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Impact of Library Instruction on the Development of Student Skills in Synthesis and Source Attribution: A Model for Academic Program Assessment

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ABSTRACT

This paper details the process and results of a multistep assessment project addressing senior Social and Behavioral Science majors' proficiency in information synthesis in capstone papers and source attribution in oral presentations. The study entailed using results from a campus-wide assessment project to identify challenging areas of information literacy for students and subsequently designing and implementing an instructional intervention focused on those areas. The intervention was assessed through a rubric-based evaluation of student work, and the resulting data suggest that the intervention was effective in enhancing students' proficiency in the areas targeted. Our strongest result was an improvement in citation practices in capstone presentations; while improvements in synthesis of information from sources were not as large or definitive, they were still suggestive of the potential that librarians have to increase students' skills in this area. This paper may prove useful for those seeking inspiration for providing instruction on synthesis in written work or attribution in presentations, or those interested in a model for using campus-wide or academic program assessment to measure the impact of library instruction.

Introduction

For academic libraries, measuring the impact of information literacy instruction can be a difficult endeavor. It is much easier to capture student impressions at the end of an instruction session than it is to determine whether the skills taught have had a lasting impact on student work. We have attempted to measure the latter by conducting campus-wide and program-wide assessments of information literacy in student work. Our initial campus-wide assessment identified two areas in which we hoped to create improvement: synthesis of information in written work, and source attribution in oral presentations. To address these areas, we developed a lesson plan and accompanying materials that were utilized to provide instruction to all students in their final semester of the Social and Behavioral Sciences (SBS) program. We attempted to "close the loop" by assessing the capstone projects these students produced at the end of the semester, and found evidence that our instructional intervention was effective at improving student performance in these two areas, as evidenced by higher scores in corresponding rubric categories. This description of these efforts may prove useful for those seeking inspiration for providing instruction on synthesis in writing or attribution in presentations, or those interested in a model for using campus-wide or academic program assessment to measure the impact of library instruction.

Our institutional context

This study was performed at California State University, Monterey Bay (CSUMB), a public, comprehensive university. The enrollment for Fall 2019 was around 7600 FTE, with 88% undergraduates and 41% transfer students. We are a Hispanic-Serving Institution, with 44% Latinx students and 50% under-represented minorities. Fifty-one percent are first-generation students and 32% are low income.

In 2012, our campus renewed its interest in conducting campus-wide assessment of the core competencies identified by our accrediting body, the WASC Senior College and University Commission (WSCUC). These competencies are information literacy, critical thinking, quantitative reasoning, and oral and written communication, which were combined to become one of the four undergraduate learning outcomes that our campus adopted in 2014. Information literacy's presence in one of our campus' undergraduate learning outcomes has increased the profile of information literacy at CSUMB and has ensured that it is assessed routinely on a campus-wide level. Dozens of faculty from across campus have participated in these assessment efforts in the role of "faculty assessment scholars." Applications for these positions are accepted from all faculty (tenure-line and adjunct), and the successful candidates receive a small stipend for their work. This work consists of 5–6 meetings throughout the semester, during which participants

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discuss the competency to be assessed and engage with materials provided by the facilitator to deepen their understanding of the competency and related pedagogy. This is followed by several days of assessment, where after norming to the rubric (modified versions of AAC &U VALUE rubrics are used in most cases) faculty assessment scholars examine student work and score it according to the various rubric categories. CSUMB's approach to faculty-driven assessment has been successful in engaging faculty and fostering a culture of assessment (Canner et al., 2020). Additional faculty have been reached with our closing-the-loop efforts, including workshops on understanding and teaching the competencies, as well as through resources such as assignment guides, rubrics, and rubric guides. Further, a notable institutional characteristic of CSUMB is that teaching and learning initiatives are fundamentally intertwined with assessment by virtue of having a unit on campus designated with overseeing each of these areas: The Center for Teaching, Learning and Assessment (TLA). This arrangement has provided many opportunities for faculty on our campus to formulate connections between assessment projects and day-to-day classroom instruction.

In the past few years, degree-granting programs have been asked to align their major learning outcomes with the undergraduate learning outcomes. Programs have the option to address elements of the undergraduate learning outcomes as part of the annual assessment they conduct leading up to academic program review (e.g. they can choose to assess information literacy instead of one of their major learning outcomes). Our campus culture of faculty-driven assessment and the incorporation of undergraduate learning outcomes into the program review cycle have been key factors in facilitating the assessment project described here.

Literature review

Synthesis of information from sources

Synthesis is a critical component necessary for students to move from “developing” to “proficient” in CSUMB's information literacy rubric (Appendix A), and crossing this threshold was a common area of struggle for students identified by our initial assessment. Thus, information synthesis was one of our areas of focus for enhancing learning within the context of SBS capstone courses. The importance of supporting students' information synthesis skills is reflected in the “Research as Inquiry” frame of the ACRL Framework, which lists “synthesize ideas gathered from multiple sources” as one of the knowledge practices within this frame (ACRL, 2016). Within the scope of SBS courses, “synthesis” primarily refers to the way that students integrate scholarly sources in both written and oral communication work in pursuit of the development of an original argument in the social sciences. According to Bråten and Strømsø (2003), multiple activities occur when students bring together information from various sources, including organization, comprehension, problem detection, and problem solving. The ability to synthesize information effectively has implications not just in academic coursework but also in students' day-to-day lives and their ability to contribute in the workplace. Project Information Literacy's Lifelong Learning Study identifies specific “adaptable information practices from college” that recent graduates have cited as important in their transition into the workplace (Head, 2014, p. 5). Interviewees in this study mentioned the importance of critical thinking skills they had taken from college, especially the ability to sort through large volumes of content and synthesize key points. Additionally, according to Howard, Serviss, and Rodrigue (2010), a focus on synthesis helps students avoid plagiarism in that effectively synthesizing texts allows students to avoid constructing arguments from isolated sentences pulled from sources, a mode of writing likely to lead to plagiarism.

The work of Howard et al. (2010), Mateos and Solé (2009), and Carlozzi (2018) articulates the way in which college students have difficulty analyzing and synthesizing different pieces of information. The aforementioned studies describe recommendations for teaching synthesis but stop short of describing the use and impact of these approaches in the classroom. The work of Lundstrom, Diekema, Leary, Haderlie, and Holliday (2015) is notable in that librarians design, implement, and assess instruction focused on synthesis, whereas much of the literature on synthesis comes from other disciplines. Our approach utilized advice from this study that students “benefit from teaching methods that break down the different skills involved in synthesis” (Lundstrom et al., 2015, p. 72).

Citations in oral presentations

A review of the literature reveals limited information about information literacy instruction related to oral communication. Several studies describe instruction designed to assist students in gathering credible evidence for their oral presentations, but do not explicitly address source attribution (Bonnet, Herakova, & McAlexander, 2018; Koss, 2014; Sjoberg & Ahlfeldt, 2010). Two studies describe librarians embedded into introductory oral communication courses to ensure an appropriate emphasis on supporting claims with credible evidence and citing sources (Rustic & Wood, 2018; Weaver & Pier, 2010). While the instruction described included citations, they were only mentioned in the context of a written bibliography accompanying the presentation outline. Gains and Stoddart (2011) reviewed oral communication textbooks in search of concepts related to information literacy, and while they found that some texts mention giving credit to sources, providing instruction in this area is beyond the scope of their paper. The instructional intervention we performed offers a different perspective on this area, in that it targets graduating seniors, who have already received instruction on finding and evaluating information, allowing us to focus on the technical aspects of citing sources in an oral presentation, both verbally and on slides or posters. The importance of a thorough approach to teaching students how to cite is reflected in the “Scholarship as Conversation” frame of the ACRL Framework, which mentions that providing attribution “enables the (scholarly) conversation to move forward and strengthens one's voice in the conversation” (ACRL, 2016).

