literature about the actual inclusion of citation formats in information literacy instruction. While bibliometric analysis has been used as a tool for evaluating the effectiveness of information literacy instruction, the correctness of the bibliographic format is typically ignored.\textsuperscript{10} In one such study, Young and Ackerson comment: “The format of the references was not rated because correct bibliographic form was not taught in the BI classes and was perceived to be the domain of the Department of English.”\textsuperscript{11}

\textbf{BACKGROUND}
Two Web-based citation generators, NoodleBib and EasyBib, and one PC-based bibliographic citation management program, EndNote Version 6.0, were selected for this study. NoodleBib and EasyBib are the only Web-based citation generators that format both citations and bibliographies. Other Web-based citation generators, such as the Slate Citation Machine, format citations but do not create, organize, and store a bibliography. Users must copy and paste each citation into a word processing document.

NoodleBib is part of NoodleTools, a suite of interactive research tools developed by teacher/librarian Debbie Abilock. NoodleBib formats and automatically alphabetizes bibliographies in American Psychological Association (APA) and Modern Language Association (MLA) styles. Input templates are available for 47 types of sources including books, journal, newspaper and magazine articles, reference books, video and audio recordings, Web sites, e-mail communications, online postings to discussion groups, research reports, proceedings, as well as theses and dissertations. The user selects the output style (APA or MLA), the source type and format (print or online), and then fills in the required information in the template. Detailed instructions are listed to the right of each field. After inputting the information, the citation is generated and the bibliography is started. Each new citation is added to the bibliography in alphabetical order. Users can create any number of citations and bibliographies. Each bibliography is saved for three months from date of creation on the NoodleBib server and is retrievable with a password unique to each list. The list can be saved in rich text format and opened in word processing programs such as Microsoft Word.
EasyBib offers two products, MyBib and MyBib Pro. MyBib is a free MLA bibliography composer that formats over 30 different types of sources, and then alphabetizes them into a bibliography. Users fill in templates similar to NoodleBib. Users can save bibliographies on the Web, print them, or open them in a word processing program. MyBib Pro is a fee-based service that produces APA and MLA citations. MyBibPro was used for this study.

EndNote is a product of Thomson ISI Researchsoft. EndNote users can search databases, organize references, create bibliographies and use built-in Microsoft Word manuscript templates for a variety of scholarly journals. References can be entered manually or imported directly from an OPAC or database with the use of import filters. The import filter tells EndNote how to decipher information that has been downloaded from an online database. Users can also search Z39.50 OPACs and databases with the EndNote search interface, using a connection file, which stores the information needed to connect to and search these databases. The results of the search appear automatically as EndNote references. Once references have been entered, bibliographies and manuscripts can be created in more than 1,000 different styles, including APA, MLA, Turabian, and Chicago Manual of Style.

Besides being Web-based products, NoodleBib and EasyBib have many similarities. Both are perhaps deceptively simple to use, with no significant learning curve to master in order to begin data entry. NoodleBib has field-by-field help on each template to guide users through the process. EasyBib offers less field-by-field help. In contrast, EndNote
is a much more complex program, and correct use of the product requires some investment of time for the user to familiarize herself/himself with its operation. There is no field-by-field help in the input template. EndNote is designed for use by researchers and graduate students, who need to organize large collections of bibliographic references, and who need to generate bibliographies for academic and professional publication. As a result, one significant advantage of using EndNote is that the user can generate bibliographies in a wide variety of styles, once data is entered. In contrast, when using NoodleBib and EasyBib, the user must commit to a style before entering the citation information.

WEB SURVEY
To determine whether academic libraries are recommending or supporting these tools, the Web sites of ARL member libraries were examined. During the month of December 2003, each ARL member library Web site was accessed via the member list available on the ARL Web site. If present, the site search feature was used and searches for “EasyBib”, “NoodleBib”, “NoodleTools”, and “EndNote” were performed. If the site search feature was not available, a Google search was performed, limited to the library’s Web site. The results are listed in Table 1. Institutions with more than one library were counted once.

EndNote is widely supported by libraries. Of the 124 ARL member libraries, 74 (59.7%) provide some kind of information about EndNote on their Web site and 57 (46.0%) provide instructions for other PC-based bibliographic citation management programs,
such as ProCite. Training classes are provided by 29 libraries (23.4%) and 13 libraries (10.5%) provide EndNote on library computers.

