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Educate, Excite, Engage

Scaffolding as active learning in nursing education

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ABSTRACT

Recent changes, such as COVID-19 restrictions and advances in technology, have led to unique effects on nursing education, requiring new pedagogical thinking and strategies. Studies have shown that a more active approach to learning leads to positive gains for students. In this conceptual paper, we argue that scaffolding specifically allows instructors to break down assignments into meaningful chunks with instructional support that fall within reach of a student's ability, making the assignment both more manageable and actively engaging. This paper outlines six principles (Van Lier, 1996) to the scaffolding approach and discusses two example assignments that utilize scaffolding in nursing education to increase active engagement and improve learning outcomes. Examples include a research critique paper and an unfolding case study.

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Scaffolding as Active Learning in Nursing Education

The Covid-19 pandemic has disrupted higher education, causing sudden shifts between online and in-person learning. Nursing programs are uniquely affected, as clinical, lab, simulation, and didactic learning experiences are modified to meet new public safety restrictions. These modifications challenge faculty's knowledge of pedagogy and require new thinking, as well as detachment from the past. Creativity in designing innovative learning strategies is required. Weberg et al. (2021) argue that faculty must challenge assumptions of what educating students means and formulate new evidence-based practices in nursing education.

While education is experiencing shifts internally, new data suggests a continuing decline in the preparedness of new graduate nurses (Kavanagh et al., 2021). Rapid changes in practice, technological innovation, and increased professional stressors threaten to widen the gap between education and practice. All nurses are challenged by the exposure of new moral dilemmas and unexpected risk situations, and support is needed to help them care for patients. This may leave experienced staff little time to mentor a new generation of nurses.

Riegel et al. (2021) notes that many nursing students are overwhelmed both personally and academically. They are easily distracted by a variety of social, emotional, financial, and time management problems. However, the challenges of the profession require that students be prepared in critical thinking and clinical judgment skills to face the demands of practice (Riegel et al., 2021).

Faculty must challenge students to apply cognitive skills, including analysis, inference, evaluation, and explanation.

Active Learning

To meet these challenges in higher education broadly, and nursing education specifically, a more active and hands-on approach is needed. In 2014, Freeman et al. suggested that learning is more effective when students are actively engaged in their learning, rather than passively receiving information through strategies such as lecture alone. This active form of instruction is colloquially referred to as *active learning* (Freeman et al., 2014). In general, active learning refers to methods that include students in meaningful activities and reflection on what they are doing (Bonwell & Eison, 1991). Active learning has been shown to lead to higher test scores and lower failure rates compared to traditional lecture (Freeman et al., 2014). Additionally, active learning has been shown to double conceptual understanding (Hake, 1998).

The value of active learning has been tested in nursing education. Research has shown that case-based learning can increase academic achievement, critical thinking, and self confidence in nursing courses (Englund, 2020; Ma & Zhou, 2022), although this finding is not consistent across settings (Carter & Welch, 2016; Kantar & Sailian, 2018). Researchers who studied a flipped classroom, characterized by situational and collaborative learning, found that students in the experimental (flipped classroom) group had higher academic performance than students in the control group (Dong et al., 2021). Students participating in team-based learning in a pathophysiology class reported higher accountability (93%) and satisfaction (92%) with their learning, although their grades were not affected (Branney & Priego-Hernandez, 2017). Other active learning teaching strategies

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described in the literature include escape rooms (Stringfellow, 2021), concept maps (Bressington et al., 2017), role-playing (Nemec et al., 2021), and scaffolding written papers (Sakraida, 2020).

Scaffolding as Active Learning

We suggest one method of active learning is scaffolding assignments. Scaffolding is an instructional method by which course material is broken down into smaller content and skills that fall within a learner's zone of proximal development (ZPD; Donato, 1988; Vygotsky, 1978; Wood et al., 1976). The ZPD refers to skills or content which is just out of reach of what a novice learner could complete on their own (potential development level), but that which the learner has potential to successfully complete with planned instructional supports. These instructional supports at each step are known as the scaffold and allow the learner to practice the skills and content until they have independently mastered the step at which time the supports are gradually removed (Weissberg, 2006). Instructional supports can include strategies in the forms of learner-content, learner-instructor, and learner-learner interaction such as interaction with peers through activities, instructor feedback and encouragement, and use of additional relevant resources (Cho & Cho, 2016).

This strategy for learning is rooted in *sociocultural theory* which views learning as taking place in a social context rather than as an independent endeavor. Therefore, learning is not merely seen as passed on from one individual to another but rather co-constructed between an expert and novice learner through dialogue with the influence of physical, psychological, and cultural tools (Barnard & Campbell, 2005).

As a form of active learning, scaffolding requires learners to actively engage in each step of the learning process rather than only passively taking in information. This allows students to practice skills, retrieve information, and receive feedback at each step of the scaffolded process. Repeated practice helps learners build the neural networks and habits needed to master learning and move information to long-term memory rather than maintaining it in short-term working memory (Ambrose et al., 2010).

