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The Application of Reliability and Validity Measures to Assess the Effectiveness of an Undergraduate Citation Rubric[1]

Shortened Title: Validity and Reliability Assessment of a Rubric

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ABSTRACT

The increasing popularity of rubrics to assess student learning outcomes in the information literacy classroom is evident within Library and Information Science literature. However, there is a lack of research detailing scientific evaluation of these assessment instruments to determine their reliability and validity. The goal of this study was to use two common measurement methods to determine the content validity and internal consistency reliability of a citation rubric developed by the researcher. Results showed the rubric needed modification in order to improve reliability and validity. Changes were made and the updated rubric will be used in the classroom in a future semester.

Keywords: rubrics, information literacy instruction, assessment, validity, reliability

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INTRODUCTION

Current Library and Information Science (LIS) literature is rife with articles extolling the scoring rubric as an effective and systematic method of assessing student learning outcomes. Within academic libraries rubrics are used to assess a variety of student assignments, such as annotated bibliographies, literature reviews, and locating scholarly resources. One pivotal component of undergraduate information literacy instruction (ILI) which has yet to be amply explored within the profession's body of knowledge is citing. In order to begin closing this gap, the researcher decided to construct a scoring rubric focused on evaluating student comprehension of basic practices and knowledge associated with two of the most commonly used citation styles, Modern Language Association (MLA) and American Psychological Association (APA).

In order to determine whether the citation rubric measured what it intended to measure in a consistent manner, it was necessary to assess its validity and reliability. Content validity and internal consistency reliability levels were calculated using both the ratings of subject matter experts and the grades students received on an activity based on the rubric. This data was used to create a modified citation rubric and in-class assignment that the researcher will implement in the upcoming semester.

LITERATURE REVIEW

Rubrics

Academic librarians have written articles detailing their experiences using scoring rubrics to assess student learning since the early 2000s (Choinski, Mark, and Murphey 2003). The popularization of rubrics truly began, however, in the late 2000s, when Megan Oakleaf and collaborators published a burst of influential articles reporting their success using rubrics within academic libraries. These articles cover a wide range of content, including the process of

norming rubrics (Holmes and Oakleaf 2013), evaluating information literacy outcomes (Oakleaf 2012), evidence based decision-making (Oakleaf 2007), and using interrater reliability to bolster rubric effectiveness (Oakleaf 2009).

While an extensive review of rubrics is beyond the scope of this paper, it is necessary to highlight some of the benefits of scoring rubrics for students and librarians alike. If constructed and used with care, these assessment tools have the potential to aptly measure the effectiveness of information literacy instruction. Van Helvoort (2010) provides a list of six advantages of scoring rubrics culled from existing literature on the topic. These benefits include the ability to assess student learning outcomes over time or across disciplines, a streamlined means of giving students concrete, objective feedback, and an opportunity for colleagues to develop unified, collaborative information competency standards and goals (26).

Librarians, of course, are not the only academics devising rubrics to assess student learning outcomes. In terms of the social sciences, there is evidence that psychology faculty are not only creating and employing scoring rubrics but are also applying rigorous methodologies to ensure their rubrics are authentic and stable. For example, Thaler, Kazemi, and Huscher (2009) describe a project in which they used the APA publication manual as a foundation to develop a rubric which uses undergraduate research papers to explore learning outcomes. Data analysis reported statistically significant levels of both convergent validity and interrater reliability. In a similar study, Stellmack et al. (2009) created an APA-inspired rubric which includes dimensions such as a adhering to APA formatting and quality of sources. Statistical analysis revealed that the rubric had both acceptable reliability and validity.

At this point in time, a rubric focusing only on citing practices was unable to be located within LIS literature. In light of the fact that standard five of the Information Literacy

Competency Standards considers citing sources in the proper documentation style an important learning outcome (Association of College and Research Libraries 2000), the creation of unique assessment tools to measure undergraduate citing abilities is long overdue. In order to ensure that the rubric clearly measures citing skills in a consistent, objective manner, steps need to be taken to calculate both validity and reliability.

