

# Using AI to Evaluate a Competency-Based Online Writing Course in Nursing

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## **Abstract**

Nursing education is transitioning from traditional teaching to competency-based education. Additionally, more nursing courses and programs are now offered online. Scholarly writing is a powerful strategy to teach effective communication and critical thinking, both core competencies for safe and effective nursing practice. However, teaching writing online to nursing students is challenging due to a lack of research evaluating best practices, faculty time constraints, and inconsistent writing assessment. Automated essay scoring systems using artificial intelligence (AI) provide new opportunities for efficient, reliable, and valid assessment of writing skills. We used a quasi-experimental design to investigate the impact of a 14-week fully online competency-based writing course on students' self-efficacy, task value, and writing performance. The participants were master's nursing students enrolled in an existing one-semester online competency-based writing course for healthcare professionals. An AI-powered writing assessment, IntelliMetric®, and the SAWSES self-efficacy survey were administered pre- and post-intervention. The results showed statistically significant gains in self-efficacy and writing performance with large effect sizes. This study addresses the gap in nursing education regarding the assessment of online, research-based writing interventions on students' scholarly writing capacity. Recommendations include implementing a required scholarly writing course in all graduate-level nursing programs, scaffolding students' competency development with the cognitive apprenticeship model, using best practices from composition research to inform online instruction, and employing AI-powered automated essay scoring to evaluate students' writing progress and instructional efficacy.

*Keywords:* online writing instruction, competency-based education, cognitive apprenticeship, automated essay scoring, writing in the disciplines

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The demand for online nursing courses has been growing. For example, from 2015 to 2019, the enrollment of master of science nursing students in distance learning programs increased by 13.7% (American Association of Colleges of Nursing [AACN], 2021b). In 2016, the number of online students in the U.S. increased for the fourteenth consecutive year, and 31.6% of all higher education students reported taking at least one distance education course (Seaman et al., 2018). In 2020, the COVID-19 pandemic prompted even more faculty and students to adopt virtual learning (2021b). Currently, there are 614 schools in the U.S. offering online nursing programs (Peterson's, n.d.), and 93% of nursing educators reported using online and/or distance learning (Wolters Kluwer, 2020). Online instruction offers flexibility and choice for students, particularly nurses already in practice. Based on a survey of the Graduate Nursing Student Academy, graduate students reported a preference for online/distance learning as opposed to mandatory in-person classes, eliminating PowerPoint-based lectures, and more training to improve faculty's use of educational technologies (Leaver et al., 2022). The growing technological landscape of higher education challenges nursing schools and educators to adopt best practices in online learning to remain competitive.

Nursing education is also in the midst of a paradigm shift from traditional, lecture-based teaching to competency-based education (Wolf, 2022). Competency-based education enables students to develop and demonstrate the essential knowledge, skills, and attitudes required to provide safe and effective care in our increasingly complex and dynamic healthcare system. The American Association of Colleges of Nursing (2021a) is leading this transformation through new competency standards reflecting the current and future needs of the profession. In response to the same shifts in the healthcare environment, the National Council of State Boards of Nursing (2023) has just launched a radically different nursing board exam focusing on cognitive competencies such as clinical judgment and decision-making.

Writing remains an essential educational strategy in nursing education. Scholarly writing enables the assessment of critical cognitive competencies required for nursing practice. Writing assists nurses in practicing, developing, and demonstrating critical thinking, clinical judgment, and decision-making. Nursing faculty recognize the importance of providing students opportunities to improve and demonstrate their critical thinking because it directly impacts patient care. Brennan et al. (2004) found that 65% of nursing errors resulted from poor clinical decision-making skills. Recognizing the importance of these cognitive skills for nursing care, the National Council of State Boards of Nursing (NCSBN, 2023) has transformed its 2023 certification exam to focus on assessing the clinical judgment of newly graduated nursing students. Clinical judgment is "an observed outcome of critical thinking and decision-making" (NCSBN, 2019, para. 1). Critical thinking and decision-making skills are integral to nurses providing quality patient care.

Writing also encompasses vital communication competencies for nurses. Clear writing is an integral part of documentation, patient education, and communication with colleagues, particularly for advanced practice nurses like nurse practitioners (McQuerrey, 2017). The World Health Organization (2016) and the American Nursing Association (2015) have cited communication skills as a core competency for nurses. Clear, effective communication between nurses and patients is critical to positive patient outcomes (Sibiya, 2018). Furthermore, Oermann et al. (2015) asserted that master's and doctoral-level nurses need to learn how to share and publish their results from evidence-based practice research to lead the profession forward. Scholarly writing instruction is integral to nursing education because it has been shown to

promote critical thinking and improve communication skills, thereby improving nursing practice (Gazza & Hunker, 2012; Jefferies et al., 2018; Zygmunt & Schaefer, 2006).

Although faculty recognize the importance of teaching writing, they face enduring and formidable challenges to effective instruction. Recurring issues with the lack of quality and development in student writing have been noted by college professors since the early 1900s (Bean, 2011) and among nursing faculty (Bickes & Schim, 2010; Gazza & Hunker, 2012; Oermann, 2013; Roberts & Goss, 2009). Common themes include frustration with students' lack of correct grammar and citation style, poor organization of ideas, inadequate synthesis representing a deep understanding of the research literature, and problems with writing coherence and clarity (Lea & Street, 2006; Bean, 2011). Other researchers have found that nursing students report low task value for scholarly writing (Borglin & Fagerstrom, 2012; Johansen & Harding, 2013; Smith & Caplin, 2012; Whitehead, 2002). Too often, graduate students progress through their coursework to graduation without demonstrating sufficient mastery of written communication and underlying critical thinking competencies (Bickes & Schim, 2010).

Nursing faculty struggle to teach writing effectively to nursing students for several reasons. For example, there is a lack of a standardized requirement and approach to teaching nursing students discipline-specific writing skills from within the profession (Andre & Graves, 2013; Oermann et al., 2015). Outside the nursing profession, there are established best practices in writing pedagogy, but most nursing faculty are not formally educated in writing pedagogy. Not surprisingly, nursing faculty tend to rely on the positivist-influenced instructional methods by which they were taught (Gimenez, 2012). Thus, nursing faculty tend to fixate on grammar and formatting errors and take a deficit approach to students' writing rather than an approach aimed at developing the cognitive skills required for effective argumentation and clear communication (Borglin & Fagerstrom, 2012; Brannon et al., 2008). Finally, amidst a global nursing shortage, many faculty members are expected to work clinically as well as teach (Worrall-Carter & Snell, 2003; Zhang et al., 2018), leaving little time for the work of commenting on student drafts or learning new online pedagogical techniques.

One major challenge to developing a standardized, evidence-based approach to the online teaching of writing in nursing and other fields is the collection of valid data on writing performance. Traditionally, assessing writing takes significant time for faculty to read and grade lengthy assignments. Evaluations of writing instruction include subjective information regarding faculty and/or student satisfaction, but quantitative data are also needed to test the effectiveness of instruction on improving students' writing performance (Hawks et al., 2016; Oermann et al., 2015; Troxler et al., 2011). However, automated essay scoring (AES) systems empowered by artificial intelligence provide new opportunities to assess student writing in a way that is valid, reliable, and efficient.