Assessment of information literacy

There has been research conducted on the effects of targeted information literacy instruction on student learning since at least the early 2000s (Emmons & Martin, 2002). This research has largely focused on instruction taking place at an introductory or first-year level (e.g. Chisholm & Spencer, 2019; Watson et al., 2013). The findings presented in our paper provide a unique contribution to the existing body of literature on information literacy assessment through our focus on the impact of an instructional intervention on senior capstone students. Luetkenhaus, Borrelli, and Johnson (2015) write that “while many librarians continue to work with individual instructors or single course sections to teach and assess information literacy, there is an increasing need for librarians to become involved in wider campus assessment initiatives to advocate for information literacy outcomes” (p. 50). Our approach aspired to meet this need through utilizing findings gained from a campus-wide assessment initiative to design a targeted intervention within a specific discipline that holds implications for information literacy instruction in departments across campus. While the use of AAC&U VALUE rubrics is relatively common among academic librarians involved in assessing student work (e.g. Holliday et al., 2015; Markowski, McCartin, & Evers, 2018) there is limited research that employs these rubrics to measure the impact of a teaching intervention.

Methods

Baseline measurement of information literacy

CSUMB conducts periodic campus-wide assessments of our undergraduate learning outcomes (ULOs), including information literacy. In Summer 2017, faculty assessment coordinators for each of the ULOs (including author Sarah Dahlen) led groups of faculty assessment scholars (including author Ryne Leuzinger) in scoring samples of student work from across campus. These assessments integrated several ULOs, with one group assessing written samples of student work, one group assessing video recordings of students' oral presentations, and another group assessing assignments that included quantitative reasoning. Information literacy was a component of all of these assessments, meaning that it was assessed in approximately 686 student artifacts, according to the components of an information literacy rubric our campus had previously adapted from AAC&U (see Appendix A). Each artifact was scored by two faculty assessment scholars, and splits of two points or greater, as well as splits between scores of two and three, which is the threshold for proficiency, were resolved by discussion. The artifacts were all produced by students in Spring 2017.

Results of this campus-wide assessment indicated that students needed more support in synthesizing information from sources and citing sources in oral presentations. While this need was not limited to a particular program, we chose to focus our intervention on the Social and Behavioral Science (SBS) program, as this is a major where faculty were receptive to our efforts. Some of the work from SBS students that had been included in the campus-wide assessment were capstone papers and recorded capstone presentations. As students produce these in their final semester of college, they provide a snapshot of the information literacy skills that these students demonstrate near graduation.

Once we decided to focus on the SBS major, we increased the sample size from the campus-wide assessment (21 SBS capstone papers and 10 SBS capstone presentations) to include the entire population of 43 papers and 14 presentations. This additional assessment work was facilitated by the authors in August 2018, with two of the faculty assessment scholars from the 2017 assessment conducting the scoring. Procedures from the 2017 assessment were followed to ensure scoring comparability.

Developing an instructional intervention

In the spring semester of 2018, the authors piloted a two-hour instruction session in one section of the final-semester capstone course in SBS, in which we focused on information synthesis in writing and source attribution in oral presentations through an active learning approach. We were then able to coordinate with course instructors to provide this instructional intervention to all sections of the final-semester capstone course in academic year 2018–19 (see lesson plan in Appendix B). We utilized a “backward design” process by first identifying our learning outcomes (students will apply concrete strategies for synthesizing information from sources; students will execute best practices for citations in oral presentations), and subsequently developing class content to support these outcomes. Recognizing that students may have divergent understandings of synthesis, the session begins with establishing a mutual definition of the term through review of a definition found in the work of Lundstrom et al. (2015). We thought that encouraging students to consider the broad relevance of synthesis would be helpful in creating an engaging learning experience. Therefore, the first portion of the session involves an emphasis on the transferability of information synthesis skills through reference to the Project Information Literacy article “What information competencies matter in today's workplace?” (Head, Hoeck, Eschler, & Fullerton, 2013), which articulates ways in which these skills are an important asset across professions.

A guiding principle for the session was that to meet the learning outcome on information synthesis, it would be necessary for students to see discrete examples of synthesis, which we strived to do by including a paragraph that exemplified information synthesis on our class handout (Appendix C). Students were asked to read the paragraph and identify where synthesis occurred, leading to a discussion of different ways that writers can make connections between sources explicit for their readers. We then facilitated student engagement in a paired activity in which each student reviewed a peer's draft literature review for evidence of synthesis, with a particular focus on textual indicators (see Appendix B for examples), number of citations per paragraph, and other indications that connections between sources were being made. We then solicited students' strategies for keeping information from their sources organized in a way that allows them to see the connections among them. Students typically had some strategies to share, and we were able to build on these by suggesting additional strategies. The primary strategy we shared, and the one that seemed to resonate most with students, was a synthesis table (see Appendices D & E). We hoped that sharing and discussing how to use a blank synthesis table and an example of a completed one would provide students with a clear, replicable method for identifying the relationships between sources and developing the synthesis-focused portions of their capstone project (e.g. literature reviews).

Improving students' ability to effectively incorporate citations into oral presentations entailed the development of instructional tools specific to this purpose. Because style guides are largely silent on this topic, author Sarah Dahlen collaborated with Shar Gregg, a CSUMB faculty member with expertise in oral communication, to develop a series of guides for students (Dahlen & Gregg, 2018, 2019a, 2019b, 2020). These guides address how students can verbally attribute information to sources and also include recommendations for including citations and reference lists on presentation slides. Assessment data had suggested that students struggled both to identify when citations in oral presentations were needed and to effectively construct these citations. Clearly articulating a rationale for citations in this context was an important starting point in this section of the instruction session. We did so through a dialogue with students regarding the role that citations play in establishing the credibility of the speaker, giving credit to the source, and allowing interested audience members to find sources. This was followed by a discussion of the audience and purpose of the presentation and how that might affect how sources are verbally cited. For their capstone presentations, SBS students are expected to give an academic conference-style presentation, but the discussion of various presentation genres may help students transfer this knowledge to other contexts. The opportunity for the transfer of these skills was made explicit through a brief discussion of how verbally attributing information to sources can be a useful workplace skill.

The final portion of the lesson was aimed at orienting students to the online guides for citations in oral presentations, with the hope that highlighting key sections of these would enable students to refer back to them at the point of need. In addition to reviewing and discussing the guide's sections on verbal attribution, in-text citations, and reference lists, we also cover citations for images, tables, and graphs. While the use of copyrighted images in educational contexts is typically covered under the fair use doctrine, we show the video on finding images licensed for reuse (Dahlen, 2018) that is embedded in the online guides and explicitly connect that content to using images in the workplace or in other non-educational settings. We have chosen to place particular emphasis on the transferability of both synthesis and citation skills to life after college because this instruction occurs during students' final semester and because we anticipate that students might be better able to transfer knowledge and skills to a new context when the possibilities for doing so are made explicit. While this section of the lesson plan includes less hands-on practice than the section on synthesis, we try to engage students in dialogue to the greatest extent possible.

