ORIGINAL RESEARCH

From exams to engagement: A writing-intensive redesign to strengthen critical thinking in undergraduate nursing

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ABSTRACT

Objective: Undergraduate nursing research and data analysis courses are foundational to evidence-based practice yet are frequently perceived as abstract and disconnected from clinical care. This study describes an instructional redesign that transitioned from an exam-centered model to a writing-intensive, guided learning approach to improve engagement, critical thinking, and clinical relevance.

Methods: A structured pedagogical redesign incorporated writing-intensive assessment, guided skeletal notes, unfolding case studies, and interactive learning tools within a concept-based undergraduate nursing curriculum. A pre–post descriptive design was used to compare course-based assessment scores (analysis, application, and critical thinking) across multiple semesters. Qualitative data from student course evaluations were analyzed to assess perceived engagement, clarity, and relevance to nursing practice.

Results: Following implementation, analysis and application scores increased by approximately 7%, while course-based measures of critical thinking improved by 6%. Continued refinement of the instructional approach was associated with sustained improvements, with analysis and application averages reaching 95%–98% in subsequent semesters. Student evaluations further indicated increased engagement, improved clarity of content, enhanced relevance to nursing practice, and greater confidence in applying evidence-based concepts.

Conclusions: Writing-intensive, scaffolded instructional strategies grounded in learning science and concept-based education was associated with improvements in course-based measures of critical thinking and professional identity formation in undergraduate nursing education.

Key Words: Active learning, Clinical judgment, Concept-based curriculum, Evidence-based practice, Nursing education, Writing-intensive instruction

1. INTRODUCTION

Preparing undergraduate nursing students to function as safe, competent, and evidence-informed practitioners remains a central responsibility of contemporary nursing education. Modern healthcare environments require nurses to interpret complex patient data, synthesize research findings, and make clinical decisions that directly influence patient outcomes. Evidence-based practice (EBP) and sound clinical judgment are therefore widely recognized as essential competencies for professional nursing practice.[1,2] The American Association

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of Colleges of Nursing (AACN) identifies evidence-based practice, scholarship for the nursing discipline, and clinical judgment as core competencies expected of graduates from baccalaureate nursing programs.[1]

In this study, many nursing students reported that research and data analysis courses were among the most challenging components of the undergraduate curriculum. Participants frequently described feeling apprehensive when approaching statistical concepts and expressed uncertainty about how research methods are related to clinical practice. Several students noted difficulty interpreting statistical terminology and understanding research findings. Overall, the results suggested that students often struggled to connect statistical knowledge with everyday patient care decisions.

Findings from this study suggest that traditional instructional approaches may contribute to students' perceptions of difficulty in research and statistics courses. Many participants described these courses as being primarily lecture-based and heavily focused on examinations. Students reported that these assessments often required memorization of statistical terminology, definitions, and formulas rather than the interpretation or application of statistical findings in clinical situations. Although some students indicated that memorization strategies helped them perform adequately on exams, several participants felt that this approach did not support the development of deeper analytical thinking needed for professional nursing practice.

Within concept-based nursing curricula, educators increasingly seek to promote knowledge transfer, clinical reasoning, and synthesis rather than memorization of isolated facts.[3] Concept-based learning organizes knowledge around broad principles that can be applied across multiple clinical contexts. This approach encourages students to connect theoretical concepts with clinical experiences and supports the development of flexible problem-solving abilities. By focusing on underlying concepts rather than isolated details, concept-based education prepares students to respond to the complexity and variability inherent in healthcare environments.[3,4]

Tanner's Clinical Judgment Model provides an additional framework for understanding how nurses interpret patient information and make clinical decisions.[5] According to Tanner, effective nursing practice involves the cognitive processes of noticing relevant patient cues, interpreting their significance, responding with appropriate interventions, and reflecting on outcomes to guide future practice.[5] Developing these processes requires opportunities for active engagement with information, contextual interpretation, and meaningful application of knowledge.[6]

Research in learning science further highlights the importance of active learning strategies in promoting durable knowledge acquisition. Educational strategies such as retrieval practice, elaborative interrogation, and writing-to-learn activities encourage deeper cognitive processing and support long-term retention of complex concepts.[7,8] Writing assignments are particularly effective in promoting higher-order thinking because they require students to organize ideas, integrate information, and articulate reasoning in their own words.[9]