In this paper, we report on a study that evaluated the impact of an online writing course for master's level nursing students on their writing competencies, combining best practices in writing pedagogy with established principles of online instruction and AES assessment. We argue that online learning can offer effective and flexible opportunities for nursing students to develop their writing skills using a cognitive apprenticeship framework. We employed a combination of survey instruments to measure writing self-efficacy and task value and automated essay scoring to measure writing performance using a quasi-experimental design. Our research question was, how does a discipline-specific online writing course affect students' self-efficacy, task value, and scholarly writing performance?

## Literature on Online Writing Instruction and Assessment

Warnock (2009) asserted that effective online writing instruction depends on migrating well-established writing pedagogy into online contexts. Central to this pedagogy is the understanding that writing is a social practice. A review of the literature on online writing instruction supports this assertion. Stewart (2021) elaborated on the importance of social presence in online writing instruction, a crucial aspect of writing as a social practice. Stewart suggested that creating a sense of "realness" and fostering social interactions are vital for effective online writing instruction. Grigoryan (2017) underscored the importance of interaction between instructor and student through effective feedback, highlighting the need for developing teaching practices and approaches to feedback designed specifically for online learning environments. Hawisher & Pemberton (2019) conducted a text analysis of discussion boards and assignments in an asynchronous online composition course, with results highlighting the importance of fostering discourse, providing constructive feedback, and promoting self-reflection among students.

However, these research-based recommendations are not always adhered to in online settings. Kwak (2017) conducted an analysis of Massive Open Online Courses (MOOCs), and the findings suggested the online designers ignored best-practices in writing pedagogy, and focused on describing discrete skills like grammar, rather than the social practice of writing. Kwak's research reinforces the importance of using rubrics to ensure that online instructors and designers are using best practices. Zimmerman et al. (2020) asserted that Quality Matters (n.d.) provides a robust, research-based, and regularly updated framework for online course quality assurance. A review of relevant literature revealed multiple studies about online writing instruction, including case studies, surveys, and qualitative studies. However, we did not find any empirical studies evaluating the impact of specific online writing interventions on learning. One reason for the lack of empirical data on outcomes may relate to a lack of valid instruments for measuring writing proficiency. Artificial intelligence may offer a solution.

There is an extensive and growing body of research on the use of artificial intelligence (AI) supported by automated essay scoring (AES). The use of AES can improve efficiency, provide instant feedback to students, enhance validity, and provide 100% test-retest reliability (Hussein et al., 2019). AI systems have strong construct validity measuring subsets that are integral to the scholarly writing process in alignment with pedagogical practices. For example, the IntelliMetric® AES has subsets based on the hierarchy of writing concerns, a concept that has been widely recognized and used in the field of academic writing (Wolf & Wolf, 2022; Bean, 2011; Harvard Writing Project, 2007). The hierarchy is divided into two categories: higher-order concerns (meaning-based skills such as focus, development, and organization) and lower-order concerns (grammar, language usage, and sentence mechanics). The IntelliMetric® assessment, for instance, measures similar constructs, thereby validating the writing assessment's construct validity (Haisfield et al., 2012).

Despite the demonstrated validity, the use of Automated Essay Scoring (AES) systems has been met with criticism, primarily due to their inability to directly measure the author's critical thinking, logic, quality of evidence, creativity, or other subtleties employed by expert writers (Deane, 2013). However, even though the measurement of these constructs is not direct, writing assessment by AES maintains a high correlation with human scorers in these categories (Bennett, 2011). Furthermore, the limitations of AES systems may not apply to more sophisticated systems like IntelliMetric®. IntelliMetric® has shown reliability and validity

across multiple studies, aligning with the manual scoring of experts, accurately scoring across multiple content areas and grade levels, and providing stable results across various samples (Elliot, 2003; Rudner et al., 2006). Thus, AES can serve as a valid measure of writing proficiency with constructs aligned with a hierarchy of concerns, with high reliability and improved efficiency, making it an ideal measure for this study.

## **An Overview of Best Practices in Discipline-Specific Writing Instruction**

Writing instruction serves several purposes within a competency-based approach to nursing education. First, scholarly writing helps nurses develop critical thinking (Goodman, 2011; Lavelle et al., 2013) and communication skills (Gazza & Hunker, 2012; Luthy et al., 2009; Whitehead, 2002). Second, nurses need to understand research and apply it in evidence-based practice. This requires developing the ability to synthesize evidence echoing the process of writing a formal thesis-driven research paper (Jefferies et al., 2018). Third, students write to an intended audience of nursing colleagues and researchers, allowing them to develop their professional identity as nursing scholars and start contributing to a professional discourse community that advances knowledge to improve practice (Borglin, 2012; Tyndall & Scott, 2017). Finally, writing offers opportunities to develop a reflective practice where nurses can direct their learning, set goals, self-monitor, and regularly evaluate their performance as healthcare professionals (Billings & Kowalski, 2006; Binding, 2010; Carter, 2008; Jefferies et al., 2018; Naber & Wyatt, 2014).

Researchers have found that there are ways to support students' writing and clarify their expectations for student work that are directly relevant to supporting the development of writing-related competencies. Because writing is a form of communication, social context and mediation is an effective method to improve students' writing. Faculty can address higher- and lower-order writing concerns and provide a balance of praise and recommendations. Reflective writing within a discipline can be a way to help nurses develop not only as writers but also as reflective practitioners. These findings echoed the literature on online writing instruction.

### **Sequenced Instructional Design**

Writing research reveals several ways to promote writing development through sequenced instructional design. Brown et al. (2018) found that students were most satisfied with online lessons that are well-structured and clear, with logical sequencing that is easy to follow, and that this is an often taken-for-granted part of instructional design overlooked in quality standards. Ideally, writing assignments and writing-intensive courses should be intentionally weaved throughout a program to create multiple opportunities for writing across the curriculum (Hawks et al., 2016; Luthy et al., 2009; Oermann et al., 2015). The writing across the curriculum approach is based on the following principles: writing is linked to thinking and transformative learning, writing is contextual and requires learning discipline-specific modes of discourse, and writing is the responsibility of all faculty and belongs in every class (McLeod & Soven, 2000).

Troxler et al. (2011) performed an integrative review of writing strategies used to teach undergraduate nurses writing. They identified five common elements across the literature: low stakes writing assignments, the importance of faculty training, sequencing assignments, providing students with exemplars, using rubrics, and requiring revision after feedback. The researchers found that program-wide writing initiatives likely included more of these elements than stand-alone workshops or courses. Likewise, Oermann et al. (2015) performed a systematic

review of programs for developing nurses' writing skills. They found many examples of writing assignments being added to individual nursing courses to improve writing, some instances of a specific course designed to address writing development, and strategies for writing across the curriculum (WAC). The authors recommended a more planful approach to how writing assignments were designed across a nursing program because students need practice, as well as feedback and the opportunity to revise papers. In agreement with Hawks et al. (2016), Troxler et al. and Oermann et al. also saw a need to evaluate the effectiveness of writing interventions since they were lacking in their reviews.