Evaluating the instructional intervention

To gauge the effectiveness of our instructional intervention, we conducted an assessment of SBS capstone papers and presentations generated by students in Fall 2018 and Spring 2019, the semesters that we implemented the intervention. Our sample size for this post-intervention assessment did not include the entire population of student artifacts for two reasons: 1.) not all students attended class on the days of the intervention, and their artifacts were excluded; and 2.) our IRB required that we obtain consent from students to use their artifacts (though they did not require us to obtain retroactive consent from the already-graduated students of the 2017 class), and not all students consented. This was a limitation of our study, though it was controlled for in our statistical analysis.

The 2018–19 student artifacts were evaluated in May 2019 by four SBS faculty assessment scholars who, to ensure data comparability, employed the same rubric and procedures as in the previous assessments. While these four faculty scholars had not participated in the previous assessments, the two authors facilitated the process and ensured that the rubric was applied similarly. These faculty were recruited through their department chair, whom we approached with a proposal to have our assessment project double as an annual assessment activity toward their academic program review. We were able to provide a small stipend, which allowed two adjunct faculty to participate in addition to two tenure-line faculty who would generally be responsible for program review activities. Forty capstone papers (48% of population) and ten capstone presentations (91% of population) were scored. Because of scoring inconsistencies in the 2017 assessment process, all ten of the 2017 presentations were re-scored by this group (without knowing which presentations came from which cohort).

The Social Science Research Center at California State University, Fullerton was contracted to conduct analyses of the two sets of rubric scores (2017, 2018–19) to determine whether the differences between them were statistically significant after controlling for variables in the composition of the cohorts. We predicted a statistically significant increase in student scores from the 2017 control group to the 2018–19 intervention group, which would point toward our instruction having a positive impact on student information literacy proficiency. For the purposes of the analysis, the rubric scores served as the dependent variable, while exposure to the instructional intervention was the independent variable. A series of linear regressions were conducted to examine whether scores on components of the rubric were higher among those exposed to the intervention than those who were not. Demographic and academic characteristics, such as gender, race/ethnicity, first-generation status, GPA, and SAT scores (when available), of the study participants were also analyzed as potential confounding variables.

Data analysts used a multi-step process to determine whether the intervention had the desired impact on rubric scores. An independent samples *t*-test to compare the mean of the intervention and comparison groups was the first step taken by the data analysts. This step established the first criteria by which analysts determined whether there was statistical evidence that the associated population means are significantly different from one another. A measure of effect size, Cohen's *d*, was also utilized to assess the results of the independent sample t-test. The width of the confidence interval resulting from the independent sample t-test was also examined, such that a confidence interval that contained a value of zero was indicative of no mean difference between the two groups.

If it was determined that the results of the t-test were suggestive of a possible effect, a second step was taken. The comparison and intervention groups were not equal with respect to various demographic and academic characteristics (see Tables 1 & 2). If the data analysis found a statistically significant difference in the rubric scores between the students in the intervention and control group, a potential confounding explanation might be that the demographic or academic differences between the two groups, not the intervention, accounted for the difference in the scores. In order to rule this possibility out, a multiple linear regression equation run on SPSS 24.0 was conducted. A multiple linear regression is a statistical technique that uses several explanatory variables to predict the outcome of some dependent variable.

Collecting feedback from students

To gauge student perception of the instructional intervention, we asked participants in the intervention group to provide feedback at the end of the instruction session. Feedback was collected via a four-question survey (see Appendix F), administered either on paper or online (the latter only when classes were held in computer labs) at the conclusion of each instructional session. Fifty-three participants completed the survey. The responses to these open-ended questions were coded using NVivo to allow us to analyze the themes that arose and their frequency.

Results

Analysis of capstone papers

Table 3 presents the mean score of the capstone papers analyzed on all three components of the rubric for the control and intervention groups, along with the average overall score. As shown, for student papers, the intervention had no effect on the “supporting materials” or “academic integrity” dimensions of the rubric: the mean difference in both between the intervention and comparison group was near zero. However, the papers from the intervention group scored slightly higher on the “use of support” dimension and on the overall rubric score. The results of the independent sample *t*-test, a measure of effect size (Cohen's d), and the confidence interval of the mean difference were used to examine these differences more closely.

Looking first at the overall rubric score for capstone papers, the test of statistical significance was not significant and the value of Cohen's d was small ($t(80) = -0.319$, $p = .751$; Cohen's $d = 0.071$). Furthermore, a confidence interval of -0.7235 and 0.5270 clearly contains the value zero, indicative of no mean difference. As such, it was determined that the impact of the intervention on the overall rubric scores for capstone papers was not significant.

Looking at the “use of support” dimension of the rubric (which includes synthesis), the test of statistical significance was also insignificant ($t(80) = -1.375$, $p = .173$). Additionally a Cohen's d of 0.304 indicates a small effect size. While the confidence interval of the mean difference contains zero, it does so by less than 0.10 points. Consequently, it was determined that the intervention may have had a small impact on this dimension of the rubric. Because the intervention and control groups differed with respect to scores on the math component of the SAT and the number of units completed by participants at the time of the study, and because these two variables were related to rubric scores for capstone papers, one more analysis was needed to rule out the possibility that these variables might be accounting for this finding.

A multiple linear regression analysis was run to determine if the effect observed in the result of the independent sample *t*-test persisted after controlling for scores on the math component of the SAT and the number of units completed at the time of the study. In this analysis, rubric dimension “use of support” was the dependent variable and the treatment condition was the independent variable. Scores on the math component of the SAT and units completed at the time of the study were entered into the regression model as a first step to control for their influence. While the p value associated with this test did not meet the cut off for establishing statistical significance ($\beta = 0.118$, $p = .485$), the Cohen's d associated with this value was 0.240, suggestive of a small, but positive, effect associated with participation in the intervention on performance on this rubric dimension.

Table 1
Demographic characteristics of participants by cohort.

		Control group count and percentage	Intervention group count and percentage
Gender	Male	19 (43%)	10 (25%)
	Female	25 (57%)	30 (75%)
Generation status	First generation	31 (70%)	28 (70%)
	Not first generation	13 (30%)	12 (30%)
Race/ethnicity	African American	1 (2%)	1 (3%)
	Native American	1 (2%)	0 (0%)
	Asian American	3 (7%)	2 (5%)
	Two or more races	5 (11%)	3 (8%)
	White	9 (20%)	11 (28%)
	Latinx	25 (57%)	19 (48%)
	Other	0 (0%)	4 (10%)
Admission status	Upper division transfer	35 (80%)	28 (70%)
	First-time freshmen	9 (20%)	12 (30%)

Table 2
Measures of academic preparedness of participants by cohort.

		Control group mean	Intervention group mean
SAT score[a]	SAT math	458 (n = 18)	417 (n = 18)
	SAT verbal	462 (n = 18)	451 (n = 18)
Years to graduation		3.2	2.7
Number of units completed		135	130
Cumulative GPA		3.09	3.19

[a] SAT scores were only available for students admitted as first-time freshmen.

Analysis of capstone presentations

Table 4 presents the mean scores on all three rubric components for oral presentations of capstones for the control and intervention groups, along with the overall scores. As shown below, the capstone presentations of those who were in the intervention group scored higher on all components of the rubric than those in the control condition.

