

TE WHAKATŪ KŌRERO WORKING PAPERS

*Student Use of Sources: A Collaborative
Investigation of Resource Use in Tertiary-level
Psychology Assignments*

Estelle Barnard and Nancy Evans Weaver

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Abstract

Successful online and distance learning relies on the skills of professionals within many units of a tertiary institution. Academic staff provide content expertise and student guidance, but must be supported by technical editors and designers, learning advisors, librarians, an online help desk, and other staff. This research is a cooperative undertaking between academic staff and library professionals. It is designed to help answer this question: What types of scholarly sources do tertiary-level psychology students in an online course use in completing their required assignments? The method is citation analysis. The references pages from submitted laboratory reports were collected, and the type and frequency of sources cited, as well as student variables, analysed. The aim was to apply these data on source use to answer both practical questions (for example: Does the library supply the type/quantity of materials students actually use? Are there implications for access and acquisition?) and pedagogical questions (for example: Do introductory psychology students use appropriate types and quantities of scholarly resources? Do they use more books or journal articles? Do they use the sources supplied/recommended?). We also examined whether source use is related to student characteristics, such as level of previous study and number of concurrent courses. Results from pilot studies and initial analyses of an entire trimester's submissions suggest higher than expected levels of source use. Most students used instructor-provided journal articles and background summaries at least to some extent, but very few library-provided sources. There may be some differences between print and online submissions, and some variables may be related to the mark received for the assignment.

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Introduction

According to Watson (2010), in a climate of budget cuts and the need to justify spending, libraries must look critically at how information resources are actually being used and therefore how collections should be managed. In academic settings, the teaching faculty also has a need to examine how scholarly resources are used by their students, because lecturers want to encourage scholarly work. To accomplish these goals, librarians and faculty must understand which types of sources students use and which they do not.

The authors, one a librarian and the other a psychology lecturer at a tertiary-level online and distance learning (ODL) institution, share this interest in measuring the use of scholarly resources. In particular, they set out to determine what types of resources undergraduate psychology students make use of in completing assignments in an introductory course and whether these resources match this institution's library collections and faculty expectations. The results can then be used to address how faculty and libraries can help students use sources more successfully.

The method chosen for this research is citation analysis. Citation analysis involves studying in-text citations (brief acknowledgements of sources placed within an assignment where a source is used) and more complete source information placed at the end of the assignment – either bibliographies (a list of all sources consulted) or references (a list of all sources cited) (see Burton, 2010, for these definitions). The purpose of these parts of an assignment is twofold: to acknowledge the theories or results of other researchers that the author has mentioned, and to provide the reader with information on how to find the original work if needed (Burton, 2010). (Note: In citation analysis, the word 'citation' is usually used to cover either or both in-text and end-of-report acknowledgements of sources.)

Citation analysis has taken a wide variety of forms. It has been used, for example, to study preferences for print versus online materials (for example, Knight-Davis & Sung, 2008; De Groot, 2008); to examine the differences between student use of sources in their writing assignments and faculty use of sources in their own professional writing (see Watson, 2010, for an overview); and to examine the effectiveness of library instruction on student use of sources (for example, Clark & Chinburg, 2010).

How is a citation analysis conducted? Because of the diversity of applications there are differences in methods, but here is a typical example of its use with undergraduate written assignments (Knight-Davis & Sung, 2008). Samples of

assignments are collected, and from each assignment information about the use of scholarly sources is extracted. Researchers examine in-text citations and/or references, bibliographies, or some combination of these. For each source mentioned in the assignment the researcher then tabulates various source variables. These often include how many sources were used, what types of sources were used (for example, books, journal articles, web sites), and the origin of such sources (for example, held by the institution's library or not, supplied by the instructor or of student origin, and online or print based). Demographic variables about the student are also often recorded (for example, year of study, discipline in which the student is enrolled). These data are then analysed with descriptive statistics and/or statistical testing.

In the present study this general research method was followed. The references pages from submitted laboratory reports were collected and analysed as to type and frequency of sources cited, as well as student variables, whether the assignment was submitted online or in print, and the mark the assignment received.