Luthy et al. (2009) described their implementation of WAC in a baccalaureate nursing program. They found that breaking a paper into parts was helpful for both faculty and students and that ongoing faculty feedback on students' written work strengthened their writing ability. They also reported that the use of peer feedback on first drafts and rubrics saved time for faculty. Gazza and Hunker (2012) created a writing scaffold to facilitate scholarly writing development. Similar to Luthy et al., they recommended sequencing assignments, using rubrics, and providing feedback from faculty, peers, and writing tutors as essential strategies for nursing faculty. Although the writing scaffold was not evaluated for effectiveness, the authors did note that their strategies were evidence-based.

### **Providing Clear Writing Expectations**

Providing clear expectations on assignments is critical not only for students to perform well on writing assessments within a specific class but also for developing writing competencies. Researchers suggest that clear expectations can be communicated effectively through standardized assignment guidance sheets, standardized rubrics, and exemplars or model papers. Bean (2011) asserted that providing students with assignment guidance sheets that specifically explain the purpose, intended audience, required elements, and approach to the writing process can help students learn writing and produce better assignments. Wengel & Fager (2008) found that students who were given these assignment guidance sheets wrote more developed and coherent essays than those who were not. A literature review by Warren & Glass (2010) found that this kind of explicit assignment guidance is an effective way to improve student writing across various disciplines. Ray (2009) found that this approach was also practical for teaching writing to nursing students.

Two studies examined standardizing writing rubrics to be used in a WAC program. Minnich et al. (2018) reported high interrater reliability among faculty using the scholarly writing rubric. Abbott and Shaw (2019) shared their success in creating a hybrid standardized rubric for writing that had common areas of assessment and individualized areas depending on the course's focus.

The use of exemplars, or model papers, was also recommended in the literature. Carter et al. (2018) performed an integrative review of using student exemplars. They found that students valued the faculty's use of exemplars because it gave them confidence and helped clarify faculty expectations. Other researchers mentioned the use of exemplars but did not include an evaluation of that practice (Behrens et al., 2016; Naber et al., 2014).

### **Socially Mediated Writing Development**

As a medium of communication, writing is a social practice that requires rich interaction between students and instructors to learn. The social context of writing includes communicating a message to an audience, understanding what discourse format is required for the situation, and

drawing upon prior knowledge (Bean, 2011). Students learn how to manage these elements of writing with the help of accomplished experts who are more knowledgeable about writing in their discipline. McCutchen's (1996) research results suggested that learning from a more skilled writer is necessary for many students to go beyond simple writing processes such as "retrieve and encode" to a more interactive and recursive process. She explained that advanced writers constantly shift between planning for the writing task, transcribing the actual words, and revising what has been written based on their purpose and audience. Novice writers, in contrast, equate writing to only transcribing words onto the page without planning or revision work. Based on previous research studies, McCutchen argued that many early writers will continue using rudimentary writing processes unless they learn strategic, recursive processes from more expert writers. Similarly, Baleghizadeh and Gordani (2012) found that conferences with faculty produced superior writing results compared to direct written feedback in their research study of graduate university students. Overall, the development of inexperienced writers is significantly enhanced with social mediation of the writing task by more experienced others.

In addition to the importance of social mediation in improving students' writing processes, discipline experts are essential to inducting novices into the professional dialogue. Mitchell (2018) argued that because writing is a social construct, writing can be used to teach students the discipline-specific knowledge needed to enter the profession successfully. Ivanic (1998) also recognized the influence of literacy practices from multiple ecological contexts on a writer and their identity development. Planning meaningful social interactions is recommended in online writing settings as well (Grigoryan, 2017; Hawisher & Pemberton, 2019; Stewart, 2021).

### **Providing Balanced Feedback**

Enhancing writing development requires faculty giving and students receiving feedback on drafts (Jefferies et al., 2018). Ball et al. (2009) surveyed students regarding faculty's written feedback on their papers. Students regarded faculty comments that balanced strengths and areas to improve as valuable to their learning. In addition, the students noted the importance of faculty providing sensitive comments, focusing on positives, and reading their papers as supportive believers in their abilities.

Feedback from faculty should be honest, but care must be taken regarding the classroom environment. Edmonson coined the term *psychological safety* when she was researching effective healthcare teams. Psychological safety is characterized by an environment where everyone feels safe enough to share their ideas, questions, or challenges, and take risks without negative repercussions (Edmonson, 1999). She discovered that when people feel safe, they have a higher chance for growth and collaboration. Likewise, researchers have found that students responded better when feedback included *mitigating* comments, where positives were included as well as negatives and framed in an encouraging way (Ball et al., 2009; Chandler et al., 2005; Smith, 2008). As Bean (2011) epitomized, the goal of faculty "is to provide useful instruction, good advice, and warm encouragement" (p. 321).

In addition to praise and psychological safety, effective feedback should be prioritized using a hierarchy of writing concerns. Bean (2011) advised college professors to be strategic when giving students written feedback and to keep in mind that the goal is to help students improve their writing, not point out every error. To that end, he recommended using "a hierarchy of concerns, descending from higher-order issues (ideas, organization, development, and overall clarity) to lower-order issues (sentence correctness, style, mechanics, spelling, and so forth)" (p.

322) and to limit comments to two or three issues per draft. Once students have addressed higher-order concerns, professors can continue to lower-order concerns. The Harvard College Writing Program (2007) advocated for a similar approach, adding that faculty should point out helpful and unhelpful patterns in student writing. An organized approach to feedback guides faculty in attending to the most salient issues first and guides students in efficiently prioritizing their revisions (Wolf & Wolf, 2022).

### **Promoting Reflection and Growth**

Even though writing is a context-specific, socially mediated task, encouraging students to take ownership of their writing process is vital to their development as autonomous thinkers. There are several ways to help writers examine their written work and ideas. Researchers have found that reflection journals on clinical experiences can help students develop a reflective nursing practice (Billings & Kowalski, 2006; Binding et al., 2010). Based on self-report data, reflective writing has increased students' belief in themselves as competent writers (Carter, 2008). Lavelle et al. (2013) found that students who reflected on their writing earned higher grades and were more likely to engage in the revision process than students who did not. Reflection encourages students to connect new learning and experiences with previous knowledge, analyze problems, and critically evaluate currently held beliefs and ideas. This metacognition about one's thinking enables nurses to assimilate and accommodate new information and processes to become better practitioners (Wolf et al., 2022). Ongoing critical reflection is a necessary skill for nurses to innovate, drive the profession forward, and move dialogue outward to other disciplines.