The results of independent sample *t*-test, a measure of effect size (Cohen's d), and the confidence interval of the mean difference were used to examine these differences more closely. Looking at the "supporting materials" dimension of the rubric, the test of statistical significance is not significant ($t(14.5) = -1.350$, $p = .198$). A Cohen's d of 0.603 indicates a moderate effect size, however. Although the confidence interval of the mean difference contains a value of zero, it does so by only 0.23. These findings point to a potentially positive relationship between participation in the intervention and scores on this dimension of the rubric.

Looking at the "use of support" dimension of the rubric, the test of statistical significance is not significant ($t(22) = -0.693$, $p = .493$). Additionally, a Cohen's d of 0.288 indicates a small effect size. The confidence interval of the mean does contain a value of zero, but it also does so by very little. These findings suggest that there may be a potentially small effect of the intervention on this dimension of the rubric.

For the "academic integrity" dimension of the rubric, which includes the use of citations, the test of statistical significance is significant ($t(22) = -2.59$ $p = .017$). Furthermore, a Cohen's d of 1.07 indicates a large effect size. Additionally, a confidence interval of -1.57 and -0.174 does not contain a value of zero, supporting a statistically significant difference. These findings point to a probable positive relationship between participation in the intervention and scores on this rubric dimension.

Looking at the overall rubric score, the test of statistical significance is not significant ($t(18) = -1.54$, $p = .141$). However, a Cohen's d of 0.688 indicates a medium effect size. Again, the confidence interval does contain a value of zero, but it does so by very little. These findings point to potentially positive relationship between participation in the intervention and overall rubric scores.

The intervention and comparison group differed with respect to the number of years to graduation and this variable was related to rubric scores for capstone presentations. A regression analysis was run to determine if the positive potential relationship between the intervention and performance (measured via each rubric component and the overall rubric score) persisted after controlling for the number of years needed to graduate.

After controlling for the number of years needed to graduate, the following relationships were uncovered. The relationship between treatment condition and rubric dimension "supporting materials" did not reach statistical significance ($\beta = 0.527$, $p = .103$). An effect size of $d = 1.29$, however, was suggestive of a large effect size. The relationship between treatment condition and rubric dimension "use of support" did not reach statistical significance ($\beta = 0.266$, $p = .356$). An effect size of $d = 0.664$ represents a small to medium effect size, however. Thus, it was determined that there is a potentially small to moderate positive effect of the intervention on rubric dimension "use of support." The relationship between the treatment condition and rubric dimension "academic integrity" did persist after controlling for years to graduation ($\beta = 0.984$, $p = .008$). An effect size of $d = 1.36$ suggests a large effect. Finally, the statistical test examining the relationship between the intervention and the overall rubric score reached near statistical significance ($\beta = 0.446$, $p = .065$). Furthermore, a Cohen's d of 1.03 is indicative of a large effect size. In combination, these results suggest that the intervention did have a positive effect on rubric dimension "academic integrity" and the overall rubric score, while it may have had an impact on rubric dimensions "supporting materials" and "use of support."

Table 3
Difference in rubric scores for capstone papers by cohort.

	Control group mean	Intervention group mean	Mean difference	Confidence interval
Supporting materials	2.84	2.79	−0.05	–
Use of support	2.40	2.60	0.1944	[−0.4758, 0.0870]
Academic integrity	2.62	2.56	−0.06	–
Overall score	7.85	7.95	0.0999	[−0.7235, 0.5270]

Table 4
Difference in rubric scores for capstone presentations by cohort.

	Control group mean	Intervention group mean	Mean difference	Confidence interval
Supporting materials	2.60	3.00	0.400	[−1.03, 0.234]
Use of support	2.36	2.55	0.193	[−0.770, 0.384]
Academic integrity	1.93	2.80	0.871	[−1.57, −0.174]
Overall score	7.05	8.35	1.30	[−3.08, 0.481]

Student feedback on library sessions

In addition to students' ability to apply the content of the instructional intervention to their capstone papers and presentations, it was also informative to analyze the feedback students provided after attending the library sessions. The tables below show the themes that most frequently emerged from our qualitative analysis of student survey responses. Each theme in the table is accompanied by the number of student responses in which it appears, a brief description, and a quote from a student response that exemplifies the theme.

The first question posed to participants was, "what was the most important thing you learned today about synthesizing information from sources?" (Table 5). The most common theme in the responses was the importance of making connections among sources (n = 18). A number of participants expressed appreciation for the textual indicators included in our handout that served as examples of how to make connections between sources explicit for the reader (n = 10). The other most frequently occurring themes were showing source similarity by incorporating multiple citations in a single sentence (n = 7) and creating a conversation between authors in the literature review (n = 6). See Table 5 for additional themes.

Participants were also asked, "what was the most important thing you learned today about citing your sources in oral presentations?" (Table 6). The most frequently occurring theme in their responses related to the necessity of and process for citing images (n = 18). Verbal attribution, or how to acknowledge sources verbally in a presentation, was another common theme (n = 10). Other themes included reasons that source citation is important in oral presentations, including establishing the credibility of the presenter (n = 7) and giving credit to the author or creator (n = 6). See Table 6 for additional themes.

The feedback survey also asked participants what could have been explained more clearly or explored in more depth during the library session (see Appendix G for response summary table). The most common theme that arose from the responses was additional support with writing, and writing a literature review in particular (n = 5). Other students requested more examples or explanations of citations in Chicago style (n = 4) or information on specific citation practices (n = 4). While some of this may be beyond the scope of our presentation, it is still useful to know which areas students perceive to be challenging, and that students may not be comfortable voicing their questions during the session, as they did not do so despite having multiple opportunities. See Appendix G for additional themes.

The final survey question asked what participants learned during the session that they can imagine using in their lives after college, which we included to enable students to reflect on how these skills might transfer to other contexts (see Appendix H for response summary table). The most common theme identified in the responses was synthesis, including some of the specific strategies presented (n = 20). The synthesis table, one of the strategies presented and thus a subset of the previous theme, was mentioned by a number of students (n = 8). How to cite images was another skill that multiple students anticipated using in their lives after college (n = 7). See Appendix H for additional themes.

The feedback we received from students attending the instructional intervention was encouraging in several ways. First, participants were able to identify important things that they learned about synthesis and citations in oral presentations, suggesting that they were sufficiently engaged in the session to recall specifics about the instruction, and these were most often related to our key instructional points. Second, while we received some useful feedback for improvement, most of the

Table 5
Student responses to "What was the most important thing you learned today about synthesizing information from sources?".

Theme	Count	Theme description	Illustrative quote
Connections between sources	18	The importance of showing or finding connections among ideas, sources, etc.	"Pointing out each individual perspective from the different sources on the common theme"
Textual indicators	10	The phrases presented on the handout that indicate connections between sources (e.g. "in comparison…")	"The most important thing I learned was although as a writer I know how my sources agree/disagree, it is not always clear to the reader so using textual indicators to connect sources is very important."
Multiple citations per sentence	7	Technicality of how to cite multiple sources in one sentence, presented as a way to show agreement among sources	"The most important thing I learned today about synthesizing is being able to cite more than one author in a sentence, or few sentences."
Conversation between authors	6	Reference to idea that in a literature review, the authors should be in conversation with each other	"Look at the sources as being in conversation with one another. Explicitly make connections."
Writing	6	Considerations involving writing, especially writing a literature review	"How to construct a paragraph by utilizing the sources and then to attach the conflicting or agreeing sentences with the indicator terms."
Communicating to reader or audience	5	The importance of using explicit language to let the reader see what the author understands, particularly with regard to connections between sources	"The most important thing I learned about synthesizing information from my sources is that leading variations, transition phrases, are crucial to informing your audience as to the direct and flow of where the piece is going. Additionally, including multiple sources to support or counter one key concept is important to establishing credibility with your audience, and makes for a stronger piece."
Multiple sources per paragraph	5	As a precursor of synthesis, and in contrast to each paragraph describing a single source	"To make sure that there is a connection between my sources. It is important to cite many authors throughout my paragraphs."
Synthesis strategies	5	Strategies presented for finding connections between sources, including finding common denominators, highlighting in different colors, and using a synthesis table	"I learned about the techniques and phrases to use in order to show synthesis in writing. I found this very useful in order to show how sources can support/contradict each other in writing."
Identifying themes	4	The need to identify the themes that appear in the sources and address these in the literature review	"Finding the common themes."
Organization	4	Strategies for organizing sources, information, etc.	"Learning how to organize sources and ideas properly"

Table 6
Student responses to "What was the most important thing you learned today about citing your sources in oral presentations?".