The first aim was to address practical questions that would help library decision making. For example, distance education students typically use online library information, especially subject guides, as an alternative to face-to-face library instruction (Grays, Del Bosque, & Costello, 2008). (See the key to Table 1 for a definition of 'subject guide'.) At the Open Polytechnic of New Zealand students are encouraged through phone calls, emails and online posts to use subject guides and other library resources. As all students study from a distance, these are the librarians' means of promoting library usage and supporting information literacy. In this research we hoped to establish the extent to which students actually cite sources obtained from subject guides or other library resources. It was expected, for example, that students would make use of journal articles that appear in subject guides and also journal articles supplied or recommended by lecturers, because Keene (2004) found that many students know they are expected to use journal articles and do so. From a practical viewpoint, if material from subject guides, for example, is heavily cited, it would make sense to continue allocating funding for their development.

The second aim was to address pedagogical questions. For example, what types and quantity of scholarly resources do introductory psychology students use? Do most of them use journal articles? Books? Do they use sources provided and recommended by their lecturers? From a practical viewpoint, such data could provide background information that could be used to devise and test methods to better teach students about scholarly writing. Information about student variables, such as level of previous study and number of concurrent courses, was also collected. It was hoped these data would allow measurement of any

effects of student background and current workload on sources used. It could be predicted that less prepared students or students with a heavy course load may have less time to find, read and incorporate sources into their assignment. Also to be examined was whether students who choose to submit online differ in characteristics from students who choose to submit in print. If so, do those differences relate to the sources they use? Finally, does source use predict success in the assignment? Is there a relationship between number and/or type of sources referenced and the mark the assignment received? Past research suggests hypotheses about many of these variables (for example, Keene's (2004) finding about frequent use of journal articles).

There were two parts to the research reported here. First, patterns of source use were examined to tabulate what types of sources students used in this assignment and how frequently they used them. Second, three specific hypotheses were tested:

1. It was hypothesised that the mark received on the assignment would be related to the number of sources used. We expected that assignments using more sources would receive higher marks.
2. It was hypothesised that the mark received would be related to the use of the instructor-provided journal articles. We expected that assignments using more of these journal articles would receive higher marks.
3. Based on pilot research it was also hypothesised that there would be a relationship between type of submission (print or online) and other variables. We began by testing the relationship between type of submission and use of the instructor-provided journal articles: it was hypothesised that there would indeed be a relationship between submission type and the number of journal articles used.

Method

Participants

Participants were students enrolled in course 73195 *General and Applied Psychology* at the Open Polytechnic of New Zealand in Trimester 1, 2010 (February–June 2010). This is a Level 5 course (beginning tertiary / university level) that is one of a pair of introductory psychology courses at the Open Polytechnic. It was expected that almost all students who enrol would be at or near the beginning of their study of psychology.

Data from all students who submitted Assignment 1 were collected. Several student variables were tabulated using the Open Polytechnic's records – namely, highest level of study before enrolling in 73195, whether this was their first time enrolled with the Open Polytechnic, and how many (if any) other courses they were taking along with 73195 in Trimester 1, 2010.

Data were collected from a total of 124 students.

Materials

Materials consisted of a set of data sheets gathered from these 124 students when completing Assignment 1. The following is a brief background to the course to explain the origin of the data sheets and what was measured.

Course 73195 is taught entirely by distance. Students purchase a textbook and an American Psychological Association (APA) writing guide, and they also receive a printed learning guide from the Open Polytechnic. Study is heavily supported by the Open Polytechnic's Online Campus, where the 73195 course page provides discussion forums, links to the library, advice on assignments, and other resources for students. Extensive lecturer support is provided online and by telephone and email.

Part of what students are specifically taught is APA citing and referencing, and they apply that developing skill to complete two in-course assignments. Each assignment is a laboratory report (named Lab 1 and Lab 2). Students conduct a psychological experiment, collect data, analyse the data, and write a report in the style of a professional journal article. They are taught to cite sources within their report if they use information from them and to include an APA-formatted

references page at the end of the report. Students are not specifically required to use any sources (other than their own data) in the first assignment, although they are encouraged to do so and taught how to cite and reference.

It was the references pages from the Lab 1 assignments that were collected.

Procedure

The proposed research was reviewed and approved by the Open Polytechnic's Ethics Committee. At the start, a research assistant coded all data sheets to remove student identity. She copied the references page(s) and removed all identifying information from each page, replacing it with a code to represent the participant and whether the report was submitted in print or online. Analysis then proceeded using only these codes. The researchers did not know any student information until the later stages of data analysis. (At that point one of the researchers had to read a sample of entire lab reports, as reported below, from which names had not been removed. Therefore she then knew the identities of the sampled students.)