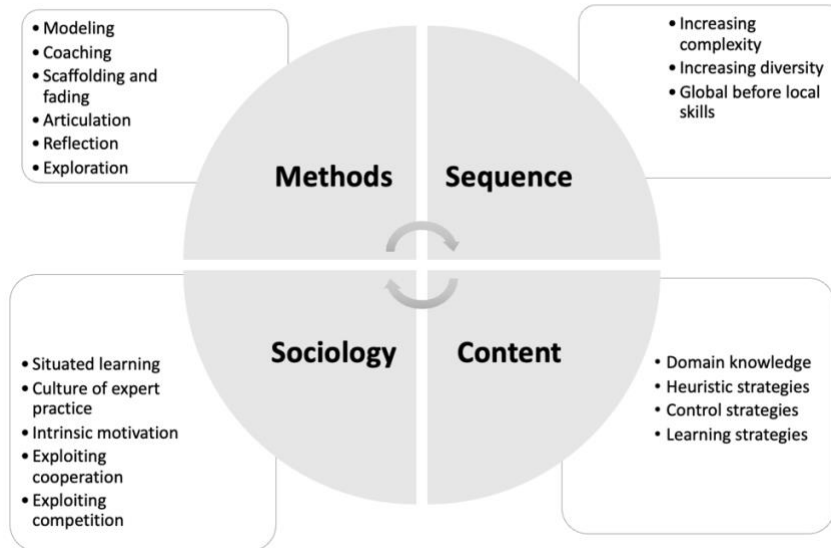
### **Theoretical Framework: The Cognitive Apprenticeship Model**

Cognitive apprenticeship was the conceptual framework used to combine these best practices in online education with writing pedagogy. The cognitive apprenticeship theory challenges the traditional approach to education in the industrial era focused on rote learning of factual and conceptual knowledge (Collins et al., 1987). Traditional lectures fail to teach professional students the processes and strategies experts use to solve complex problems in real-world contexts. For example, in learning writing, a novice may know the rules of grammar and composition but fail to understand the methods expert writers use to plan, organize, draft, and revise manuscripts in a specific discipline.

Collins et al. (1987) proposed a new framework for designing learning environments based on classic apprenticeships, where students learn complex cognitive skills through structured interactions with teachers. The model comprises four domains: sociology, sequencing, method, and content (Figure 1). Sociology refers to the social environment that situates learning within authentic problems and communities of practice. Sequencing involves the gradual progression of learning from simple to complex tasks and teaching global skills before local ones. The method encompasses the pedagogical methods teachers use to guide students from novice to independent mastery. These specific teaching activities that help students acquire cognitive skills include modeling, coaching, scaffolding, articulation, exploration, and reflection. Finally, content focuses on the types of knowledge needed to become an expert in a domain, such as facts, concepts, and methods of self-regulation that include monitoring and remediating behavior, problem-solving, and learning strategies that facilitate the students' ongoing growth within the community of practice.



**Figure 1**  
*A Framework for Designing Learning Environments*



*Note.* This is a graphic representation of the framework presented in Collins, A., Brown, J. S. & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics*. In L. B. Resnick (Ed.), *Cognition and instruction: Issues and agendas*. Lawrence Erlbaum Associates.

The cognitive apprenticeship model has been used to guide writing pedagogy (Bean, 2011) and research on writing instruction (Bernstein & Greenhoot, 2014; Klucevsek et al., 2016; Ding, 2008). Cognitive apprenticeship was used as a model to design this online writing course because scholarly writing in nursing requires mastery of complex cognitive skills.

## Methodology

Our purpose in this study was to explore the experience of master's nursing students in a discipline-specific online writing course and measure how the course affects students' writing capacity, self-efficacy, and task value. We used a quasi-experimental design. The research question was: How does a discipline-specific online writing course affect students' scholarly writing performance, self-efficacy, and task value?

### Study Population

Participants were students enrolled in a course called The Writing Workshop at a school of nursing at a non-profit research-intensive university during the 2021 fall semester. The course enrollment began at 68. Four students who dropped out of the course were excluded from the study, so there were 64 participants with demographic characteristics and master's program membership detailed in Table 1.

**Table 1**  
*Demographic Data of Study Participants*

<b>Attribute</b>	<b>Frequency</b>	<b>Percent</b>
Gender		
Female	58	90.6
Male	6	9.4
Race/Ethnicity		
Hispanic	2	3.1
American Indian or Alaska Native	2	3.1
Asian	3	4.7
Black or African American	0	0.0
Native Hawaiian or Other Pacific Islander	0	0.0
White	54	84.4
2+ Races <sup>a</sup>	2	3.1
Nonresident Alien	1	1.6
Academic Program		
Nurse Practitioner	19	29.7
Certified Nurse Leader	7	10.9
Healthcare Leadership	15	23.4
Nursing Education	10	15.6
Non-matriculated	13	20.3

<sup>a</sup> Two students identified here as 2+ races, one self-identified as Black and Native American, the other as White and Asian.

## **Procedure**

The research protocol was approved by the Institutional Review Boards of the University of Southern California and the University of Rochester. Pre- and post-test survey data on student self-efficacy and task value, and automated essay scoring (AES) of writing proficiency were measured routinely in this course for program evaluation. Using a quasi-experimental design, these data were analyzed to answer the research question.

## **Intervention**

The Writing Workshop is an online course designed to provide master's nursing students with a foundation in scholarly writing, critical thinking, and synthesis to make research-based recommendations to improve clinical practice. Using those objectives, backward design was used as the instructional design method (Wiggins & McTighe, 1998). The course also went through the Quality Matters peer review process and gained certification in 2017. The Quality Matters rubric is based on the eight general standards of course overview and introduction, learning objectives, assessment and measurement, instructional materials, learning activities and learner interaction, course technology, learner support, and accessibility and usability (Quality Matters, n.d). An online course needs to achieve 85% on the rubric and meet all essential standards to achieve certification.

The AES was used in a few ways. First, it provided a quick, objective measure of students' academic writing ability. These scores helped ensure an equitable distribution of students among the course faculty. Second, it gave the faculty and students a baseline for each

student's writing strengths and weaknesses. Students were encouraged to use this information in setting their own personal goals for the semester. Finally, students were asked to reflect on the changes in their AES scores at the end of the course, providing them with comparable data points to evaluate their progress and set new writing goals for the future.

The course pedagogy was based on the four components of the cognitive apprenticeship model (Collins et al., 1987). Our adaptation to online writing is represented in Figure 2.