Internal consistency reliability

There is also little documentation within LIS literature exploring the ability of Cronbach's alpha to determine the internal consistency reliability of assessment instruments. Cronbach's alpha is the most popular measure of reliability within social sciences research, and works well in cases where people are measured with an instrument on a single occasion (Clark and Catts 2007). Simply put, in reference to a testing instrument, internal consistency calculations determine whether "individual items on the test agree with each other" (Mitchell and Jolley 2012, 124). If applied to a rubric, the goal of an internal consistency measure would be to determine whether all the different dimensions of the rubric measure the same construct.

Only one article, which addressed the use of Cronbach's alpha in rubric reliability testing, was located within two LIS subject databases. Steckelberg et al. (2008) describe the creation of a rubric intended to evaluate the essential conditions necessary to incorporate emerging technologies into K-12 schools. Cronbach's alpha was used by the researchers, all with backgrounds in education and learning technologies, to determine the rubric's internal consistency reliability. The alpha level of the entire instrument was 0.92, identifying the rubric as extremely reliable. Cronbach's alpha levels are generally considered acceptable if they exceed 0.7 (Bresciani et al. 2009).

Content validity

There is presently little scholarship documenting the application of validity techniques to higher education assessment tools in general, and LIS occupies a palpable space within this lacuna. In terms of ILI skill evaluation, a sizeable amount of assessment tools are administered without formal confirmation of reliability or validity (Walsh 2009). Although the researcher was unable to find any studies that use content validity to evaluate LIS scoring rubrics, there are a few notable articles, which describe using content validity techniques to assess other vital components of ILI.

In a 2010 review of 20 articles detailing rubric usage at higher education institutions, Reddy and Andrade reported that only two of these 20 studies evaluated rubric validity and reliability. Zero studies in this review delved into the topic of content validity, a central type of validity that the authors wished to see incorporated into future scholarship. Content validity uses subject matter experts (SMEs), or experts on a topic, to judge whether the "sample of behavior, that is the test, is truly representative of the domain being assessed. Such an effort requires first of all a thorough knowledge of the domain" (Domino and Domino 2006, 53).

Erfanmanesh, Abrizah, and Karim (2012) recruited LIS experts to review their Information Seeking Anxiety scale in order to confirm that all items on the scale directly measured this particular construct. Seven experts assessed the scale and confirmed that overall it was capable of measuring the construct information seeking anxiety. Therefore, the researchers in this study could feel very confident that their instrument would evaluate what it intended to evaluate.

Another study used experts to determine the content validity of the Information Skills Survey for Assessment of Information Literacy in Higher Education, a self-report inventory

which evaluates IL skill levels of higher education students (Clark and Catts 2007). The researchers were interested in investigating the reliability and validity of the instrument among a sample of medical students. This study is unique because in addition to using experts to determine content validity these researchers employed a group of students to assist with the process. Researchers included two questions on the inventory for participants to explain if they believed its items encompassed the entire range of IL skills needed by medical students. The results reported acceptable levels of content validity among first year medical students but low levels among fourth year students suggesting that the information needs and skill sets of the more advanced students exceed the capabilities of the instrument.

METHOD

Participants and Materials

This study included two separate groups of participants: students in ILI classes and library professionals who rated the rubric. In terms of the former, the population of interest was undergraduates enrolled in the Core Seminar (COS) class at Long Island University, Brooklyn Campus (LIU Brooklyn), an urban university in New York City with a student body of around 8,000. COS is a unique interdisciplinary social sciences class which all undergraduates must complete in order to graduate. Prior to enrolling in COS, students must have passed an introductory English composition course.