Procedures were also put in place to minimise some perceived weaknesses of citation analysis. First, references were used, not bibliographies. This is because students had been specifically taught in the course that references must include only and all cited sources – that is, only and all the sources they actually made use of in their reports. They were told they would be marked on this. It seems reasonable, therefore, to assume students do their best to include only those sources they actually used and all sources they actually used. (In the opinion of the authors, references pages may often be a better data source than bibliographies, because there is no requirement to cite all sources listed in a bibliography – so students may be tempted to 'pad' that list, giving a less accurate estimate of sources actually used if only the bibliography is analysed.)

Second, to be more rigorous in evaluating whether data sheets included only and all cited sources, a stratified random sample of the Lab 1 reports was pulled and the entire report, not just the references page, examined. The sample consisted of 10% of the total collected data sheets (n=12), stratified by mark received on the report (since it was expected that there might be a relation between the mark received and the number/type of sources used). Details of this sampling are provided in Appendix A.

To summarise the results of the random sampling, the collected references pages can be considered a fairly accurate representation of cited sources. While students do make errors in what they report, especially if the requirement is an

entirely correct references page, almost all (96.97%) cited sources do appear on this page, and most (88.89%) of the sources appearing here have indeed been cited within the report. (Note: Correct **format** in citing or referencing was not evaluated – that is, we didn't examine for errors in APA style. Only **content** in citing and referencing was examined. For instance, did the report cite some information about the source within the text at point of use? Did it place some information about that source on the references page? If it did, it was counted as correct citing and/or correct referencing for our purposes.)

Having described the sampling procedures, we now turn to the general content analysis of the 124 data sheets. Each data sheet was analysed on a set of variables (determined to be useful from a pilot study run the previous year and originating from authors' interests and the literature on citation analysis). These variables are explained and data analysed in the next section.

Results

Besides the participant variables mentioned earlier (highest level of study before enrolling in course 73195, whether this was their first time enrolled with the Open Polytechnic, and how many (if any) other courses they were taking concurrently), a set of source variables was examined. Analyses of these source variables are the main focus of this research at this time.

Source variables analysed were: (1) total number of references; (2) whether or not students referenced their course textbook, a set of journal articles supplied and recommended by the instructors, or background information also supplied; and (3) how many sources students used from the library resources. It was also noted whether students submitted the assignment in print or online, and what mark they received for it.

To analyse these variables, a set of descriptive statistics was calculated to summarise the data. In addition, several statistical tests have now been run to determine the significance of the data. The following is a summary of both types of statistics.

As descriptive statistics, three measures of central tendency (mean, median, mode), as well as a measure of variability (range), are reported. These values for the major source types are shown in Table 1.

Table 1: Source type and use summed across participants (n=124)

Variable name	Mean or percentage	Range	Median	Mode and other frequencies
Number of sources used	3.62	0 to 11	4	4 (n=36) 3 (n=28)
Textbook	59%	0 or 1 (No or Yes)	1	1 (n=73) 0 (n=51)
Instructor-provided journal articles: B & T	83%	0 or 1 (No or Yes)	1	1 (n=103) 0 (n=21)
Instructor-provided journal articles: L & Z	53%	0 or 1 (No or Yes)	1	1 (n=66) 0 (n=58)
Instructor-provided journal articles: P et al.	57%	0 or 1 (No or Yes)	1	1 (n=71) 0 (n=53)
Instructor-provided background	45%	0 or 1 (No or Yes)	0	1 (n=56) 0 (n=68)
From library: Subject guide	6%	0 to 2	0	0 (n=117)
From library: RR & AR	2%	0 to 4	0	0 (n=121)
Other sources	21%	0 to 7	0	0 (n=98)

Note: The following is a key to the definitions and technical term used in Table 1:

B&T	Brewer and Treyens, authors of one of the instructor-provided journal articles
L&Z	Loftus and Zanni, authors of one of the instructor-provided journal articles
P et al.	Pezdek et al., authors of one of the instructor-provided journal articles
Subject guide	Online library resource containing 73 materials relevant to this assignment
RR & AR	Recommended resources and additional resources – 17 library materials generally relevant to psychology

The mean number of sources used was 3.62 sources per assignment. This is very similar to the results of the earlier pilot study (students from 2009, n=95), where the mean number of sources used was 3.46. In the present study the mode (most frequently occurring number of sources used) was 4, with 36 students using that number of sources. The next most frequent number of sources used was 3, with 28 students using that number of sources. The median score (the score at the middle (position 62) when the 124 scores are arranged in numeric order) was 4. One student used 11 sources. Three students used no sources.