1. **Sociology considers the learning environment:** Students in the course explore a real-world problem faced by nurses in their area of clinical practice. Social mediation of learning is promoted through weekly interactions with a team of experts in writing and/or nursing (Baleghizadeh & Gordani, 2012). The faculty intentionally foster psychological safety (Edmonson, 1999) to create a class culture conducive to taking risks and experimenting without fear of judgment. Elements of building online relationships were also incorporated by providing instructor-created video content, defining course expectations, asking questions, using videoconference webinars and individual student meetings, and providing weekly individualized feedback (Martin, 2019).
2. **Sequencing:** The course is divided into 14 weekly modules designed to scaffold students' progress through stages of an iterative writing process: (a) define a problem; (b) search the literature for applicable studies; (c) critically read, summarize, and synthesize the results; (d) create an outline and thesis; (e) participate in peer review; (f) develop a classical argument supported by evidence; and (g) use revision strategies to improve presentation of scholarly thinking and argumentation. Discipline-specific writing expectations are clarified using detailed assignment guidance and a standardized rubric for scholarly writing (Troxler et al., 2011). Faculty use a hierarchy of writing concerns to guide students through the revision process in an organized way, focusing on higher-order thinking skills before lower-order (Bean, 2011; Wolf & Wolf, 2022).
3. **Method:** This course employs a flexible "scale of help" to support students' autonomy and writing competency. Each student is assigned to work with the same faculty mentor throughout the course. Formative feedback from faculty is provided on each weekly assignment and students learn how to engage in peer review (Oermann et al., 2015) and ongoing reflection. Faculty differentiate feedback based on student needs. In the final stages of the writing process, students keep revising and receiving feedback until their writing meets expectations for early graduate-level work.
4. **Content:** Students learn higher-order writing strategies to improve their focus, use of evidence, and organization of ideas. Students also learn to control lower-order writing concerns such as paragraph organization, sentence structure, transitional devices, diction, and using APA style citations and formatting. Students are guided from reading research to constructing knowledge, synthesizing ideas, and discerning how to best present their research-based recommendations to a professional audience.

**Figure 2***The Cognitive Apprenticeship Model in Online Writing Instruction*

<b>The Cognitive Apprenticeship Model in Online Writing Instruction</b>			
<b>SOCIOLOGY</b> Characteristics of the learning environment	<b>METHOD</b> The approach used to develop competency	<b>SEQUENCING</b> The order activities are introduced	<b>CONTENT</b> Knowledge required for mastery
<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Psychological safety</li> <li>• Online faculty presence</li> <li>• Available, responsive faculty</li> <li>• Peer review partners</li> <li>• Synchronous webinars</li> </ul>	<ul style="list-style-type: none"> <li>• A flexible scale of help to scaffold students' writing development</li> <li>• Regular, balanced formative feedback from faculty and peers</li> <li>• Individualized feedback and support</li> <li>• The goal is independent mastery</li> </ul>	<ul style="list-style-type: none"> <li>• Guided through each stage of the writing process</li> <li>• Discipline-specific writing expectations</li> <li>• Multimedia content delivery</li> <li>• Hierarchy of writing concerns for revision</li> <li>• Assignments build on each other</li> </ul>	<ul style="list-style-type: none"> <li>• Higher-order and lower-order skills</li> <li>• Methods for searching, summarizing, and synthesizing research</li> <li>• Revision strategies</li> <li>• Paragraph revision and line editing</li> <li>• Peer review process</li> <li>• Reflection</li> </ul>

*Note.* This model is based on Collins et al.'s (1987) Framework for Designing Learning Environments.

**Data Collection**

Writing assessment data were collected within the first week of the Writing Workshop. All students were given the same prompt for the pre-test. The one-hour assessment is web-based so it is hosted, scored, and stored on Vantage Labs' server and reports can be downloaded by school administrators. The post-intervention assessment was given in the last two weeks of the writing course. Students were given a different writing prompt on the post-test.

***Survey on Situated Academic Writing Self-Efficacy Scale***

The *Situated Academic Writing Self-Efficacy Scale*, developed by Mitchell et al. (2021), was used in the creation of the school's self-efficacy survey. This survey is based on Bandura's (1997) concept of self-efficacy, as part of his social cognitive theory (Bandura, 1986), and was used to provide deeper insight into students' writing development. Self-efficacy is the idea that one's beliefs about their ability affect their motivation and achievement. Specifically, self-efficacy mediates a person's ability to maintain effort, progress towards a learning goal, and persist despite challenges. Participants in the study were given a pre- and post-intervention self-efficacy survey on scholarly writing to measure any differences in self-efficacy after the writing intervention and facilitate students' reflection on their confidence about writing (see Appendix A for a list of the survey questions).

The scale was originally developed with nursing students and was later validated with interdisciplinary undergraduate and graduate students. The survey is divided into three subscales that address more complex features of scholarly writing as students make progress through the survey, including: (a) writing essentials focusing on confidence with word choice, and synthesizing evidence; (b) relational reflective writing focusing on using feedback for revision, monitoring, and reflecting on their writing process; and (c) creative identity focused on perceptions of creativity, writing voice, and general confidence about scholarly writing.

### ***Survey on Task Value***

Students' task value for scholarly writing was also measured on the survey. Task value is a component of expectancy-value theory and represents the value a person places on a specific task, helping them attain a desired goal. Like self-efficacy, task value affects a student's motivation to engage in, persist with, and perform well on a task that they value (Eccles & Wigfield, 2002). Questions from *A Manual for the Use of the Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich et al., 1991) were adapted regarding the task value component of motivation. These questions were framed within the context of learning scholarly writing. The six questions include two questions about utility value, two questions on intrinsic value, and two on the attainment value of scholarly writing (see Appendix A for a list of the survey questions).

### ***Automated Essay Scoring of Writing Proficiency***

The automated writing assessment was developed by Vantage Labs using the artificial intelligence (AI) called IntelliMetric®. This test was based on a five-level rubric aligned to a similar hierarchy of writing concerns taught in the Writing Workshop. IntelliMetric® has demonstrated reliability and validity (Elliot, 2003; Rudner et al., 2006).

### ***Instrumentation***

IntelliMetric® has been used to administer testing for multiple educational institutions at the district, state, and higher education levels. For instance, IntelliMetric® has been used by The College Board, Harcourt Companies, and the Secondary School Assessment Testing Board (Elliot, 2003). Currently, ACT, GMAC, ACER, and ACARA use IntelliMetric® and work with Vantage Labs for automated scoring.

The scoring system for each prompt within the IntelliMetric® system was created by collecting hundreds of written responses from community college students that were scored by faculty. The AI system was trained to recognize patterns in an effective persuasive essay and calculate scores based on the faculty's scoring of hundreds of essays responding to the same prompt. The IntelliMetric® AES was based on a five-item rubric created by writing specialists who selected anchor papers from national exemplars for each score point appropriate for college student expectations. The IntelliMetric® test has a rating scale of 1 to 6 for each item and the holistic score, representing a mean of all items. The rubric generally defines a holistic score of three as the equivalent of the writing skills expected of the average first-year undergraduate student, a four would correspond with a college senior, a five would be considered a master's level, and a top score of six would indicate doctoral-level writing (Edelblut, personal communication, April 18, 2022).

### ***Validity and Reliability***

This AI-scored writing assessment demonstrates construct validity because the subsets measured are subskills of the scholarly writing process. The subscale scores are based on the hierarchy of writing concerns (Bean, 2011; Harvard Writing Project, 2007; Wolf & Wolf, 2022). These areas are divided into two categories. The higher-order, or global concerns, are the meaning-based skills of focus, development, and organization. The lower-order, or local concerns, include grammar, language usage, and sentence mechanics. The Vantage Labs assessment measures similar constructs: focus and meaning, content and development, organization, language usage, and mechanics (Haisfield et al., 2012). The writing assessment has

construct validity because it uses the same constructs as the hierarchy of writing concerns and the writing rubric used for the final paper in the course.