Theme	Count	Theme description	Illustrative quote
Citing images	18	Why and how to cite images, including pictures, graphs, etc.	"Learning about the importance of citing images and videos and learning how to format those citations in APA."
Verbal attribution	10	How to acknowledge sources verbally in a presentation, including what parts of a citation to mention	"The way you cite sources orally heavily depends on the audience and the best way of showing credibility is stating the publisher/ journal the source was found on."
Establish credibility	7	Use of citations to bolster the credibility of the presenter	"Using sources and citing them properly in oral presentations demonstrates research and analysis capabilities, establishes credibility with the audience, and showcases the amount of research it took to arrive at the thesis being presented."
Give credit to author or creator	6	As a reason to cite sources	"That it's important to give credit where credit is due."
Reference slide left up at end	4	The recommendation to leave the references cited slide displayed at the end of a presentation, while the audience asks questions, so that the audience has time to digest the citations	"Leave sources up when asking for questions at the end of a presentation instead of using a slide that asks 'Questions' at the end. This makes presenter seem more credible and allows references to be better viewed."
Image licensing	4	Various licensing options for images, including Creative Commons	"Depending on the licensing there are further restrictions to how a photo can be used by someone other than the author"
Communicating to reader or audience	3	Awareness of the audience in an oral presentation and how that affects verbal attribution	"Depending on the audience you might need to focus on the author, publication or the main idea."
Citation guides	2	Comments related to the online citations in oral presentations guides	"Citing pictures and a resource webpage to help sort."
Citing graphs or charts	2	How to cite graphs and charts, including differences depending on source of data	"Differentiating using source's data to make own graphs"

responses in this area are fixed with minor adjustments or outside of the scope of the presentation, indicating that participants were not feeling overly confused about the material presented. Finally, most participants identified skills that they thought they might use in life after college, suggesting that we were successful in promoting these as lifelong skills that can be employed in a variety of contexts.

Discussion

The information literacy rubric we applied to our samples of student work included three components of information literacy: supporting materials, use of support, and academic integrity (Appendix A). Our instructional intervention focused on just a subset of these components: use of support (which includes synthesis) for written capstone papers, and academic integrity (which includes citations) for oral capstone presentations. Thus, these were the areas of the rubric where we hoped to see improvement as a result of our intervention. To summarize our statistical findings, our instructional intervention had a large positive effect on academic integrity in oral presentations, and a small positive effect on the use of support in written work. This indicates that the intervention was successful in improving student performance in the two targeted areas: source citation in oral capstone presentations and synthesis of information from sources in written capstone papers.

It was encouraging to see that our strongest result was the improvement in academic integrity in capstone presentations, as this was one of our main areas of focus in the instructional intervention. The high post-intervention adoption rate of this practice suggests that our instruction was effective at raising student awareness that citations are expected in oral presentations and providing them with the knowledge and resources to properly execute their citations. Citing information in written contexts was not a new topic to these students, and providing explicit instruction on how to transfer this knowledge to an oral context was sufficient to make a statistically significant difference in the rubric scores for this area. The SBS instructors who were guiding students in their preparations for oral presentations were on board with adopting the practices outlined in the oral citation guides, and their support was likely instrumental in encouraging student compliance.

While the improvements in synthesis evidenced in the written capstone papers were not nearly as large or definitive, we still find them promisingly suggestive of the potential that librarians have to increase students' skills in this area. That it is more difficult to make a measurable improvement in student performance in this area is not surprising, considering that synthesis is a complex skill. Because multiple activities occur when students bring together information from various sources, including comprehension, organization, problem detection, and problem solving (Bråten & Strømsø, 2003), there are multiple points at which the process might break down. Lundstrom et al. (2015) note that "commonly found aspects of synthesis are as follows: establishing associations between texts, recognizing patterns among information (similarities, differences, unique instances), organizing information to express these relationships and patterns by using transitional sentences, and other explicit or implicit markers" (p. 65). When students neglect one or more of these elements, synthesis may not be fully realized.

Importantly, comprehension of sources is a necessary precursor to synthesis (Mateos & Solé, 2009). While we tend to think of synthesis as primarily related to writing and critical thinking, students who lack effective reading skills will struggle even to summarize their sources, much less synthesize them. Poor reading comprehension can lead to some of the ineffective writing strategies defined by Howard et al. (2010), such as "quote-mining," or searching a text for a good sentence to quote, and "patchwriting," or starting with text from a source and making some changes. They identify these techniques as transitional stages of writing that indicate that students are not writing from sources, but rather from sentences. While effective reading strategies were not a part of our instructional intervention, we have come to recognize them as a necessary prerequisite to synthesis and thus a crucial part of a scaffolded approach to teaching synthesis.

Because of the complex nature of synthesis and its prerequisite skills, it is unrealistic to expect a single instructional session from a librarian to have a deep and lasting impact on student achievement in this area. In fact, one of the recurring responses in student feedback after the instructional intervention was the desire to have been presented with this information earlier in their college careers. An ideal approach to teaching synthesis would include scaffolding and extended practice over time with the tools included in the lesson plan, such as the synthesis table. While some of this might be achieved by a dedicated librarian who has the support of the academic program to provide regular instruction to each section of certain required classes, faculty buy-in is critical to fully realizing this goal. Minimally, faculty instructors need to design assignments that include synthesis and make it part of the grading criteria. Optimally, they would assume a greater role in reinforcing the strategies presented by librarians and providing feedback related to synthesis on early drafts of student work. Mateos and Solé (2009) observed that more revision of written work on the part

of students leads to better synthesis, particularly when the revision includes referring back to the sources cited.

Creating faculty buy-in, especially when it involves making changes to established instruction and assignments, may not be an easy task. The assessment model we employed to evaluate our instructional intervention successfully created buy-in among the faculty involved, and has potential to be transferred to other contexts. While we were able to provide small stipends to our faculty scholars, an additional motivation for participation, and one that might be sufficient even in the absence of funding, was our facilitation of this assessment process that faculty could use for academic program review. The process for academic program review varies by institution, but it is typically employed to evaluate program effectiveness and guide future directions for the program, and thus usually involves assessment. At CSUMB, the seven-year program review cycle includes annual assessment activities, in which the program is expected to evaluate student learning outcomes, either for the major or for the institution. Because information literacy is an undergraduate learning outcome at CSUMB, we were in a position to offer to facilitate assessment of information literacy in service of program review (in addition to evaluating our instructional intervention). We imagine that faculty at other institutions would similarly embrace an opportunity to get assistance with meeting a needed requirement.