Convenience sampling, a type of nonprobability sampling frequently used with college students (Gravetter and Forzano 2011), was used to select participants from a specific population: all students at LIU Brooklyn enrolled in the COS course during the spring 2014 semester. According to the university's course schedule, 21 COS classes were taught during this time, with a grand total of 384 students. All 21 of these classes are required to visit the library on

two separate occasions. The researcher chose two of these 21 classes as a sample in which to pilot the APA and MLA citation rubric. The two classes were comprised of a total of 42 students: 25 first years and 17 sophomores. COS professors generally permit students to use either MLA or APA style to write their papers in these classes.

The researcher created the citation rubric to assess basic APA and MLA knowledge of first and second year students in the ILI classroom. Exploration of the Rubric Assessment of Information Literacy Skills (RAILS) website was combined with the researcher's past experiences with rubric construction to devise this study's instrument. Reliability of the rubric was assessed using Cronbach's alpha, a coefficient used to determine an instrument's internal consistency. When used to evaluate rubrics, Cronbach's alpha offers an authentic measure of the correlation between the tool's various items (MacLaughlin et al. 2010). The rubric was used to evaluate an in-class activity designed by the researcher (see Appendix B). The activity is comprised of four questions pertaining to citing in APA and MLA styles.

In addition to the student group, a sample of LIS professionals was also recruited to participate in this study. In order to assess the content validity of the rubric, 42 self-identified subject matter experts (SMEs) were asked to rate the extent to which the items of the rubric fully measure the construct at hand: the ability of students to distinguish between and cite in APA and MLA formats. This rating was accomplished via a four-question survey created in Google Forms (see Appendix C).

A combination of two nonprobability sampling methods was employed to secure participants: snowball sampling and expert sampling (Singh 2007). The process began with expert sampling, in which the researcher emailed ten colleagues an anonymous survey which asked them to rate the rubric's effectiveness. Snowball sampling was then employed,

encouraging these ten librarians to forward the survey to other SMEs. In order to recruit additional SMEs, this survey was also sent to a popular ILI Listserv. Out of the 42 experts, 40 identified as reference and/or instruction, one identified as technical services, and one identified as a children's librarian. The rubric's content validity was calculated using the Content Validity Index (CVI), a measure frequently used in the health professions but presently uncommon in LIS research.

Procedure

The researcher created a brief Google Forms survey asking SMEs to assess the relevancy of each of the rubric's four items (see Appendix C). A Likert scale ranging from 1 (irrelevant) to 4 (extremely relevant) was used as the rating scale. Once all 42 participants submitted their ratings, the researcher calculated the CVI of each item and the instrument as a whole. The former is called item-level CVI (I-CVI) and the latter is scale-level CVI (S-CVI) (Polit and Beck 2006). CVI is calculated by adding all the scores of threes and fours for each item and dividing the sum by the total number of responses (DeVon et al. 2007). I-CVI is generally accepted to exist if the CVI >0.78 with a pool of six or more judges and the acceptable S-CVI is usually >0.8 (Polit and Beck 2006).

Next, the researcher used the rubric to grade the student citation assignments, all of which were administered during the spring 2014 semester. In addition to validity, it is important to discern the reliability of a testing instrument. The type of reliability most pertinent to the present study is internal consistency, which is frequently measured with the Cronbach's alpha coefficient. SPSS was used to calculate the Cronbach's alpha level of the scores from the in-class citation activity. The rubric was used to determine these scores.

RESULTS

Prior to calculating the content validity of the rubric, the average SME rating for each of the four rubric dimensions was calculated. As a reminder, participants used a scale ranging from 1 (irrelevant) to 4 (extremely irrelevant). The average relevance rating for each rubric dimension is presented in Table 1.