Despite this growing body of educational research, some undergraduate research courses remain structured around examinations rather than applied synthesis.[10] Students may memorize definitions of statistical tests or research terminology without fully understanding how those tools guide clinical decision-making. This disconnection between theoretical instruction and clinical application can limit engagement and reduce the perceived value of research education.[10]

Student performance data in a junior-level nursing research course revealed acceptable overall grades but weaker outcomes on assessment items requiring analysis and application of statistical concepts. Students demonstrated the ability to recall definitions and identify statistical tests but struggled when asked to interpret research findings or apply data to patient care scenarios. Course evaluations also suggested limited engagement and difficulty recognizing the relevance of statistical content to nursing practice.

The learning environment during this period was further influenced by the COVID-19 pandemic. Nursing students experienced prolonged periods of remote instruction and significant disruptions to their academic routines. Many students also encountered emotional and psychological stress related to witnessing the impact of the pandemic during clinical experiences. These factors affected student motivation and engagement with course content.

Although course outcomes remained acceptable, they did not reflect the level of analytical excellence required in professional nursing practice. The National Council of State Boards of Nursing emphasizes that safe clinical practice requires nurses to recognize cues, analyze information, prioritize interventions, and evaluate outcomes.[11] These competencies depend heavily on strong analytical reasoning and critical thinking skills. Specifically, students demonstrated proficiency in recall-based questions but performed less consistently on items requiring interpretation of statistical findings and application to clinical scenarios.

Recognizing these challenges, a structured instructional redesign was undertaken. The redesign sought to trans-

form the course from an exam-centered instructional model into a writing-intensive and scaffolded learning experience grounded in concept-based education, learning science, and caring pedagogy.

The purpose of this manuscript is to describe the development, implementation, and evaluation of this instructional innovation. The redesign aimed to improve student engagement, strengthen analytical reasoning, and enhance the perceived clinical relevance of research and data analysis in undergraduate nursing education.

1.1 Background and theoretical framework

1.1.1 *Concept-based curriculum and clinical judgement*

Concept-based curricula have gained increasing prominence in nursing education as faculty seek strategies to address the rapidly expanding body of healthcare knowledge.[3,4] Rather than attempting to cover an ever-growing list of facts and procedures, concept-based education focuses on helping students understand fundamental principles that can be applied across diverse clinical situations.

Within a concept-based framework, students are encouraged to recognize patterns, identify relationships among variables, and apply conceptual knowledge in multiple contexts. This approach promotes cognitive flexibility and helps learners develop the reasoning skills necessary for effective clinical decision-making.[12]

Research and statistics courses play an important role in supporting concept-based learning because they teach students how knowledge is generated, evaluated, and applied in healthcare practice. However, these courses can be challenging for students who struggle to perceive the relevance of statistical analysis to patient care.[3,4]

Tanner's Clinical Judgment Model provides a useful lens for understanding the role of research literacy in nursing practice.[5] Nurses must recognize meaningful patient cues, interpret clinical data, respond with appropriate interventions, and evaluate outcomes to guide future care. Research evidence supports these processes by providing data that inform clinical decisions.

Educational approaches that emphasize application and interpretation of research findings can therefore strengthen students' ability to integrate evidence into clinical practice.

1.1.2 *Learning science foundations*

Learning science research offers valuable insights into how students acquire and retain complex knowledge. One consistent finding is that passive listening is insufficient for deep learning. Instead, students benefit from instructional strategies that require active engagement with course material.[7]

Retrieval practice involves actively recalling information rather than simply reviewing it. This process strengthens memory and improves long-term retention.[7] Low-stakes quizzes, polling questions, and interactive discussions are common methods used to promote retrieval practice.

Elaborative interrogation encourages students to explain relationships among concepts and articulate the reasoning behind their conclusions. When learners explain ideas in their own words, they engage in deeper cognitive processing that supports conceptual understanding.[7]

Writing-to-learn strategies represent a particularly powerful form of elaborative learning. Writing requires students to synthesize information, organize ideas, and communicate reasoning clearly.[9] These processes strengthen higher-order thinking skills such as analysis, evaluation, and synthesis.