Looking at types of sources on the references pages, the most frequently used source in this assignment was one of the instructor-provided journal articles (coded as B&T to indicate its authors). These journal articles were chosen by the lecturers as being especially relevant to this assignment. Copies are printed and inserted with the assignment information in the students' printed study materials, and the articles are also available online on the course page. Students are encouraged to use these articles. The B&T article, which was the one most used, was included on the references page by 83% of students. The other two instructor-provided journal articles were also fairly well used, at 57% (P et al.) and 53% (L&Z) respectively. Not shown in Table 1, but also examined, was how often students used none of these articles, one of them, two of them, or all three of them. We found that 12 students (just under 10%) used none, 29 students (23%) used one, 38 students (31%) used two, and 45 students (36%) used all three of the instructor-provided articles. The journal articles supplied by lecturers were also well used by the students in the 2009 pilot study.

The textbook, which contains a chapter that is very relevant to this assignment, was cited by 59% of the students. This again mirrors the pilot study, where 61% of students included their textbook in the references page.

A multi-page summary of the theoretical background and past research for this assignment, written by one of the instructors and inserted with the assignment information in the students' printed study materials, was referenced by 45% of students. In the pilot study, 37% of students used it.

Library resources of all types measured were infrequently used by students. Sources from the subject guide, which is an online resource showing 73 items of library-held material that are relevant for this assignment in this course (as chosen by the lecturers and the psychology librarian), were used by only 6% of students. Similarly, 'recommended resources' (RR) and 'additional resources' (AR) were also used by very few students (2%). These RR and AR materials are 17 sources held by our library as general psychology resources (for example, other psychology textbooks), not geared particularly to this course or this assignment. To summarise, a few students do use resources of library origin, but they are exceptions.

Finally, any source listed on a references page that did not clearly come from the textbook, the instructor-provided sources, or the library-provided sources, was listed as 'Other'. In all, 21% of references pages contained this type of source. These sources are probably of student origin, although they may have come to the student from a librarian at the student's local library or from some other person. Of the 26 students who used this type of source, most of them (n=16) used only one source.

The study also tabulated which students submitted online and which by print. Ninety-nine students (80%) chose to submit the assignment online, while 25 (20%) chose to submit it in print. (A variety of factors may influence the way in which students submit, including ease of access to the internet, familiarity with online submission, and personal preference.)

The overall mean mark on this assignment was 64.47 out of 100 marks, the mode was 75, and the median was 67. The highest mark obtained was 91 and the lowest 18. Looking at letter grades, 27% of students received a grade in the A range, including A-, A and A+ (marks of 75–100), 40% received a grade in the B range (marks of 60–74), 20% received a grade in the C range (marks of 50–59), and 13% received a D or a Failure grade (marks of 0–49).

Descriptive statistics were also collected on three student variables, chosen because it was expected that they might affect student use of sources. These three variables were highest level of previous education, whether or not this was the student's first enrolment at the Open Polytechnic, and number of other courses being taken concurrently with this course in this trimester.

The highest levels of previous education were categorised and then summed within the categories. It was found that 55% of students had achieved NCEA Levels 2 or 3, 31% had achieved NCEA Level 1 or no New Zealand secondary qualification, and 15% had some other type of previous education (for example, an overseas qualification). As to whether or not this course was their first enrolment with the Open Polytechnic, this was fairly evenly split. For 47% this was their first enrolment, while 53% had previously enrolled with the institution for at least one course. On the measure of how many other courses the students were taking concurrently with this course, 67% had no other courses this trimester, 17% had one other course, and 16% had two or more other courses. Overall, then, more than half of the students whose assignment was analysed in this research had achieved NCEA Levels 2 or 3 previously, slightly less than half of them were enrolled with the Open Polytechnic for the first time, and about two-thirds of them were taking only this course this trimester.

With those descriptive statistics completed, statistical tests began. The aim was to determine which source variables and which student variables, if any, were significantly related to measures such as number of sources used and mark obtained for the assignment. This testing is only now beginning. So far, some differences have been found between print and online submissions, and some variables have been shown to significantly affect marks. These test results are summarised in Table 2 and variables are explained in Appendix B.

Table 2: Summary of chi-square tests of hypotheses

Variables tested	X ²	df	P-value
Instructor-provided articles; type of submission	7.44	3	0.059
Number of sources; Assignment 1 marks	12.59	6	0.050
Instructor-provided articles; Assignment 1 marks	24.78	9	0.003

Note: The null hypothesis for all three tests above states that there is no relationship between the two tested variables. If the P-value is less than 0.05 the null hypotheses should be rejected and the conclusion accepted that there is a relationship between the variables, significant at the P level of probability.