Table 1: Average Relevance Rating as Determined by SMEs

Locating a journal article in specified database and emailing it to the instructor	**Citing a journal article in APA**	**Citing a journal article in MLA**	**Listing a difference between MLA and APA**
2.71	3.67	3.64	2.89

Collectively the SMEs determined that two of the dimensions on the rubric, citing a journal article in MLA and citing a journal article in APA, had excellent I-CVI (see Table 2) at the item level. MLA received a score of 0.88 and APA received a score of .90. The two other dimensions, locating a journal article in a specific database and listing a difference between MLA and APA styles, fell below the standard of 0.78. Both received scores of 0.6. The rubric received an S-CVI score of 0.76.

Table 2: CVI Scores as Rated by Subject Matter Experts

	Locate article	APA	MLA	Difference	Sum Total
# of items scored 3 or 4	25/42	38/42	37/42	25/42	125/164
CVI	0.60	0.90	0.88	0.60	0.76

Next, the researcher graded all of the student assignments using the citation rubric in one sitting. The average scores of the 42 students for the four tasks on the assignment can be viewed in Table 3. The internal consistency reliability of the rubric was calculated by applying Cronbach's alpha to the scores on the student assignment as determined by the citation rubric. According to SPSS the alpha level for the instrument was 0.51 (see Table 4).

Table 3: Average Student Scores on In-Class Citation Assignment

Locating a journal article in specified database and emailing it to the instructor	Citing a journal article in APA	Citing a journal article in MLA	Listing a difference between MLA and APA
1.05	0.62	1.07	1.62

In addition to the overall Cronbach's alpha, the item-total statistics as reported by SPSS are also important (see Table 5). These numbers identify individual correlations and alpha levels which can be used as a guide to improve the reliability of an instrument. The two columns on

this table useful for the purposes of this study are Corrected Item-Total Correlation (CITC) and Cronbach's Alpha if Item Deleted (CAID). The CITC column indicates the correlations between the four individual items on the rubric and the overall score. Low correlations are a problem because they signify that the item in question doesn't fit in well with the instrument in its entirety. An acceptable level for the CITC is >0.3 (de Vaus 2013). The tasks asking students to cite articles in APA and MLA accomplished this goal, with respective correlations of 0.39 and 0.48. However, the other two rubric dimensions did not meet the 0.3 mark, with the email task scoring 0.18 and the difference between MLA and APA task scoring 0.24.

Table 4: Cronbach's Alpha Statistics

Reliability Statistics

Cronbach's Alpha	N of Items
.514	4

Next, the CAID column determines alternate Cronbach's alpha levels were the item in question completely deleted from statistical analysis. The present data reports that the only way for the current rubric to gain a higher alpha level would be to remove the email task. Deleting any of the three remaining dimensions would result in a lower alpha level than the present level, which once again is 0.51.

Table 5: Item-Total Statistics for Rubric

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation		Cronbach's Alpha if Item Deleted
Email	3.3095	2.512	.182		.588
APA	3.7381	2.881	.390		.400
MLA	3.2857	1.965	.489		.239
Difference	2.7381	3.076	.241	.131	.494

DISCUSSION

Overall, statistical analyses suggested that the citation rubric needed some modifications in order to improve both its validity and reliability. In terms of the rubric's content, the 42 SMEs indicated that half of the four dimensions might be unnecessary in the scoring of student citing abilities: locating an article in a database and sending it to the instructor and listing a difference between MLA and APA styles. The average rating on the 1 to 4 Likert scale for the former was 2.71 and 2.89 for the latter, placing both dimensions between somewhat relevant and quite relevant (Beck and Polit 2006). These results were reflected in the I-CVI, as neither of these two dimensions received acceptable content validity levels.

However, the SMEs showed strong support for the inclusion of both citing an article in ALA and MLA styles on the rubric. The average score for the former was 3.67 and the latter was 3.64, placing them both squarely in between quite relevant and extremely relevant. These two dimensions reported excellent I-CVI levels, with citing in APA at 0.90 and citing in MLA at 0.88. When assessed as a whole, the rubric received an S-CVI score of 0.76, just barely missing the generally accepted score of >0.80.