Scaffolding is another important instructional strategy. Scaffolding involves structuring learning experiences to provide support as students develop new skills. Educational literature suggests that scaffolding is particularly useful in complex content areas because it provides structure while students develop independent reasoning skills.[13] Examples include guided notes, structured prompts, and step-by-step problem-solving activities. As students gain confidence and competence, these supports can gradually be reduced.

Such approaches are especially beneficial in courses involving complex analytical content, including research methodology and statistical analysis.

1.1.3 *Caring pedagogy and relational teaching*

Effective nursing education must also address the relational and emotional dimensions of learning. Nursing is fundamentally grounded in the concept of caring, and this principle extends to the educational environment.[14]

A caring teaching philosophy emphasizes supportive relationships between instructors and students. Faculty who demonstrates empathy, respect, and encouragement help create learning environments in which students feel comfortable asking questions and engaging with challenging material.[14,15] In this course, however, the primary challenge was not relational disengagement, but rather students' difficulty connecting abstract research content to clinical practice, suggesting that both cognitive and relational teaching approaches needed to be considered.

Students often learn professional values through observing the behaviors and attitudes of their instructors. When educators model compassion, ethical decision-making, and professionalism, students internalize these values and incorporate them into their developing professional identities.[14,15]

Research indicates that students who perceive their instructors as caring and supportive experience increased motivation, confidence, and engagement in learning.[15,16] Caring relationships also foster psychological safety, which is essential for intellectual risk-taking and collaborative learning.[14]

Integrating caring pedagogy with active learning strategies can therefore support both cognitive and professional development among nursing students.

2. METHODS

2.1 Setting and participants

The instructional redesign occurred in a junior-level undergraduate nursing research and data analysis course within a Bachelor of Science in Nursing program in the United States. Students enrolled in the course were typically in the third year of the nursing curriculum and concurrently completing clinical rotations in acute care and community health settings. These clinical experiences provided opportunities for students to observe patient care situations and consider how research evidence informs clinical interventions.

2.2 Measurement

Rubrics were structured to assess three domains: analysis, application, and critical thinking. Analysis criteria included accurate interpretation of statistical findings and identification of appropriate tests. Application criteria evaluated the ability to apply findings to clinical scenarios. Critical thinking was operationalized as the ability to synthesize evidence, justify conclusions, and articulate clinical implications using supporting rationale. Each domain was scored using a 4-point scale with defined performance descriptors.

2.3 Qualitative

A total of 73 student responses were analyzed. Responses were reviewed using an inductive thematic approach. The instructor independently reviewed responses, identified recurring patterns, and grouped them into themes related to engagement, relevance, and confidence.

2.4 Study design

A pedagogical intervention design was used to evaluate the impact of the instructional redesign. Student performance data from semesters prior to implementation were compared with outcomes following the redesign.

Quantitative data included scores from assignments designed to measure analysis and application of statistical concepts. These outcomes aligned with higher levels of Bloom's taxonomy.

Qualitative data were obtained from student course evaluations, reflective comments, and post-course surveys describing learning experiences.

2.5 Data sources and analysis

Data were collected from three consecutive course offerings (Fall 2021 n = 47, Fall 2022 n = 46, and Fall 2023 n = 34). The sample included all enrolled junior-level nursing students in the research course (n = 127 across three semesters).

Quantitative data included student performance on course assessments specifically designed to measure analysis and application of statistical concepts. These scores were derived from assignment rubrics aligned with course learning outcomes and Bloom's higher-order cognitive domains.

Pre-implementation data were obtained from exam-based assessments (Fall 2021), while post-implementation data were derived from writing-intensive assignments (Fall 2022–2023). Scores were compared descriptively across semesters using percentage averages.

Qualitative data were obtained from end-of-course student evaluations and open-ended survey responses. Responses were reviewed using thematic analysis to identify patterns related to engagement, perceived relevance, and confidence in applying research concepts.