Although EndNote is widely supported, libraries vary widely in the extent of support. Some libraries limit support to linking to the tip sheets, interactive tutorial and technical support available at the EndNote site. Other libraries provide guides to choosing bibliographic management software, including product comparison charts and information about special academic pricing. Many libraries offer detailed information about using EndNote with the library’s databases and catalog, including the necessary import filters and connection files. There were also detailed online tutorials developed by the libraries and specifically tailored to the library.

Newer citation generators, such as Easy Bib and NoodleBib, are not as well supported. Only 3 libraries (2.4%) provided a link to EasyBib, while 10 (8.1%) provided a link to NoodleBib. The institutions providing links to EasyBib or NoodleBib did so on a style guide page. None offered an institutional subscription.

**METHODOLOGY**

To review the accuracy of citation generators, bibliographies were created using EasyBib, NoodleBib, and EndNote. In order to generate a set of sources representative of those used by undergraduates, student bibliographies were used from a one-credit information literacy course, UNL205, taught by user education librarians at the University at Albany. The major research project for the course is an annotated bibliography that must include
sources of different types, including books, reference books, scholarly journal articles (both print and online), primary sources, and Web sites. 10 student bibliographies were obtained from a UNL205 instructor, providing 100 citations for analysis. The subjects of the bibliographies are listed in Table 2. The sources listed in the bibliographies were then located in the library or on the Web. Photocopies of the relevant sections needed to cite the sources were made.

Bibliographies were created in APA style for 50 of the sources using each of the three programs. Because EasyBib and NoodleBib do not have the ability to import citations from an OPAC or database, this feature was not used when creating a bibliography in EndNote. The data was entered manually by the authors, working from the source material upon which the student bibliographies were based. The student bibliographies themselves were not consulted for data entry.

The bibliographies were reviewed and compared to the proper citation format as outlined in the Publication Manual of the American Psychological Association, 5th ed. Errors were then categorized and recorded in an Excel spreadsheet. If multiple types of errors were present within a citation, each was noted. Errors were categorized in the following ways: print or electronic source; software or user error; and incorrect citation component. Software errors were defined as those in which the data was entered according to instructions, but the resulting citation was still incorrect. For example, EasyBib does not have a format for a signed encyclopedia article, so any citation for that type of source will be incorrect. User errors were defined as those in which an error occurred because the user failed to follow instructions, that is, the citation would have been generated correctly
if the data had been input correctly. For example, NoodleBib instructs the user to capitalize the first word of the title, subtitle and proper names. If all title words were capitalized during input, NoodleBib cannot correct this and the citation generated is incorrect. This was counted as a user error.

**RESULTS**

Errors were tabulated for each of the three programs, NoodleBib, EasyBib, and EndNote. Figure 1 sorts the errors into user errors and software errors. The three programs generated a total of 106 errors from the fifty citations created in the study. NoodleBib generated the fewest errors; it was responsible for 30 (28%) of the total errors. EndNote generated 32 errors (30%) and EasyBib generated 44 errors (42%).

The breakdown of user errors versus software errors varied considerably between the programs. Only a single user error (3.1% of the program’s total errors) was generated using EndNote, while EasyBib had 34.1% user errors and NoodleBib had 80%.

Figure 2 shows the errors produced from print sources as compared to electronic sources for the three programs. EasyBib produced the largest number of errors for both print (20 errors or 19%) and electronic (24 errors or 23%) citations. NoodleBib had 19 errors (18%) for print and only 11 errors (10%) for electronic formats. EndNote had the lowest number of print errors (13 or 12%) and the second highest number of errors for electronic formats (19 or 18%).

Since 20 of the sources included in this study were in electronic format, and 30 were in print, the number of errors produced by print formats might be expected to be higher than
those produced by a smaller number of electronic sources. Table 3 shows the rate of error for each program by source format on a per citation basis. This error rate was determined by dividing the number of errors each program produced for the two types of formats by the total number of citations in that format category. An error rate greater than 100% indicates that some citations in that category had more than one error. For print citations, EasyBib and NoodleBib had very similar error rates, 66.7% and 63.3% respectively. NoodleBib handled electronic citations much better than EasyBib, with error rates of 55.0% and 120.0% respectively. EndNote produced fewer errors per print citation than either of the Web-based programs, at a rate of 43.3%. For electronic sources, EndNote fell between the two Web-based programs, with an error rate of 95%.