As for the internal consistency of the rubric, statistical analysis revealed a Cronbach's alpha level of 0.51, which falls well below the minimum acceptable level of 0.7. Alpha levels

dipping below 0.6 are considered unacceptable (Sharma and Petosa 2012, 111), suggesting that the items on the original rubric did not share a close enough relationship to each other to justify their continued use.

Additional statistical support in favor of alterations to the rubric can be garnered from the item-total statistics in Table 5. The fact that two out of the four items on the rubric, the email and the APA/MLA difference tasks, failed to reach the recommend CITC level of 0.3 shows a weak relationship between these tasks and the instrument as a whole. This calls into question the ability of these two tasks to consistently and efficiently achieve the goal of measuring student knowledge of APA and MLA fundamentals. Furthermore, data in the CAID illustrates that removal of the email task from the rubric would increase the alpha level to nearly 0.6, which is moving closer to the accepted level of 0.7, and henceforth an empirically reliable instrument.

The results from the content validity and internal consistency calculation demonstrated to the researcher that the rubric, and by proxy COS students, could benefit from a restructuring. The fact that so many librarians were uncertain about the need for a dimension involving locating an article in a database on a citation rubric led to the eventual deletion of this dimension. After much thought, the researcher decided it was not representative enough of the task at hand: developing basic skills in citing articles in MLA and APA styles.

Additionally, the statistical data led to the removal of the dimension asking students to list a difference between APA and MLA styles. Instead, the feedback of the SMEs led to the addition of two new dimensions to the rubric: writing an in-text citation in APA style and writing an in-text citation in MLA style. Because of their high I-CVI scores the two rubric dimensions about citing journal articles in MLA and APA were kept on the rubric. However, the language of both dimensions was slightly altered for clarification purposes. The modified rubric can be

viewed in Appendix 4. The student in-class citation activity will also be updated to reflect the changes in the rubric. All future COS library instruction classes taught by the researcher will receive the revised citation activity, which will be graded using the revised rubric.

There are a few salient limits to this study worth addressing, especially in light of the fact that the discipline of LIS is displaying increasing commitment to the assessment and documentation of ILI strategies. First, this researcher chose to focus on the assessment of a specific instrument used to evaluate an integral aspect of undergraduate IL skill development, citation practices. The main goal of the project was to evaluate the reliability and validity of the rubric, identifying aspects which needed to be altered to order to better measure student knowledge of basic citing abilities. The actual scores the students received on the in-class assignment were not very high, as can be seen in Table 3. For example, the average rubric score of citing an article in APA was 0.62, below the beginner level, and the average score for citing in MLA was 1.07. These scores show, no doubt, that first and second year students in COS classes would definitely benefit from extra instruction on citing in both MLA and APA.

The researcher opted not to delve too far into student scores on the assignment because this study was intended as a pilot study, which would establish reliability and validity of the citation rubric. The next step in this project will be to apply the empirically improved rubric to a larger group of students and conduct an in-depth assessment and analysis of citation abilities among lower-level undergraduates. This future study will fully address causes and solutions of low scores on citation activities.

Another limit is that while the use of the Content Validity Index (CVI) generated rich and beneficial quantitative data it did not leave any room for qualitative responses from any of the 42 subject matter experts. These librarian participants helped modify the rubric with numbers alone,

which fit the purposes of the CVI but precluded any discursive feedback. In the future, the researcher would structure content validity surveys to include a comments space for participants to include qualitative data, as it would definitely be a benefit to the instrument's construction to receive detailed advice from knowledgeable LIS professionals.

A final study limit is that countless citation styles exist within academic research and this article only encompasses two, APA and MLA. Therefore, this rubric would need to be altered if used by librarians teaching students who work with other popular styles, such as Chicago or AMA. Future comparative projects investigating the reliability and validity of rubrics measuring other citation styles would be a valuable contribution to the professional literature. In order to ensure that our students are receiving the highest quality ILI possible it is essential that we not only develop assessment tools but that we also assess the effectiveness of these tools.