IntelliMetric® has further demonstrated reliability and validity. Elliot (2003) summarized a review of over 100 studies involving the use of IntelliMetric®, showing that this technology aligns with the manual scoring of experts, can accurately score across multiple content areas and grade levels, and provides stable results across various samples. Rudner et al. (2006) examined IntelliMetric® prior to adopting it as a secondary measurement to human raters for GMAT essays and concluded that IntelliMetric® scores matched human raters, the AI was able to identify essays containing plagiarism, and the technology was “superior to simple word counts or simple probability modeling” (p. 12).

### Data Analysis

Scores from the AES measures of writing proficiency, self-efficacy survey, and task-value survey were first summarized with descriptive measures of central tendency. To test the effectiveness of the writing intervention, pre- and post-test scores were then analyzed using a paired *t*-test for dependent measures.

## Results

### Improvement in Self-Efficacy: Self-Efficacy Survey Results

Statistically significant differences between pre- and post-intervention scores were found across all three subscales for writing self-efficacy, including writing essentials ( $t(49) = 6.8, p < 0.001; d = .96$ ), relational reflective writing ( $t(48) = 7.7, p < 0.001; d = 1.1$ ), and creative identity ( $t(47) = 7.8, p < 0.001; d = 1.12$ ). The average scores were all higher on post-test scores compared to pre-test scores, indicating a significant improvement in students' reported self-efficacy after completing the Writing Workshop (see Table 3). Effect sizes for these differences were large (Cohen's  $d > 0.8$ ), demonstrating clinical as well as statistical significance (Cohen, 1988). These results are summarized in Table 2.

**Table 2**

*Pre- and Post-Test Scores on Self-Efficacy and Task Value*

Subscales	Test	<i>M</i>	<i>N</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Writing essentials	Pre	6.08	50	1.69	6.8	49	0.001	0.96
	Post	7.89	50	1.47				
Relational reflective writing	Pre	6.68	49	1.40	7.7	48	0.001	1.10
	Post	8.25	49	1.10				
Creative identity	Pre	5.70	48	1.48	7.8	47	0.001	1.12
	Post	7.72	48	1.48				
Task value	Pre	7.93	50	1.50	0.8	49	>0.05	0.11
	Post	8.08	50	1.49				

### No Change in Task Value for Scholarly Writing: Task Value Survey Results

The difference between task value pre- and post-course scores was not significant ( $t(49) = 0.8, p > 0.05; d = 0.11$ ). In other words, respondents reported approximately the same task value score on the pre-test as they did on the post-test (see Table 2). It is notable that survey respondents exhibited high task value for scholarly writing (7.93 out of 10) before the course and that high task value remained consistent after the course (8.08 out of 10).

**Table 3**

*Parametric Statistics: Pre- and Post-Course Writing Assessment Scores*

Dimension	Test	<i>M</i>	<i>N</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Focus and meaning	Pre	3.18	57	0.83	14.3	56	0.000	1.9
	Post	4.70	57	0.91				
Content and development	Pre	2.74	57	0.72	12.3	56	0.000	1.63
	Post	4.14	57	0.83				
Organization	Pre	2.82	57	0.66	12.2	56	0.000	1.62
	Post	4.12	57	0.73				
Language usage and style	Pre	2.95	57	0.67	16.2	56	0.000	2.15
	Post	4.77	57	0.93				
Mechanics and conventions	Pre	2.82	57	0.66	15.3	56	0.000	2.03
	Post	4.47	57	0.85				
Holistic Score	Pre	3.19	57	0.81	15.1	56	0.000	2.00
	Post	4.79	57	0.92				

### Improvement in Writing Performance: Writing Assessment Results

Statistically significant differences between pre- and post-scores were found across all six subscales of the writing proficiency test, including: focus and meaning ( $t(56) = 14.3, p < 0.000; d = 1.9$ ), content and development ( $t(56) = 12.3, p < 0.000; d = 1.63$ ), organization ( $t(56) = 12.2, p < 0.000; d = 1.2$ ), language usage and style ( $t(56) = 16.2, p < 0.000; d = 2.15$ ), mechanics and convention ( $t(56) = 15.3, p < 0.000; d = 2.03$ ). The holistic score, representing a mean of means of the subscales also showed a significant difference between pre- and post-tests ( $t(56) = 15.1, p < 0.000; d = 2.00$ ). The average scores were all higher on post-test scores, compared to pre-test scores, indicating a significant improvement in writing skills following completion of the Writing Workshop (see Table 3). Effect sizes for these differences were large (Cohen's  $d > 0.8$ ), demonstrating clinical as well as statistical significance (Cohen, 1988).

## Discussion

This study has evaluated an existing competency-based writing intervention that used a cognitive apprenticeship approach to deliver writing instruction to students in graduate nursing education in an online course. The literature on best practices in online writing pedagogy, including research specific to nursing education, was reviewed, analyzed, and used as the foundation for this study. The literature review revealed a need for more studies measuring the

impact of online writing pedagogy on student performance in both the nursing literature and online learning literature. However, there is ample literature on writing pedagogy in other contexts. This study tested the effect of combining many of these evidence-based practices of writing pedagogy together in one online course organized around a cognitive apprenticeship framework aimed at improving writing competencies for graduate nursing students.

Findings from the study suggest that an online writing course designed and taught according to a cognitive apprenticeship model significantly impacted students' writing self-efficacy and performance. Specifically, survey data showed that the Writing Workshop improved students' self-efficacy across all three subscales, including writing essentials, relational reflective writing, and creative identity, with large effect sizes. Similarly, student writing performance increased significantly from pre- to post-test in all six subscales and the holistic scores, demonstrating large effect sizes. The results highlight the effectiveness of a cognitive apprenticeship model in improving both self-efficacy and performance in scholarly writing.

### **The Cognitive Apprenticeship Model**

The cognitive apprenticeship model is useful for interpreting this study's results. Cognitive apprenticeship includes four pedagogical components that must be addressed for effective teaching and learning (Collins et al., 1987). We will use these four components to analyze why the intervention was successful.

### **The Sociology of the Learning Environment**

Because writing is a form of communication, it is also an inherently social activity that presupposes a specific audience, format, and message to deliver (Bean, 2011). In The Writing Workshop, the writing task was situated in a meaningful, relevant task of researching a nursing-related problem and writing recommendations based on the literature. Intrinsic motivation was supported because students chose their topic and created their writing goals from the beginning. In addition, students engaged in peer review and small group work during synchronous webinars.

Faculty enhanced instructor presence via pre-recorded lecture videos in the Blackboard LMS. Faculty were available to talk or meet with them as needed. Students reached out to meet with faculty when they needed clarification or additional support. Some students had several conferences with their assigned faculty throughout the semester; others did not require any. Faculty offered students generous flexibility regarding late submissions, without penalty, because they wanted to allow students sufficient time to research, think, write, and revise. This warm, benevolent, psychologically safe environment was intentional to help students take risks and grow from their mistakes without fear of harsh judgment.