Participation in institutional-level assessment is an effective way to engage faculty and can lead to faculty buy-in for making changes in their teaching, course design, and assignment design (Canner et al., 2020). We found the same to be true for the faculty participating in the academic program assessment described here. These faculty, after seeing how students across the program were performing in these areas, were doubly committed to incorporating synthesis and oral citation practices into their classes. While we librarians had proposed the initial collaboration, these faculty approached us the following semester to request our assistance with a more in-depth assessment of synthesis. They view this collaboration as an initial step in making program-wide changes in the teaching and learning of synthesis. We believe that this model of librarians facilitating assessment in service of academic program review has potential for adoption at other institutions and could similarly lead to increased faculty attention to the teaching and learning of information literacy.

The success of our instructional intervention has had several implications for our library instruction at CSUMB. In the short term, we will continue to provide instruction on synthesis in written work and citations in oral presentations for the SBS program, making adjustments based on student and faculty feedback. Over the longer term, we will consult with SBS faculty as they decide how to better scaffold information literacy, and synthesis in particular, throughout the curriculum. Additionally, we have started to provide similar instruction for one other major, and have shared our findings with the other librarians at our institution, some of whom have expressed interest in providing instruction in these areas to their liaison programs.

Limitations of study

Several limitations in the current study made it difficult to make a more conclusive statement about the effectiveness of the intervention. That the intervention and control groups completed their capstones during different academic years made it impossible to assume similarity between them. While multiple linear regression was used to control for potential differences, this statistical procedure cannot control for differences in variables that the data analyst does not have access to. Furthermore, the number of students who delivered oral capstone presentations was very small, potentially compromising the statistical power of the data analyses. This would have the effect of making it difficult to detect statistically meaningful differences that might be present.

The information literacy rubric that we used (see Appendix A), while necessarily broad to allow measurement of the various elements of information literacy, did not measure synthesis in a very granular way. In the “use of support” dimension, the distinguishing feature between the “developing” and “proficient” performance levels is the presence or absence of synthesis. Because it does not provide a more nuanced measurement of the elements of synthesis, it may have been too blunt a tool to fully explore changes in students' demonstration of synthesis as a result of the instructional intervention. We are currently working on an adaptation of the synthesis rubric developed by Lundstrom et al. (2015) to meet our institution's needs.

Conclusion

This study illustrates that measuring the impact of information literacy instruction is both a complex and rewarding endeavor. Using our university's culture of assessment as a springboard, we were able to identify areas of information literacy that were challenging for students, implement specific teaching practices, and “close the loop” by leveraging the process of academic program review to engage faculty in the measurement of our impact on student learning. For our library, this project represented a compelling opportunity to employ librarian-led assessment to support students' culminating experience in the Social and Behavioral Sciences program and to support faculty with their program review, thus demonstrating the impact of information literacy instruction and the potential role of the library in academic program and campus-wide assessment. We hope that this description of our efforts will prove useful for those providing instruction on synthesis in written work or source attribution in presentations, as well as those interested in using assessment to measure the impact of library instruction and to make evident the contributions of academic libraries to a university's teaching and learning efforts.

Further research is needed that explores a scaffolded, longitudinal approach to teaching the facets of information literacy addressed in our study, particularly information synthesis. Additionally, while we developed our own standards for citation practices in oral presentations, a professional organization such as the Association of College and Research Libraries (ACRL) would be well-positioned to provide leadership in the development and adoption of standards in this area. Future research could further explore the potential of library involvement in campus-wide assessment projects and those within academic programs that involve a baseline measurement of students' information literacy skills, a revisioning of teaching practices based on identified needs, and another round of assessment to gauge impact. In a higher education environment that is increasingly outcomes and assessment oriented, such endeavors have the potential to ensure that the library plays a leading role in using assessment to identify unmet needs in student learning and contributes to institutional processes like program review.

CRediT authorship contribuution statement

Sarah P.C. Dahlen: conceptualization, methodology, formal analysis, investigation, data curation, writing - original draft, writing - reviewing & editing, visualization, supervision, project administration, funding acquisition.

Ryne Leuzinger: investigation, writing - original draft, writing - reviewing & editing, funding acquisition.

(Note: Some formal analysis was contracted to Laura Gil-Trejo at the Social Science Research Center at California State University, Fullerton.)

Declaration of competing interest

None.

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Appendix A. Information literacy rubric

Information Literacy Undergraduate Learning Outcome Rubric
California State University, Monterey Bay
CSUMB's Intellectual Skills Rubrics were influenced by the AAC&U VALUE Rubrics and created to help educators design activities and assignments that better help students demonstrate their learning. Rubric levels are developmental (describing student development over a 4-year undergraduate program). See link at bottom for guidance on how to use this rubric.

	4 - Advanced	3 - Proficient	2 - Developing	1 - Beginner
	Expectations for some students at or near graduation.	Expectations for all students at or near graduation.	Expectations for students advancing toward proficiency.	Expectations for students initiating development toward proficiency.
Supporting materials (IL)	Chooses a variety of information sources appropriate to the scope and discipline of the task. Selects sources after considering the importance of multiple criteria, such as relevance to the topic, currency, authority, audience, and bias or point of view.	Chooses a variety of information sources appropriate to the scope and discipline of the task. Selects sources using multiple criteria, such as relevance to the topic, currency, and authority.	Chooses a variety of information sources. Selects sources using basic criteria, such as relevance to the topic and currency. Sources are mixed with regard to authority.	Chooses too few information sources. Selects sources using limited criteria, such as relevance to the topic. Authority of sources is questionable.
Use of support (IL)	Organizes, interprets, analyzes, and synthesizes information from sources to fully achieve a specific, intended purpose with clarity and depth.	Organizes, interprets, analyzes, and synthesizes information from sources to achieve intended purpose.	Organizes, interprets, and analyzes information from sources. Achieving intended purpose requires synthesis of information.	Provides information from sources. Achieving intended purpose requires better organization, interpretation, and/or analysis in addition to synthesis of information.
Academic integrity (IL)	Does all of the following consistently and correctly: • Attributes information to sources • Appropriately chooses to paraphrase, summarize, or quote • Uses information in ways that are true to original context • Distinguishes between common knowledge and ideas requiring attribution • Acquires information ethically and legally	Does all of the following consistently, though some errors are present: • Attributes information to sources • Appropriately chooses to paraphrase, summarize, or quote • Uses information in ways that are true to original context • Distinguishes between common knowledge and ideas requiring attribution • Acquires information ethically and legally	Does the following inconsistently, with some errors: • Attributes information to sources • Appropriately chooses to paraphrase, summarize, or quote • Uses information in ways that are true to original context • Distinguishes between common knowledge and ideas requiring attribution • Acquires information ethically and legally	Use the following practices incorrectly or incompletely: • Attributes information to sources • Appropriately chooses to paraphrase, summarize, or quote • Uses information in ways that are true to original context • Distinguishes between common knowledge and ideas requiring attribution • Acquires information ethically and legally

Suggested citation: CSUMB Center for Teaching, Learning, and Assessment. (2018). Written Communication Integrated Institutional Learning Outcome Rubric. California State University, Monterey Bay. Retrieved from: https://csumb.edu/tla/ulo-assignment-guides-rubrics-and-threshold-concepts.