As shown, chi-square testing suggests first that there may be a relationship between use of the journal articles provided by the instructors and whether the assignment was submitted in print or online. The instructor-provided articles were grouped (no articles used, one article used, two articles used, or all three articles used) and a weak relationship (chi-square = 7.44, df = 3, p = .059) with type of submission was found. In general, online submitters tended to use more of the instructor-provided journal articles than did print submitters.

Some variables were also found to relate to mark. There is a weakly significant relationship between the number of sources used and the mark achieved (chi-square = 12.59, df = 6, p = .05). Assignments with more sources tended to get higher marks. For example, when grouping together assignments using four or more sources (the median and mode – see Table 1), it was found that 53 out of a total of 69 of these (77%) received a mark in the A or B range. But of the grouped assignments using no sources or one source, only 3 out of 10 (30%) got an A or a B.

There was also a strongly significant relation between mark and use of the instructor-provided articles (chi-square = 24.78, df = 9, p < .01). Grouping use into four categories (no articles used, one article used, two articles used, or all three articles used) and merging D and Failure grades, assignments using more of the articles achieved better grades. Of the assignments that contained all

three sources, for example, 39 out of 45 (87%) were marked as either A or B, but only 4 out of 12 (33%) of the assignments that used no sources were marked that highly.

To summarise results so far, means, medians, modes, and range information has been collected on the use of a variety of academic resources by students submitting the first assignment in an introductory psychology course offered through online/distance education. On average, students included three or four sources in their references page. The most frequently used sources were instructor-provided journal articles, the course textbook and instructor-provided background information. Library resources were infrequently used, even those resources specifically relevant to the course and assignment. Statistical testing has begun. So far there is a suggestion that there may be differences between print and online submissions, and that several source variables (number of sources used and use of the instructor-provided journal articles) are related to the mark achieved for the assignment.

Discussion

The overall plan of this research was to examine the pattern, if any, of source use by tertiary-level students in an introductory psychology course who were completing their first assignment. The method chosen was citation analysis, which collects information about the sources used by the author of the document through examining in-text citations, reference pages and/or bibliographies. Based on the literature, experience with students in this course and an earlier pilot study, it was expected that students would use a variety of scholarly sources and that patterns of source use could be tabulated and analysed by examining the references pages of their assignments.

To summarise the findings, patterns of use emerged, and three specific hypotheses were tested. The hypotheses that the mark received would be related to both the number of sources used and the use of the instructor-provided journal articles were both supported – assignments using more sources received higher marks, and assignments using more of the provided articles also received higher marks. In addition, it was hypothesised that there would be a relation between type of submission (print or online) and other variables. Of those relationships tested so far, online submissions may have used more of the instructor-provided articles than did print submissions.

In the descriptive statistics about source use, a number of source variables were measured, including the overall number of sources used on the references page, whether the textbook was used, and whether two types of library-origin sources were used. Most students showed three or four sources on the references page in this first assignment. The set of journal articles provided and recommended by course instructors were the most heavily used resources, followed by the textbook and background information written by one of the instructors. Library resources, even those specifically chosen as the most relevant for this course and this assignment, were infrequently used. Most assignments were submitted online (80%), rather than in print (20%). The most frequently given mark was in the B range.

A set of student variables, chosen because it was expected that they might affect the pattern of source use, was also tabulated. The most frequent level of past education for these students was completion of NCEA Level 2 or Level 3. Slightly less than half of the students were enrolled for the first time at the Open Polytechnic when taking this course, and two-thirds of them were studying only this course in the trimester tested.

This study relates to a body of research using citation analysis. As summarised by Heller-Ross (2002), citation analysis is widely used in library research, and even small studies have been helpful in setting library budgets and policies. Academics can also benefit from using this method to examine how their students seek and use scholarly sources. For example, past research (Leiding, 2005; Kraus, 2002) suggests that journal articles are a favourite type of resource in student writing. Kraus (2002) also suggests that advice from teaching faculty may have a pronounced effect on what types of sources students look for and cite.

In agreement with this literature, frequent use of journal articles, in particular those articles provided and recommended by the course's teachers, was found in this study. The overall number of sources cited (on average, nearly four per student) was higher than expected, given that this assignment does not specify that students must use outside sources at all. On the other hand, it had been expected that more students would cite their textbook, given that secondary sources are allowed and this assignment is specifically linked to a chapter in that textbook. In reviewing the instructions given to students for this assignment, one possible explanation is that the use of the textbook may not have been stressed as much as was the use of articles, particularly the three instructor-recommended articles.