Although students received a maximum of ten points on each weekly assignment, and their final paper had to achieve a minimum of 80% on the rubric, the course itself was "pass or fail" to help students focus on faculty feedback instead of grades. Rather than taking a deficit approach, where students who are not successful are deemed deficient, the prior knowledge and strengths of students were used as a foundation for new knowledge. Faculty invited students' drafts, providing them with encouraging praise and constructive feedback on their writing in progress. This approach aligns with research about the importance of encouraging students' efforts and establishing psychological safety in promoting the learner's growth and development (Ball et al., 2009; Chandler et al., 2005; Edmonson, 1999; Smith, 2008). Building an intentionally supportive class culture that focuses on student mastery of professional competencies is vital when using the cognitive apprenticeship approach to teaching.



### **Sequencing: The Importance of Instructional Design**

In this writing intervention, students received support for various stages of learning through sequenced instructional design, clearly written expectations, and differentiated instruction using a hierarchy of writing concerns. Each weekly assignment built upon the previous one, essentially dividing the writing project into specific tasks. This is consistent with current thoughts on writing instruction, acknowledging that writing is iterative rather than linear (Bean, 2011; Gazza & Hunker, 2012; Luthy et al., 2009). In addition to the benefits of sequencing assignments, dividing the complex task of writing a paper into discrete chunks may have supported learning by ensuring that instructional activities were not too complex, thereby reducing the cognitive load (Sweller, 1994). Students were led through the step-by-step writing process: literature search, critical reading, defining a problem, summarizing and notetaking, APA citation, synthesis, thesis development, outlining an argument, drafting, revision, line editing, and reflection. The direct instruction of discrete skills involved in the writing process gave students a clear picture of what was required at each stage to develop their written argument.

Another example of supportive online instructional design was the provision of detailed assignment guidance each week that explained what they were being asked to do, why the work was professionally relevant, and a heuristic for how they might proceed with accomplishing the task combined with a model paper, and rubrics. This information was provided in video and text formats to accommodate a wide range of users and their preferences (Borgman, 2018). These supports took the guesswork out of faculty expectations and gave students a suggested structure for approaching and completing each assignment. Again, the research literature also corroborates the importance of clarifying student expectations using these methods (Behrens et al., 2016; Carter et al., 2018; Gazza & Hunker, 2012; Naber et al., 2014; Troxler et al., 2011).

### **Method: Faculty Used a Scale of Help to Scaffold Students' Learning**

One of the main principles of sociocultural theory is that learning is social by nature. Vygotsky (1978) defined the *zone of proximal development* (ZPD) as the area of learning where an individual can accomplish a task with help but has not yet achieved independent mastery. With appropriate support from a more experienced person, Vygotsky posited that a learner could eventually become proficient with a task they previously could not accomplish alone. In other words, learning occurs within a social context, and learners benefit from the direct guidance of individuals with more knowledge and expertise through shared language and experience. Bruner (1966) described the act of supporting the learner by simplifying a task and providing guidance as “scaffolding,” recognizing that the support can be withdrawn when a learner can perform a skill independently. This study illuminates the vital role of scaffolding in developing students' writing capacity, with the instructors providing individualized support for students throughout the course.

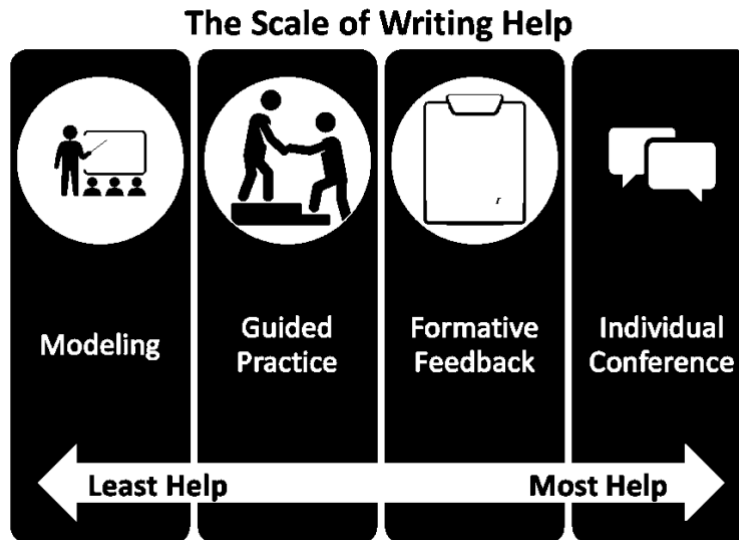
### ***Providing a Flexible Scale of Help***

The term *scale of help* was developed by Marie Clay (2005), founder of Reading Recovery®, to categorize the level of scaffolding a teacher provided from least to most help. The baseline of help given to students in the Writing Workshop was direct instruction and modeling via multimedia content, assignment guidance tools, peer review, and a course design that facilitated an iterative writing process. The second level of support was delivered via three synchronous webinars: an orientation to the unique course design, how to organize paragraphs,

and line-editing techniques. In addition, the webinars furnished direct instruction and guided practice to the whole group. The third level of help was personalized feedback students received from faculty on each weekly assignment. The fourth level of help was a writing conference with the faculty. These individualized sessions allowed faculty to explain their written comments in more detail, model a strategy they wanted the student to use, help organize students' thinking, guide students through the proper citation of sources, or address student questions or confusions. The scale of writing help, as used in the online writing intervention, is represented in Figure 3.

**Figure 3**

*The Scale of Writing Help*



*Note.* This scale is based on Marie Clay's (2005) concept of contingent help, where a teacher offers just enough support to assist students in completing a task, with the goal being students' independence and transfer of learning. This scale is adapted for the online writing context.

The scale of help allowed faculty to customize the course to meet the needs of students from a broad range of backgrounds and literacy experiences. Although most students were reasonably independent, this flexibility accommodated students who needed regularly scheduled appointments to those who only had an occasional question via email. Because faculty could request various levels of interaction, students received the support required to maximize their learning within the ZPD and alleviate excessive periods of frustration or inactivity. The reviewed literature confirmed the value of scaffolded social mediation in improving students' writing development (Baleghizadeh & Gordani, 2012; Grigoryan, 2017; Hawisher & Pemberton, 2019; McCutchen, 1996). Differentiating learning within a required, discipline-specific writing course supplied even the most fragile writers with the level of instruction they needed to succeed without the notion that they were "remedial" students or less capable than their peers. This curricular approach assumes writing is developmental rather than remedial and requires direct instruction instead of assuming students should enter college as fully developed writers (Hathaway, 2015).

### ***The Value of Formative Feedback During the Writing Process***

Faculty spent most of their instructional time giving students regular, formative feedback on weekly assignments and final drafts to develop their writing capacity. Formative feedback from a more experienced writer enabled students to enhance their understanding of writing as a strategic, iterative task to communicate meaning to a broader audience and improve their writing development (Jefferies et al., 2018; McCutchen, 1996). McCutchen found that without formative feedback, many writers would not become strategic and would continue to view writing as merely putting words on a page. Additionally, formative feedback allowed instructors to guide students' development of discipline-specific conventions and scholarship (Ivanic, 1998; McCutchen, 1996; Mitchell, 2018).