Appendix B. Lesson plan

Before the session:

- Coordinate with instructor to find a time to schedule this session when students will have an early draft of their literature review
- Have students bring the current draft of their literature review to class, preferably as a hard copy, though digital copies can also work in a computer lab setting
- Send instructor these documents/links to put in their Learning Management System:
  - Handout on synthesis (Appendix C)
  - Video on Writing in APA (Silva, 2011)
  - Blank synthesis table (Appendix D)
  - Completed synthesis table (Appendix E)

Bring to the class session:

- Copy of Project Information Literacy article (Head et al., 2013)
- Handout (Appendix C), including:

- Definition of synthesis
- List of textual indicators of synthesis
- Example paragraph with good synthesis

- Bring extra copies of lit reviews from previous student papers for those students who forget to bring their own

Welcome and introduction (15 min)

- Learning outcomes (write on board)
  - Students will apply concrete strategies for synthesizing information from sources
  - Students will execute best practices for citations in oral presentations
- Why are these skills important?
  - Mention Project Information Literacy article findings (Head et al., 2013): Synthesis as a desirable job skill
    - A hard copy of the article to hold up and show students while talking about it is a great prop, though it could also be projected onto a screen
    - Points to emphasize:
      - This study interviewed employers from a number of different industries who employ recent college graduates
      - Employers asked what information-related skills they expect recent college grads to have, and which they actually have
      - Employers report that students are great at finding information from various sources, but not as good at synthesizing that information
    - Reiterate that synthesis of information from sources is important for writing the capstone paper, but also a skill that employers look for
  - Verbally citing sources
    - Oral presentations in the workplace
    - Establish your credibility when making an argument or persuading others

Synthesizing information from sources (25 min)

- Intro to synthesis
  - What do we mean by synthesis of information from sources? (ask students)
    - Pass out handout after students answer
    - Read (or have a student read aloud) definition on handout: Explicit connections are made between sources, including connections between contradictory sources. Similarities, differences, relationships, and patterns are identified so the reader can see how the sources are related and how they support the thesis. (Lundstrom et al., 2015, p. 81)
- Textual indicators of synthesis
  - Explain to students that synthesizing can be as simple as including words or phrases to show the reader how the sources you are describing are connected.
  - Emphasize that it's not really about specific phrases, but any indication within the text of how sources are connected.
    - List of textual indicators (adapted from Graff & Birkenstein, 2018)
      - In comparison
      - In contrast
      - Similarly
      - Moreover
      - Compared with/to
      - Relative
      - Versus
      - Likewise
      - X agrees when she writes, "_____."
      - X disagrees when he writes, "_____."
      - According to both X and Y, _____.
      - A number of sociologists have recently suggested that X's work has several fundamental problems.
      - On the contrary
      - Conversely
      - On the other hand
  - Select and share a paragraph with good examples of synthesis (this could be from an academic article or a student paper)
    - Ask students to read and identify where they see evidence of synthesis.
    - Students have a few minutes to read the paragraph to themselves before sharing with the class.
    - Example paragraph from Ambrose et al. (2010, p. 102):
      Whether or not students benefit more from practicing component skills in isolation or in the context of the overall task depends to a large extent on the nature of the task. Although the research results are mixed, it seems generally true that whole - task practice is preferable if the overall task is fairly simple or if components cannot be realistically extracted from the whole (Wightman & Lintern, 1985; Naylor & Briggs, 1963; Teague, Gittelman, & Park, 1994). However, if the task is highly complex and can be easily divided into component parts, students often learn more effectively if the components are practiced temporarily in isolation, and then progressively combined (White & Frederickson, 1990; Wightman & Lintern, 1985; Salden, Paas, & van Merrienboer, 2006). The extent to which isolated practice facilitates learning also depends in part on the skill level of the student. Studies have shown that explicit instruction and isolated practice of component skills, while helpful for novice learners (Clarke, Ayres, & Sweller, 2005), might be counterproductive for advanced learners if they have already integrated these components into a coherent whole (Kalyuga, Ayres, Chandler, & Sweller, 2003). Finally, the extent to which isolated practice is beneficial depends on the learning objectives of the class. For example, if a central objective of a course like Professor Solomon's is to help students build teamwork skills, then it might make sense to focus on specific skills in isolation. One example might be to reinforce students' abilities to reconcile intra-group differences of opinion by having them role-play responses to hypothetical conflicts. (Ambrose et al., 2010, p.

102)

- Debrief by having students share what they found.
- Points to note if they don't come up organically:
  - The second sentence of the paragraph does an excellent job of showing what the scholarly consensus is on the topic.
  - A single sentence can be followed by an in-text citation including multiple sources; this in itself is synthesis because it shows that these sources agree or are examples of what the author has described.
  - Ask students how many sources are cited in the entire paragraph. If a paragraph is written addressing a single topic/theme/thesis (as it should be), having multiple sources cited in the same paragraph is a first step toward synthesis. The next step is to show how these various sources relate to each other and the theme.
- Review peer's paper (draft literature review) for synthesis (15–20 min.)
  - Review the number of citations per paragraph
    - This isn't a perfect indicator, but gives us a general idea regarding progress toward synthesis
    - If every paragraph describes one source only, that is a red flag that synthesis is not happening
  - Ask students:
    - What textual indicators do you see in your partner's paper showing connections between sources?
    - What other evidence of synthesis do you see in your partner's paper?
    - Where do you see opportunities for your partner to include more synthesis?
  - Students share what they found with partners
  - Full group debrief: “Would anyone like to share any insights they gained from this exercise?”
- Strategies (15 min)
  - What are your strategies for synthesizing information from sources? (ask students)
    - Students often have strategies for seeing connections, including:
      - Highlighting passages of text in different colors that correspond with different themes
      - Using NVivo (software for qualitative analysis) to code their sources at various nodes that correspond with themes
  - Video on Writing in APA - 5 min. (Silva, 2011)
    - Before showing the video, mention that while some of the details of this video are specific to APA, most of it is about synthesizing information and will also apply to other styles (if needed, pause video at appropriate intervals to present examples from other citation styles).
    - After showing video:
      - Note that the video describes one possible technique: Creating a slide or notecard for each source, noting the main points, and using this to see where the “common denominators” are.
      - See if students have any questions about citing multiple sources in a single in-text citation.
  - Show synthesis table and example. Describe how the table will be useful for their ongoing work.
    - Table shows you where the gaps in your sources might be. If you have a theme that only one source speaks to, it might be a good idea to find additional sources that address that theme.
    - When writing your paper, the table allows you to easily see what the scholarly consensus is on each theme and where the differences are.
    - A spreadsheet can also be used to allow for a larger table.
  - Reminder to use textual indicators to make synthesis explicit for the reader: “similarly…” “in contrast…”

Citing sources in oral presentations (20 min)

- Ask students: How does citing in oral presentations differ from citing in writing?
  - In-text citations and reference lists are similar, but verbal attribution should occur in presentations, and citing images is more common
- Ask students: When you're giving a presentation, what purposes do citations serve? (establish your credibility, give credit, allow people to find source)
  - In-text citations on slides, references at end: This doesn't allow the audience to evaluate the sources you cite in real time. This is why verbal attribution is important.
- Mention that there are three types of citations: in-text, reference list, verbal attribution
  - Verbal attribution
    - Ask students: Which pieces of information are important?
      - This depends on the audience and the purpose of the presentation, but for a capstone presentation, probably journal title, author, possibly date
    - Examples
      - “In their research published in the Journal of Human Evolution, Lee and Posner found that…”
      - “In her book on Bilingual Education, Katherine Harper notes that…”
    - Practice: Have students tell a classmate an important point made by one of their source authors, using language suitable for a presentation.
- Share online citation guides (Dahlen & Gregg, 2018, 2019a, 2019b, 2020), highlighting certain sections:
  - In-text citations
  - Reference list
  - Citing images
    - Watch embedded video on finding images licensed for reuse (Dahlen, 2018)
    - Fair use generally covers you for educational purposes, but won't be true for workplace
    - See slides on various types of images and their citations
  - Tables, charts, and graphs

Solicit questions and feedback (5 min)

Appendix C. Handout

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Synthesis of information from sources:

Explicit connections are made between sources, including connections between contradictory sources. Similarities, differences, relationships, and patterns are identified so the reader can see how the sources are related and how they support the thesis (Lundstrom et al., 2015, p. 81).