Leo Van Lier (1996) has formulated six principles of scaffolding:

- Contextual support—a safe but challenging environment, errors are expected and accepted as part of the learning process
- Continuity—repeated occurrences over time of a complex of actions, keeping a balance between routine and variation
- Intersubjectivity—mutual engagement and support, two minds thinking as one
- Flow—communication between participants is not forced, but flow in a natural way
- Contingency—the scaffolded assistance depends on learners' reactions, elements can be added, changed, deleted, repeated, etc.
- Handover—the ZPD closes when learner is ready to undertake similar tasks without help (Van Lier, 1996, p. 196).

Scaffolding Assignment Examples

The principles of scaffolding can be utilized for a variety of types of assignments. These can happen both inside and outside the classroom. Below we outline two examples that highlight some of the diversity of assignments and learning environments in which scaffolding can take place.

Assignment Example 1: The Research Critique Paper

Writing a research critique paper is an example of a scaffolded assignment that comes from a course on Scholarly Inquiry. This 3-

credit course meets face-to-face for three hours each week over 14 weeks. Students learn about the research process as well as evidence-based practice. The research component of the course emphasizes analysis and evaluation of nursing research, as well as writing skills.

The Quantitative Research Critique paper challenges students to read and analyze one quantitative study, and to describe their findings in a 6-page APA paper. Students choose an article from three posted options. The outline for the paper is based on pre-set criteria, which serve as the basis for the analysis. Additionally, students use their textbook and lecture materials to appraise the article.

The class content on quantitative research is spread over three weeks and is supported as weekly modules in the learning management system (LMS). Students have four weeks to complete the paper. The scaffolded assignment is not only divided into the required content chunks but also broken into recommended process steps. These steps include appraising and writing to be completed each week as smaller active learning activities. By scaffolding the paper, students are actively involved with peers and the instructor each step of the writing process, getting feedback along the way, rather than working in a silo. Table 1 outlines the content, resources, and recommended activities that are presented to students each week.

In week 1, students are introduced to the assignment with a tour of the resources in the LMS. Recommendations are given to use this first week to select one research article from the three posted based on their own interests. The Writing Center meets with the class to present tips on initiating an APA paper. The quantitative critique worksheet is introduced as a way to begin writing the paper in small sections.

In weeks 1 through 3, classroom activities are planned to cover the quantitative research process. Students interact with this information by working through class worksheets in small groups, recalling information in class games, and comparing class PowerPoint presentations with textbook information. Activities are planned to engage students. A bingo game in week 2 reinforces concepts on sampling and data collection. During "Tea Test Time" in week 3, students learn the meaning of the t-test statistic by collecting data from two types of chocolate chip cookies and calculating a t-test using an online calculator.

In week 3, the final lecture content is presented. This gives students an adequate understanding of quantitative research to practice the critique process in online groups of 15–16 students. These online discussions are held during week 3, in which each student submits the answer to one of the paper criteria and receives instructor feedback. Most students are asked to rewrite and repost, to improve their writing, APA citations, and the accuracy of the information. This group critique is described as a "dry run" of the individual critique paper, and students are held to the same standard. Concepts which give students difficulty are reviewed in the LMS Q & A Discussion.

Students are encouraged to work with peers, the instructor, and the Writing Center to understand the content for the paper and to write effectively. At the end of class on week 3, students are divided into three face-to-face groups corresponding to the research article they have chosen to critique. Each group discusses how the information in the study meets critique criteria. Over the following week, individual students reach out to the instructor with questions and work with the Writing Center on drafts of the paper. While TurnItIn (a plagiarism detector) is required, students are encouraged to use TurnItIn as a learning tool by submitting their final draft early enough to rewrite and improve it if their plagiarism score indicates that their work is not sufficiently unique.

Since this approach has been initiated, feedback from students has been positive. In an anonymous midterm survey, students made the following comments: (a) "I think the worksheet and sample paper for the essays help me a lot" and (b) "Deadlines and clear instructions help me stay focused." Although not all students take advantage of time management recommendations, they all use the quantitative

Table 1
Quantitative Critique Paper Assignment: Content, Resources, and Activities