Although validated instruments for measuring critical thinking (e.g., standardized critical thinking inventories) were not used, course assessments were intentionally designed to align with higher-order cognitive domains of Bloom's taxonomy, specifically analysis and application. Rubrics were developed to evaluate students' ability to interpret statistical findings, synthesize information, and apply evidence to clinical scenarios. These outcomes reflect key components of clinical judgment and evidence-based practice competencies in nursing education. No formal statistical testing was conducted due to the course-level nature of the data; findings are therefore interpreted as descriptive rather than causal.

2.6 Instructional redesign

The redesigned course incorporated several instructional strategies intended to promote active engagement, critical thinking, and meaningful application of research concepts.

2.7 Writing-intensive assignments

Traditional examinations were replaced with structured writing assignments that required students to analyze datasets, interpret statistical findings, and apply research evidence to clinical scenarios. Writing assignments encouraged students to articulate reasoning processes and demonstrate understanding of statistical relationships. Writing-to-learn approaches promote integration of knowledge and development of critical thinking skills.[10] By requiring students to articulate

reasoning and link findings to patient care implications, assignments shifted emphasis from memorization to analytical thinking. Opportunities for revision and feedback reinforced mastery rather than single-attempt performance.

2.8 Guided skeletal notes

Guided skeletal notes, defined as partially completed structured note templates that require students to actively fill in key concepts, calculations, and interpretations during instruction, were introduced to provide structured cognitive scaffolding during class sessions. Structured scaffolding supports learners in organizing complex information and progressively assuming responsibility for higher-order reasoning.[17, 18] Templates included prompts for interpretation, calculation, and application, reducing passive note-taking and increasing active processing. These notes provided structured outlines that organized complex statistical concepts into manageable sections. Students completed key ideas, calculations, and interpretations during class sessions.[9]

2.9 Unfolding case studies

Case-based learning approaches allow students to apply theoretical knowledge within realistic patient care scenarios and strengthen clinical reasoning skills.[19] Unfolding case studies were incorporated to simulate realistic clinical scenarios. Patient information was revealed gradually over several class sessions, requiring students to interpret evolving data and apply research evidence to patient care decisions.

2.10 Interactive learning activities

Simulation and experiential learning approaches have also demonstrated effectiveness in nursing education.[20] Interactive learning activities were used to reinforce applied learning and retrieval practice. Microsoft Excel activities were incorporated to allow students to manipulate real datasets and interpret output in clinical contexts. Formative tools such as polling and quizzes increased engagement and supported retrieval practice and immediate feedback, strategies associated with improved retention and transfer.[6, 17]

3. Results

These outcomes were derived from course assessment scores comparing exam-based evaluations prior to redesign with rubric-based writing assignments following implementation.

Implementation of the redesigned instructional model produced measurable improvements in student learning outcomes. Analysis and application scores increased by approximately seven percent following the introduction of writing-intensive assignments and scaffolded learning strategies.

Course-based rubric scores associated with critical thinking increased by approximately six percent. Continued refinement of the instructional approach led to sustained improvements in subsequent semesters, with analysis and application scores reaching averages between ninety-five and ninety-eight percent. The reported percentage increases represent differences in average student performance across semesters rather than statistically tested differences.

Student feedback reinforced these quantitative findings. Approximately 94% of students referenced increased engagement or relevance in open-ended evaluations. Course evaluations indicated that students felt more engaged in the learning process and better able to understand statistical concepts when they were connected to nursing practice.

Many students reported increased confidence in their ability to analyze research data and apply evidence to patient care decisions.

4. Discussion

The findings of this instructional redesign suggest that writing-intensive, scaffolded learning approaches may meaningfully enhance higher-order thinking and student engagement in undergraduate nursing research education.

While the outcome measures in this study were course-based rather than derived from standardized instruments, they were intentionally aligned with higher-order cognitive processes associated with critical thinking and clinical judgment. Students were evaluated on their ability to interpret data, justify conclusions, and apply findings within clinical contexts, which are core elements of evidence-based practice. As such, these measures provide a practical representation of applied critical thinking within the context of nursing education.