Textual indicators comparing sources:

- In comparison
- In contrast
- Similarly
- Moreover
- Compared with/to
- Relative to
- Versus
- Likewise
- X agrees when she writes, "_____."
- X disagrees when he writes, "_____."
- According to both X and Y, _____.
- A number of sociologists have recently suggested that X's work has several fundamental problems.
- On the contrary
- Conversely
- On the other hand

Adapted from Graff and Birkenstein (2018)

Example of a paragraph that synthesizes sources:

Whether or not students benefit more from practicing component skills in isolation or in the context of the overall task depends to a large extent on the nature of the task. Although the research results are mixed, it seems generally true that whole-task practice is preferable if the overall task is fairly simple or if components cannot be realistically extracted from the whole (Wightman & Lintern, 1985; Naylor & Briggs, 1963; Teague, Gittelman, & Park, 1994). However, if the task is highly complex and can be easily divided into component parts, students often learn more effectively if the components are practiced temporarily in isolation, and then progressively combined (White & Frederickson, 1990; Wightman & Lintern, 1985; Salden, Paas, & van Merrienboer, 2006). The extent to which isolated practice facilitates learning also depends in part on the skill level of the student. Studies have shown that explicit instruction and isolated practice of component skills, while helpful for novice learners (Clarke, Ayres, & Sweller, 2005), might be counterproductive for advanced learners if they have already integrated these components into a coherent whole (Kalyuga, Ayres, Chandler, & Sweller, 2003). Finally, the extent to which isolated practice is beneficial depends on the learning objectives of the class. For example, if a central objective of a course like Professor Solomon's is to help students build teamwork skills, then it might make sense to focus on specific skills in isolation. One example might be to reinforce students' abilities to reconcile intra-group differences of opinion by having them role-play responses to hypothetical conflicts. (Ambrose et al., 2010, p. 102).

Appendix D. Blank synthesis table

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Synthesizing Information from Your Sources

In each box, summarize what each author has to say about each theme

	Author A	Author B	Author C	Author D	Author E
Methodology					
Population					
Theme 1					
Theme 2					
Theme 3					
Theme 4					

Appendix E. Completed synthesis table

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Synthesizing Information from Your Sources

In each box, summarize what each author has to say about each theme. (Note: Sources listed here are fictitious and intended to demonstrate possible use of the table.)

Topic: How does household division of labor differ between same-sex and heterosexual couples?	Author A Smith, 2017	Author B Sato, 2014	Author C Jones & White, 2008	Author D Takahashi, 2015	Author E Kudo & Roach, 2010
Methodology	Survey	Survey	Interviews	Mixed (survey, interviews)	Survey
Population	Gay & straight couples with children in CA; n = 197	Straight, married college students in Canada; n = 67	Lesbians in NYC; n = 30	Same-sex couples in SF; n = 45	Married heterosexual couples with children in U.S.; n = 390
Theme 1 Relationship with earnings	Earnings affect labor for straight couples more than gay couples	n/a	Earnings have no relationship with labor among lesbians	n/a	Shows relationship with earnings and labor among straight couples
Theme 2 Types of household labor	n/a	Straight couples: women more likely to cook, clean	n/a	Same-sex couples: no pattern in different types of labor	n/a
Theme 3 Child care	Same-sex couples have more equal division of child care than straight couples	n/a	Lesbian couples share child care equally	n/a	n/a
Theme 4 Perception of division versus actual time	n/a	Straight couples: Men think they do a greater proportion of chores than they actually do	Lesbian couples tend to think the labor is split equally	n/a	Straight stay-at-home moms perceive bigger difference but believe it's fair

Appendix F. Student feedback survey questions

1. What was the most important thing you learned today about synthesizing information from your sources?
2. What was the most important thing you learned today about citing your sources in oral presentations?
3. What should have been explained more clearly or explored in greater depth?
4. What did you learn today that you can imagine yourself using in your life after college?

Appendix G. Student responses to "What should have been explained more clearly or explored in greater depth?"

Theme	Count	Theme description	Illustrative quote
Writing	5	Considerations involving writing, especially writing a literature review	"In my opinion, I believe what should be more clear is examples of how to write a literature [review] using steps by steps"
Chicago style	4	More examples or explanation of citations in Chicago style	"The social history discipline requires that writers use Chicago style citation, therefore, I would like to know more about how to cite multiple sources as in-text citations using superscripts and footnotes."
Citation technicalities	4	Specific citation rules beyond the scope of the presentation	"I think there was a lot of great points made but I wanted to know more about how to cite in a new paragraph whether or not to use the year again."
Verbal attribution	3	How to acknowledge sources verbally in a presentation, including what parts of a citation to mention	"More examples when introducing sources. For example, how important is it remembering names and dates when presenting?"
Wish we had known this sooner	3	Desire to be presented with this information earlier within the degree program	"Would have been great to know this info in the 300/400 classes."
Common mistakes	2	Common pitfalls seen in student work	"What is an example of what not to do?"

Appendix H. Student responses to "What did you learn today that you can imagine yourself using in your life after college?"

Theme	Count	Theme description	Illustrative quote
Synthesis strategies	20	Strategies presented for finding connections between sources, including finding common denominators, highlighting in different colors, and using a synthesis table	"As an aspiring educator, I have learned how to demonstrate to other students what synthesizing information in academic writing should look and sound like."
Synthesis table (a subtheme of "synthesis strategies")	8	Table presented for identifying connections between sources (see Appendices D & E)	"The organizational table that ordered our themes and authors into columns and rows."
Citing images	7	How to cite images, including pictures, graphs, etc.	"In the future I can better use citations for images within my presentations because I have lacked that knowledge before."
Connections between sources	6	The importance of showing or finding connections between ideas, sources, etc.	"How to mesh together competing or similar arguments or perspectives. I work in politics where this is an important skill."
Professional presentations	6	As a place to apply this knowledge	"If I had to give a professional presentation or write a research paper or published work"
Verbal attribution	5	How to acknowledge sources verbally in a presentation, including what parts of a citation to mention	"I learn[ed] that I am able to talk about a topic providing evidence."
Organization	4	Strategies for organizing sources, information, etc.	"Today I learned that it is very useful to organize and cite sources to be able to reference back to the authors work."
Give credit to author or creator	3	As a reason to cite sources	"When to credit someone with an idea and how to do it."
Image licensing	3	Various licensing options for images, including Creative Commons	"I learned how I can find licensed images in google and how to cite them."
Writing	2	Considerations involving writing, especially writing a literature review	"How to do a better literature review"

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