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Appendix A: Original Citation Rubric

Criteria	Level 1 Beginning	Level 2 Developing	Level 3 Advanced
Locating a journal article in a specified database and emailing it to the instructor	Does not email a journal article	Emails a journal article from an incorrect database	Emails a journal article from the specified database
Citing an electronic journal article in APA (6th edition) format	Three or more errors in formatting article in APA or leaves question blank	One or two errors in formatting article in APA format	Cites article in perfect APA format
Citing an electronic journal article in MLA (7th edition) format	Three or more errors in formatting article in MLA or leaves question blank	One or two errors in formatting article in MLA format	Cites article in perfect MLA format
Listing differences between MLA and APA styles	Provides incorrect answer or leaves question blank	Provides vague or partially incorrect answer	Correctly lists one or more differences between MLA and APA styles

Appendix B: Student In-Class Citation Activity

NAME: _____

CLASS YEAR (please circle): FIRST YEAR SOPHOMORE JUNIOR SENIOR

Learning outcomes

Once you have completed this activity you will be able to meet the following goals:

- **Be able to find one scholarly article in a Library database**
- **Be able to format article citations in APA and MLA styles**
- **Be able to identify primary differences between APA and MLA citations**

1. Find one article relevant to your paper topic in **SocINDEX With Full Text**. Please email the article to yourself and to me (insert librarian's email address).

2. Using **APA style**, write down the citation for the article you found. See your citation handout or the Purdue Online Writing Lab webpage to create your citation: https://owl.english.purdue.edu/owl/resource/560/07/

3. Using **MLA style**, write down the citation for the same article you found. See your citation handout or the Purdue Online Writing Lab webpage to create your citation: https://owl.english.purdue.edu/owl/resource/747/07/

4. List one **difference** you notice between APA and MLA styles, using your citations above as examples.

Appendix C: Content Validity Survey Administered to SMEs

Feedback on a citing rubric

The purpose of this survey is to seek other academic librarians to help determine the content validity of a rubric I created. The overall purpose of the assignment which uses this rubric is for undergrads to properly distinguish between citing a journal article in MLA and APA format.

I'm trying to establish how appropriate each of my 4 items are to what I'm trying to measure [undergrads' abilities to cite articles in both MLA and APA]. Given that you know the goal of this assignment, can you please rate on a scale from 1 (least) to 4 (most) how relevant you think my items are to the task at hand? Thank you so much!

Citing a journal article in MLA formatt*
Please select how relevant you think this item is.

	1	2	3	4	
Irrelevant	○	○	○	○	Extremely relevant

Locating a journal article on their research topic in a specified database and emailing it to the instructor*
Please select how relevant you think this item is.

	1	2	3	4	
Irrelevant	○	○	○	○	Extremely relevant

Citing a journal article in APA format*
Please select how relevant you think this item is.

	1	2	3	4	
Irrelevant	○	○	○	○	Extremely relevant

Please select your current position.*

- ○ Reference and/or instruction
- ○ Technical Services
- ○ Systems
- ○ Other: _____

Listing a difference between MLA and APA styles*
Please select how relevant you think this item is.

	1	2	3	4	
Irrelevant	○	○	○	○	Extremely relevant

Appendix D: Modified Citation Rubric

Criteria	Level 1 Beginning	Level 2 Developing	Level 3 Advanced
Format an in-text citation in APA (6th edition) for an electronic journal article	Two or more errors in formatting in-text citation or leaves question blank	One error in formatting in-text-citation	Cites article in perfect APA format
Cite an electronic journal article in APA (6th edition) for References page	Three or more errors in formatting article in APA or leaves question blank	One or two errors in formatting article in APA format	Cites article in perfect APA format
Format an in-text citation in MLA (7th edition) for an electronic journal article	Two or more errors in formatting in-text citation or leaves question blank	One error in formatting in-text-citation	Cites article in perfect MLA format
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