In addition, errors produced by the three programs were grouped into commonly occurring categories (see Figure 3). The categories used for this analysis were incorrect capitalization, punctuation errors, improperly formatted retrieval statements, date, problems with volume or issue information, and syntax. Syntax errors involved the incorrect placement of elements within the citation. Certain differences in errors stand out when categorized in this manner. EndNote produced only one capitalization error, while EasyBib generated eight. NoodleBib produced no punctuation errors, but 10 date errors, the highest of any of the programs. Both EasyBib and EndNote produced a large number of syntax errors, (14 and 13 respectively), while NoodleBib generated only 2 syntax errors. All three programs produced similar results for retrieval statement errors, with EasyBib having a low of five and NoodleBib and EndNote having six each. The
programs also had similar error rates for volume/issue information, with EndNote having a low of six errors, EasyBib with seven, and NoodleBib with a high of eight errors.

**DISCUSSION**

NoodleBib and EndNote produced very similar total error rates, yet the two products are quite different in most respects. The types of errors differ sharply. EndNote was nearly free of user errors, in large part because it automatically corrects for capitalization, which the other two programs were unable to do. This feature is necessary in EndNote because of its capability to switch citation styles.

**SOFTWARE ERRORS**

Many of the software errors generated in EndNote came from its faulty handling of electronic formats. In particular, EndNote did not handle articles retrieved from electronic databases correctly, because there is no source type option within the program specifically for this format. When the user enters the data, he/she is faced with a dilemma. If “electronic source” is selected as the source type, the software doesn’t allow for the inclusion of data about the journal. If the user instead selects “journal article” as the source type, there is a data entry field for entering a uniform resource locator (URL), but it does not appear when a bibliography is generated, and the citation is identical to that of a print article. In neither case is there any possibility for entering the name of the database from which the article was retrieved, as is required for correct citation format. According to the American Psychological Association guidelines, “when referencing material obtained by searching an aggregated database, follow the format appropriate to
the work retrieved and add a retrieval statement that gives the retrieval date and the
proper name of the database."\textsuperscript{14}

EndNote was not alone in being unable to handle articles from
full text databases; none of the programs were flawless in this regard. NoodleBib
provided a field for entering the database name, but it incorrectly included the URL in
addition to the database name in the retrieval statement. EasyBib provided a source type
for electronic journal articles, but did not have a field for entering the database name, and
only the article’s URL appeared in the retrieval statement.

EasyBib’s exceptionally high error rate (120\%) for electronic sources was not solely the
result of retrieval statement errors. There were several other sources of significant error.
For Web sites that contain no publication date, the \textit{Publication Manual of the American
Psychological Association} instructs writers to “use n.d. (no date) when a publication date
is not available.”\textsuperscript{15} EasyBib failed to do this. In addition, EasyBib does not contain data
fields for volume and issue numbers for magazine articles in electronic format. Several
of the electronic sources were book or performance reviews. EasyBib has no format
specifically for reviews, so the sources had to be entered as more generic Web sites. That
led to very confusing and inaccurate citations, in which it was difficult to distinguish the
work being reviewed from the review itself.

EndNote handled print formats extremely well, and produced no software errors for those
sources. EndNote was developed in an era before full text electronic media became
common. One of its major functions is to help academics organize personal print libraries and reprint files, and it is well tailored to this purpose.

EasyBib and NoodleTools both had problems with certain print source types. One of EasyBib’s major flaws is the lack of source type for a signed article in a reference work. The closest source type is for a dictionary or encyclopedia entry. While the editors of the reference work can be input, there is no field for inputting the author of the entry. Given EasyBib’s target audience of undergraduates and high school students, who are likely to rely heavily on encyclopedias and reference works, this is a problem that needs to be addressed.

**USER ERRORS**

The three products have differing levels of available help, to prevent users from inputting information incorrectly. EndNote comes with a very extensive print manual. However, unlike EasyBib and NoodleBib, the data entry templates contain no examples or tips. There is a help choice on the menu containing some material from the user manual. Obviously, this is very useful for the motivated user, but would probably not be well utilized by undergraduates. The data entry screen of NoodleBib includes helpful examples and tips next to each line, which serve as a convenient reminder for users in dealing with details like capitalization and publication information. EasyBib has a few such onscreen tips, but far less than NoodleTools.