### ***Supporting Reflection and Metacognition***

The Writing Workshop used reflection to stimulate students' metacognition about their writing progress, self-efficacy, and transferred use of cognitive tools in the workplace (Gazza et al., 2018; Prestia, 2019). Students engaged in reflection through a letter of response included with each submitted draft, explaining how to receive and incorporate instructor feedback in their revision process. Also, in a final reflection assignment, students were given the opportunity to reflect on their writing goal for the course, how they approached the writing project, which strategies worked well, how they addressed challenges, how they applied what they learned to their practice, and setting new goals for the future. The reviewed literature bears witness to the importance of reflection to successfully enculturate novices into the profession (Chaudoir et al., 2016; Tyndall & Scott, 2017). Reflection allows students to integrate their learning through experience and interactions with peers and instructors to internalize the knowledge, skills, and values required to become active members of the professional community.

### **Content: Requisite Knowledge for Mastery**

The final component of cognitive apprenticeship addresses the content. In the Writing Workshop, students were taught an iterative writing process, the principles of APA style, research summarizing, and synthesis, peer review, and revision strategies organized around the hierarchy of writing concerns. This hierarchy, divided into higher-order and lower-order writing concerns, guides students to approach revision in an ordered way with clear priorities. This organizational approach to revision work and providing feedback has been discussed by other authors (e.g., Bean, 2011; Harvard Writing Project, 2007). Students also learned specific processes to frame a problem, improve their focus, organize paragraphs, and support an argument with evidence. These writing techniques provided students with “tricks of the trade” in presenting evidence in a focused, organized, impactful way to a scholarly audience. In sociocultural terms, the socially mediated strategies students learned in this writing course became what Vygotsky would consider “cognitive tools” or a structured system of thinking that became internalized (Kozulin, 2002, p. 19). According to Marie Clay (1991), as a student adopts these tools as their own, they will eventually create a self-extending system whereby using these strategies will facilitate the student's self-regulated and ongoing writing development.

## **Implications**

There are four important implications for practice based on the reviewed literature and the results of this study. First, nursing faculty should offer students required writing and writing-intensive courses based on cognitive apprenticeship principles. Second, this study affirms

Wornock's (2009) assertion that the migration of writing pedagogy to an online context is effective. Faculty can use best practices from research on composition and writing instruction to inform their online instruction.

Third, a competency-based approach that provides students with a flexible path to mastery can operate within a traditional time-based semester online. Instructors who support the development of nursing students' writing and thinking skills can empower students from a wide range of educational backgrounds. The scale of help is a promising strategy for students from underrepresented and low socioeconomic groups to enter the profession and enable their ongoing success in graduate school and as future leaders, scholars, faculty, and researchers.

Fourth, this study indicates that using automated essay scoring enabled by artificial intelligence can provide an efficient, reliable, and valid way to evaluate students' writing performance for educational research. This has significant implications for evaluating writing, not only allowing this study to be replicated but also extended into longitudinal studies that track the development of writing performance across a curriculum. Additionally, this instrument may help researchers further explore the relationship between writing performance, critical thinking, clinical judgment, and decision-making. The administration of automated essay scoring at the beginning and end of a course or program can also provide students with data points to reflect upon their writing progress over time.

## **Limitations**

The limitations of this study primarily relate to the selective sample and quasi-experimental design. This course involved nursing graduate students at a private four-year school, and further study is needed to generalize these findings outside of that population. Additionally, this was a quasi-experimental study with no control group, raising the possibility that there might be uncontrolled confounding variables influencing the results.

## **Conclusion**

Nursing faculty have struggled with finding recommendations for writing instruction that have been evaluated for their potency. This study illustrates how a discipline-specific online competency-based writing course can significantly improve graduate nursing students' writing capacity and development. In 1984, Benjamin Bloom challenged educational researchers to explore group interventions that parallel the outcomes of high-quality tutoring. One-on-one tutoring has been shown to create a maximum effect on student learning compared to other instructional methods, with an effect size of two. The cognitive apprenticeship approach, as used in the Writing Workshop, shows excellent promise in meeting Bloom's challenge. This study showed significant growth in students' writing performance with an effect size of two, matching the desired effects of tutoring. These results provide evidence that a competency-based, fully online writing intervention, with its roots in cognitive apprenticeship, can have a profound impact on students' writing performance and self-efficacy in only one semester.

## **Declarations**

The authors declare no conflicts of interest associated with this study.

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## **Appendix A**

### **Self-Efficacy and Task Value Survey Questions**

**Instructions:** As you respond to the items in this survey, please visualize any past writing experiences you've had while writing at the post-secondary (university or college) level. Experiences you had prior to university or college may contribute to how you self-assess your writing abilities in the areas described in the instrument.

Rate what you think is your ability to successfully achieve each task presented in the question with a score of 0 meaning you are “completely sure you cannot” successfully perform that item and 10 meaning you are “completely sure you can” successfully perform the item.

#### **Writing Essentials**

1. Even when the writing is hard, I can find ways to overcome my writing difficulties.
2. I can successfully use scholarly, academic words and phrases when writing in my courses.
3. I can combine or synthesize multiple sources I've read to create an original product or text.
4. I am confident that I can successfully complete scholarly writing assignments in master's level nursing courses.

#### **Relational Reflective Writing**

5. When I write, I can think about my audience and write so they clearly understand my meaning.
6. When I receive feedback on my writing, no matter how it makes me feel, I can use that feedback to improve my writing in the future.
7. When I reflect on what I am writing, I can make my writing better.
8. When I read articles about my topic, the connections I feel with the ideas of other authors can inspire me to express my own ideas in writing.
9. When I look at the overall picture I've presented in my writing, I can assess how all the pieces tell the complete story of my topic or argument.

#### **Creative Identity**

10. I can use creativity when writing a scholarly paper.
11. I feel I can give my writing a creative spark and still sound professional.
12. I feel I can develop my own writing voice (ways of speaking in my writing that are uniquely me).
13. Even with very specific assignment guidelines, I can find ways of writing my assignment to make it original or unique.

#### **Task Value**

Rate your answers to the following statements with 0 meaning “not at all” and 10 meaning “extremely.”

14. I think I will be able to use what I learn about scholarly writing in The Writing Workshop in other courses in my graduate program.
15. It is important for me to learn how to write like a nursing scholar.
16. I am very interested in the content of The Writing Workshop
17. I think the course material in The Writing Workshop is useful for me to learn as a professional in healthcare.
18. I like learning how to become a better writer.
19. Understanding the scholarly writing process is very important to me.

Notes: Survey questions, except for the task value items, are from the “Situating Academic Writing Self-Efficacy Scale” by Mitchell, K. M., McMillan, D. E., Lobchuk, M. M., & Nickel, N. (2021). Development and validation of the Situated Academic Writing Self-Efficacy Scale (SAWSES). *Assessing Writing*, 48(2), 100524. <https://doi.org/10.1016/j.asw.2021.100524>  
Task value items are adapted from “A manual for the use of the motivated strategies for learning questionnaire” by Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the motivated strategies for learning questionnaire*. Technical report no. 91-B-004. The Regents of The University of Michigan.