Writing assignments required students to interpret statistical findings and articulate reasoning processes, aligning with learning science research demonstrating that elaborative processing supports deeper conceptual understanding.[7] By shifting from an exam-centered model to writing-based synthesis and applied learning, students engaged more actively in interpreting research findings, and applying statistical concepts to clinical scenarios. This approach represents a departure from traditional models that emphasize memorization of terminology and procedural problem solving.

These instructional strategies are consistent with cognitive learning theory, which suggests that elaborative processing supports conceptual understanding and knowledge transfer.[7, 8, 13] Such processes are important for nurses who must interpret research findings and apply evidence in clinical decision-making.[8, 13]

The incorporation of scaffolded learning strategies also ap-

peared to contribute to improved student outcomes. Guided skeletal notes helped organize complex statistical information into structured frameworks that supported cognitive processing and reduced learner overload. These supports provided a foundation for understanding statistical relationships while encouraging active engagement.

Unfolding case studies further supported connections between research education and clinical practice by situating statistical reasoning within realistic patient care scenarios.[19] This approach mirrors the clinical decision-making processes and reinforces the relevance of research literacy in practice.

Interactive learning activities also supported engagement and comprehension. Exercises such as Excel-based data analysis allowed students to visualize statistical relationships and practice interpreting results.

While polling and formative assessments provided opportunities for retrieval practice and immediate feedback, both associated with improved retention and conceptual understanding.[7] Together, these strategies contributed to a more participatory learning environment.

The findings presented here reflect observed changes in course-based performance measures and student perceptions. Interpretations regarding underlying cognitive processes are informed by existing science and nursing education literature rather than directly within this study.

Another important element of the redesign was the integration of caring pedagogy. Nursing education is inherently relational, and students' perceptions of instructor support can influence motivation and learning. By fostering a classroom environment characterized by respect, encouragement, and constructive feedback, the instructor promoted psychological safety and intellectual risk-taking. Students reported feeling supported when engaging with challenging statistical concepts, which may have contributed to increased confidence and participation.

The outcomes observed in this study suggest that combining active learning strategies with caring pedagogy may support both cognitive and professional development. Students demonstrated higher performance on course-based analytical measures and reported increased confidence in applying research findings in clinical contexts.

The sustained improvement in analysis and application scores across semesters suggests the possibility of durable changes in learning outcomes rather than short-term gains. Continued refinement of course activities, including expanded opportunities for applied learning and interaction, may have contributed to these trends. These findings also highlight instructional redesign is an iterative process in which ongoing reflection and adjustment enhance teaching effectiveness.

Importantly, the redesign also addressed student disengagement commonly reported in research courses. When students perceive course content as relevant to professional practice, they are more likely to engage actively. By explicitly linking statistical concepts to patient care scenarios, the redesigned course may have helped students recognize the value of research literacy in nursing practice.

While improvements in performance and student engagement were observed, the study did not directly measure constructs such as clinical reasoning or conceptual understanding using validated instruments. Therefore, interpretations linking observed outcomes to theoretical frameworks should be informed by existing literature rather than empirically established within this study.

Alignment with AACN Essentials and Clinical Judgement Models The instructional redesign described in this study aligns with the competencies outlined in the American Association of Colleges of Nursing (AACN) Essentials for Professional Nursing Education,[1] which emphasize clinical judgment, evidence-based practice, scholarship, and professional identity formation.

Writing-intensive assignments and case-based learning activities provided opportunities for students to engage in processes central to evidence-based, practice including interpreting data, evaluating evidence, and applying to clinical scenarios. These activities also supported the development of scholarly inquiry by encouraging critical evaluation of research.

The redesign also reflects key principles of the National Council of State Boards of Nursing Clinical Judgment Measurement Model (CJMM), which emphasizes recognizing cues, analyzing information, prioritizing hypotheses, and evaluating outcomes.[11] The use of unfolding case studies and writing assignments provided structured opportunities for students to engage in these processes.

By aligning instructional strategies with both the AACN Essentials and the CJMM, the redesigned course supports the broader goals of contemporary nursing education.[1,11] Preparing students to interpret and apply research evidence may encourage their ability to engage in evidence-based practice and contribute to informed clinical decision-making.

Ultimately, integrating research literacy with clinical judgment development may help prepare undergraduate nursing students to apply scientific evidence in ways that support patient care and healthcare system improvement.