The most surprising result is the very low use of library resources. The psychology librarian has a forum on the course page and strongly advocates the use of these sources, and the lecturers frequently encourage students to use this forum or contact the librarian directly. Yet few students used library resources in this assignment. It may be that there needs to be more encouragement for students to use these resources, or there may be factors in the way students access or interpret these resources that should be considered.

From the initial statistical testing it was found, as expected, that there does seem to be some relation between the number of sources used – and especially the use of the recommended journal articles – and the mark received for the assignment. It is also interesting that there may be some differences between assignments submitted electronically and those that students printed and sent in by post.

There are limitations in this research, of course. The two most important involve the participants and the materials. First, source use was examined only for one set of students in one course in one trimester in one discipline at one distance-based institution. Second, data came from the references page of assignments.

Although measures were taken to test that this page did indeed accurately reflect sources used, the competency of students to report sources and their honesty in listing them are major assumptions. In addition, some analyses were based on categories with relatively few cases, which may have affected results.

Plans for continuing this research begin with further statistical tests to be run on these data. For example, possible differences between assignments submitted online and those submitted in print have only briefly been considered. Relationships to student variables, such as level of previous education and whether the student is newly enrolled, also need more analysis. For example, do more experienced students use more sources?

The next step is to go beyond this first assignment. The references pages from the second assignment in this course (73195 in Trimester 1, 2010) are available. By analysing them, whether or not students change their pattern of source use, as compared with how they use them in the first assignment, can be tested. With these additional data a larger number of cases in each category can be included in testing as well. Finally, student use of sources in higher-level courses should be examined. In particular, this course is the prerequisite for a Level 6 course, 73212 *Thought, Memory and Language*, in which students also submit two laboratory reports with references pages. How do students who have already completed 73195 and gone on to 73212 use sources in this higher level of study? That will form the next major stage of the research.

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Appendix A: Details of analysis of stratified random sample

Of the 124 references pages collected, two were dropped because at that time their marks could not be obtained. (These marks were later found and so these two data sheets are included in the general analyses described in this paper.) Another 25 could not be included for this test because those assignments were submitted in print and so had been returned to students and were not accessible. That left 97 reports from which to sample 12. A representative number (based on their frequency in the total population of reports) was sampled. Randomly chosen were two reports with marks between 0 and 49, two reports with marks of 50–59, three reports with marks of 60–69, three reports with marks of 70–79, and two reports with marks of 80–100.

One of the researchers then read these 12 assignments in their entirety, noting for each whether: (1) all cited sources were included on the references page; and (2) only cited sources were included on the references page. These data were then analysed in three ways: by entire page, by citations and by references.

By **entire page**, of the 12 references pages collected, eight were found to be completely correct – that is, all sources cited within that report were included on the references page and only cited sources were included on the references page. Of the four reports with some type of error, three did include all cited sources, but also either one or two sources on the references page that had not been cited. The remaining report had only cited sources on the references page, but omitted one cited source from this page. In analysis by entire report, therefore, eight of the 12 (66.67%) were entirely correct.

By **citations**, there were 33 cited sources over the 12 reports. Of the 33, 32 were included (as they should be) on the references page and one was omitted (an error), for an accuracy level of 96.97% (32 sources out of 33).

By **references**, there were 36 sources listed on the references pages of the 12 reports. Of these, 32 were cited within the report (as they should be) and four were on the page but not cited within the report (an error). The accuracy according to this type of analysis is, therefore, 88.89% (32 sources out of 36).

Appendix B: Statistical variables tested and their range of possible values

Mark	Numerical variable showing mark received on Assignment 1. Range = 0–100.
Mark grouped	Categorical variable obtained by grouping the mark variable. Categories = 0–49, 50–59, 60–74, 75–100.
Instructor-provided articles	Categorical variable recording whether or not each of the three instructor-provided articles was included on references page. Categories = 0 or 1.
Instructor-provided articles grouped	Categorical variable obtained by grouping the instructor-provided articles variable. Categories = used all three articles (coded as 3), used two articles (2), used one article (1), used no articles (0).
Number of sources	Numerical variable showing total number of sources on references page. Range = 0–infinity.
Number of sources grouped	Categorical variable obtained by grouping the number of sources variable. Categories = 0–1 (coded as 1), 2–3 (2), 4 or more (4).

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