The data was entered into the citation generators by the authors, who are librarians familiar with citation formats. Still, user errors appeared using all three products, and differences in the products’ ability to offer helpful suggestions or correct user errors
were reflected in the results. Undergraduate students, many of whom lack any experience creating bibliographies, would be expected to generate significantly more user errors than appeared here.

All three products yielded few user errors for electronic formats. That may be because the types of mistakes made by the users tended to revolve around capitalization of titles and volume/issue information. When errors for electronic journals were found, they tended to appear as software errors due to the incorrect handling of this format, rather than user errors.

Citations for print sources produced using NoodleBib were prone to date errors. In many cases, the citations contained extra information, not conforming to American Psychological Association style guidelines. The NoodleBib data entry screen did contain the following tip:

“Only specify month/season if journal is published more than once a year AND there is no volume number.”

However, eight date errors resulted from the inclusion of months or dates in the citations where they should not have been present. Since most journals are published more than once a year and have a volume number, the default setting should be set to handle this scenario, with perhaps a radio button where the user is forced to make a choice to obtain a window for entering month/season information.
EasyBib produced a variety of types of user errors, but most were due to incorrect capitalization. EasyBib does not have an onscreen tip or example showing the correct way to input titles, nor can it correct capitalization errors.

CONCLUSION

Personal bibliographic citation managers such as EndNote are widely used by faculty and graduate students and are being supported by librarians. For undergraduate students, these programs have several drawbacks: they are expensive, have an extensive learning curve, and perform unnecessary functions for undergraduate assignments. Recently developed Web-based citation generators such as NoodleBib and EasyBib offer an alternative. They are inexpensive, portable, easy to use, and perform the functions undergraduates need.

Should these new citation generators be recommended to students and supported by libraries? If used properly, these programs can produce accurate citations and bibliographies. NoodleBib’s error rate was less than that of the widely used and supported EndNote. EasyBib, however, was less accurate than EndNote. EasyBib and NoodleBib both do a better job than EndNote with citations for some types of sources that undergraduates frequently use, such as full text articles from an online database. In addition, one would hope that these programs will be improved by their developers as errors are brought to light. Based on error rates comparable to the widely supported EndNote, the convenience, and the reasonable cost, there is good reason to support and recommend Web-based citation generators. As new citation generators are developed, students and faculty will look to librarians for guidance on which product to select and
support in using the product. Librarians should be proactive in regard to these programs and take on the role of educator and consultant, as described by Strube et al, by becoming familiar with the products available and guiding users to the best ones.

These types of programs could be included in information literacy instruction, but not as a substitute for learning how to prepare a citation manually. A product like NoodleBib could be introduced at the midway point of an information literacy course, after students have had practice creating citations manually. Students need an understanding of proper citation format in order to detect errors in automatically generated citations. A large percentage of the citation errors in NoodleBib and EasyBib were user errors, so instruction in how to use these programs should be helpful and increase the accuracy of citations. Allowing students to use these programs may reduce their frustration with a tedious process and help them to resist the urge to skip citing resources. Working with software programs devoted to creating citations may underscore the importance of this function.

However, instruction on citation generators should include a sense of the limitations of these programs as well as the fact that the ultimate responsibility for accurate citations rests with the user. As with all computer software, the “garbage in, garbage out” rule applies. Students must enter the information according to the instructions or the resulting citation will not be correct. EasyBib and NoodleBib do not have spell checkers, so spell checking should be done once the bibliography has been transferred to a word processing program. Some sources will not fit into any of the categories provided by the programs
and students will have to consult the appropriate style manual and prepare the citation themselves, or alternatively, use the closest source type available, and then modify the citation.

**FUTURE RESEARCH**

Many questions remain about these types of programs, their use by students, and their support by libraries. Studies of student use of these programs should be undertaken. For example, an investigation of whether bibliographies prepared by students using a citation generator are more or less accurate than those prepared manually by students would be helpful. As new products are developed, and existing products are improved, continuing research will allow librarians to offer training and support to undergraduates who want to take advantage of these new tools.

**References**


2. Ibid., 25-40.
LASIE, 32 (April 2001): 64-70.

4. Ibid., p. 70.


13. Ibid., p. 119.


15. Ibid., p. 273.

![Figure 1. Total Errors](image-url)
Figure 2. Errors By Format