Limitations

Several limitations should be considered when interpreting the findings of this instructional redesign. First, the study reflects the implementation of a pedagogical innovation within a single undergraduate nursing course at one institution. Although the results proposed measurable improvements in analysis, application, and critical thinking outcomes, the findings may not be fully generalizable to other nursing programs with different curricular structures, institutional contexts, or student populations. Nursing programs vary widely in their adoption of concept-based curricula, class sizes, and available instructional resources, all of which may influence the implementation and outcomes of similar instructional strategies. Findings should therefore be interpreted as indicative of trends rather than definitive evidence of effectiveness.

An important limitation is the use of different assessment modalities across time points. Pre-intervention outcomes were derived from exam-based assessments, whereas post-intervention outcomes were based on writing-intensive assignments. These differences may influence score comparability, as writing-based assessments may more directly capture higher-order cognitive processes.

Second, the evaluation relied primarily on course-based assessments and student evaluations rather than validated instruments of critical thinking or research competence. Although these measures were aligned with higher-order cognitive skills, the absence of standardized tools limits the ability to generalize findings or compare outcomes across studies.

Future studies could incorporate validated instruments that measure research literacy, critical thinking, or evidence-based practice competencies to provide more robust evidence of learning outcomes.

A third limitation relates to the absence of a randomized comparison group. Although student performance before and after the instructional redesign suggests meaningful improvement, the study design does not allow for causal conclusions regarding the effectiveness of the intervention. Other factors, such as cohort differences, student motivation, or broader curricular changes, may have contributed to the observed improvements. Future research using quasi-experimental or controlled study designs could provide stronger evidence regarding the impact of writing-intensive and scaffolded instructional strategies on student learning outcomes. Likewise, the COVID-19 pandemic may have influenced student engagement and learning conditions, representing a potential confounding variable when comparing cohorts across semesters.

Additionally, qualitative feedback from students provided valuable insights into engagement and perceived relevance of course content; however, the analysis of qualitative data was limited to course evaluations and informal student comments. More systematic qualitative methods, such as focus groups or structured interviews, could provide deeper understanding of how students experience writing-intensive research instruction and how these experiences influence their attitudes toward evidence-based practice.

The long-term impact of the instructional redesign also remains an important area for further investigation. Although improvements were observed in course-level outcomes, it is unclear whether these gains translate into sustained competence in evidence-based practice during clinical training or professional practice. Longitudinal research could examine whether students who participate in writing-intensive research courses demonstrate stronger clinical judgment, research utilization, or quality improvement engagement during later clinical coursework or after graduation.

Future research may also explore the scalability and adaptability of writing-intensive research instruction across different educational contexts. Replication studies in multiple nursing programs could help determine whether similar instructional strategies are effective in diverse learning environments, including accelerated nursing programs, RN-to-BSN programs, or graduate-level education. Additionally, examining how these strategies function in both face-to-face and online learning environments would provide valuable insight as nursing education continues to expand digital and hybrid instructional models.

Further investigation could also explore how writing-intensive research instruction contributes to professional identity formation among nursing students. By engaging with research evidence and applying data to patient care scenarios, students may begin to see themselves not only as clinicians but also as scholarly practitioners who contribute to evidence-based improvement in healthcare systems.[21]

Despite these limitations, the present study provides encouraging evidence that instructional redesign grounded in learning science, scaffolding, and caring pedagogy can enhance student engagement and higher order thinking in nursing research education. Continued investigation into innovative teaching strategies will be essential as nursing education seeks to prepare graduates who are capable of critically interpreting evidence, exercising sound clinical judgment, and contributing to high-quality patient care.

5. Conclusion

Transitioning from an exam-centered instructional model to a writing-intensive, scaffolded learning approach improved

student engagement, strengthened analytical performance, and enhanced the perceived clinical relevance of an undergraduate nursing research course. Grounded in learning science, concept-based education, and caring pedagogy, the redesigned course created meaningful opportunities for students to apply research evidence to patient care scenarios. Intentional instructional redesign can therefore transform research education into a powerful platform for developing clinical reasoning, evidence-based practice competence, and professional identity among future nurses.

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