Class Content & Activities	Resources	Activities Outside Class
<p>Week 1</p> <p>Lecture</p> <ul style="list-style-type: none"> • Introduction to quantitative designs • Introduction to the quantitative critique paper. <p>Small groups</p> <ul style="list-style-type: none"> • Worksheets on threats to validity and types of designs <p>Guest speaker</p> <ul style="list-style-type: none"> • Writing center overview 	<p>LMS Module</p> <ul style="list-style-type: none"> • Overview of quantitative critique paper (instructions, articles to critique, quantitative critique worksheet, sample paper, sample format, evaluation rubric, APA worksheet) <p>Textbook</p> <ul style="list-style-type: none"> • Assigned readings <p>Lecture and class materials</p> <ul style="list-style-type: none"> • Power Points • Quantitative critique worksheet 	<p>Individual work</p> <ul style="list-style-type: none"> • Complete textbook readings • Take knowledge check quiz • Review resources in LMS module • Select one article from three posted • Read and re-read the selected article
<p>Week 2</p> <p>Lecture</p> <ul style="list-style-type: none"> • Data collection & sampling <p>Class activity</p> <ul style="list-style-type: none"> • Bingo game on data collection & sampling 	<p>LMS module</p> <ul style="list-style-type: none"> • See above <p>Textbook</p> <ul style="list-style-type: none"> • Assigned readings <p>Lecture and class materials</p> <ul style="list-style-type: none"> • Power points • Quantitative critique worksheet 	<p>Individual work</p> <ul style="list-style-type: none"> • Complete textbook readings • Take knowledge check quiz • Complete the quantitative critique worksheet • Ask questions in the class Q & A Discussion • Consult with instructor or writing center <p>Peer study groups (self-selected)</p> <ul style="list-style-type: none"> • Discuss critique of article
<p>Week 3</p> <p>Lecture</p> <ul style="list-style-type: none"> • Quantitative data analysis • Appraising quantitative data <p>Class activity</p> <ul style="list-style-type: none"> • Tea test time activity with calculation of t-test • Review of the TurnItIn similarity score <p>Small groups</p> <ul style="list-style-type: none"> • Meet in three separate groups (based on 3 articles being critiqued) to discuss criteria 	<p>LMS module</p> <ul style="list-style-type: none"> • See above <p>TurnItIn</p> <ul style="list-style-type: none"> • How to avoid plagiarism <p>Textbook</p> <ul style="list-style-type: none"> • Assigned readings <p>Lecture and class materials</p> <ul style="list-style-type: none"> • Power Points • Quantitative critique worksheet 	<p>Online small group discussion</p> <ul style="list-style-type: none"> • Group critique of a quantitative study <p>Individual work</p> <ul style="list-style-type: none"> • Complete textbook readings • Take knowledge check quiz • Write first draft APA paper, using worksheet information • Ask questions in the class Q & A Discussion • Consult with instructor or Writing Center <p>Peer study groups (self-selected)</p> <ul style="list-style-type: none"> • Discuss critique of article
<p>Week 4</p> <p>Begin new content on evidence-based practice</p>	<p>LMS module</p> <ul style="list-style-type: none"> • See above <p>TurnItIn</p> <ul style="list-style-type: none"> • How to avoid plagiarism 	<p>Individual work</p> <ul style="list-style-type: none"> • Plagiarism Check (submit paper to obtain TurnItIn similarity score) • Revise paper as needed, based on reviewer feedback and similarity score • Final check against evaluation rubric • Submit final paper in drop box

critique worksheet to help them break down content into chunks. The worksheet also serves as a tool to share when reviewing their ideas with the instructor and other students. We emphasize that “writing follows thinking” and by putting down their thoughts in the worksheet, students have an easier time with the writing process.

Assignment Example 2: Unfolding Case Study

This unfolding case study example comes from a course on Complex Care with Adults and Aging Populations. This 6-credit course meets face-to-face for three hours of theory and 10 hours of intermediate and intensive care clinical each week for 14 weeks. The unfolding case study activity example outlined below in Table 2 closely follows a case study published by Kirwan (2015) and takes thirty to forty-five minutes to complete. The instructor stands in front of the class and begins writing on the whiteboard while verbalizing the report. Students are free to work individually or in small, informal groups to answer questions posed by the instructor designed to stimulate critical thinking. Students must recognize pertinent data, interpret these data based upon the patient’s unique situation and history, and then respond with appropriate solutions based on a rapid, holistic evaluation of the situation (Tanner, 2006). Throughout the activity the instructor creates a sense of urgency, clarifies points of disagreement, prompts as needed, and asks “what if” questions to further enhance learning. By scaffolding the case study and unfolding it over time, the

instructor is able to build layers of understanding and skills that require inquiry and critical thinking from students.

An ideal learning scenario in a complex medical-surgical course would involve a patient who presents with a common chief complaint yet possesses multiple underlying health conditions, takes multiple medications and is at risk for a wide range of complications. This allows complexity to the case that students can uncover and analyze, similar to what they would encounter in a real-life scenario as they obtain additional, potentially contradictory information. The case study exemplar outlined in Table 2 is conducted following a short lecture on rapid responses yet requires students to recall and apply learning from the previous week related to chronic obstructive pulmonary disease (COPD). They must also recall and apply knowledge from previous semesters related to opioids and myocardial infarctions as they treat an individual in a unique situation. Students become quite engaged as they critically think through Mrs. J’s situation, request interventions, receive results, and call the rapid response team. They are also asked to think about how they will delegate care for their other patients while engaged with Mrs. J. and are reminded to include her husband in the plan of care.

The exemplar is based on a well-developed case study, but other brief cases on seizure emergencies (Purviance, 2019) and esophageal varices (Purviance, 2021) have also been utilized following related lectures. Many of these brief cases are available online and in nursing journals, are easily tailored to course objectives, and can help identify areas of student confusion while engaging students in activities to reinforce learning.

Table 2
Unfolding Case Study Activity: Opioid Induced Respiratory Insufficiency

Information Written on White-Board by Instructor	Questions Posed to Students by Instructor	Common Student Responses (Varies)	Thinking Points & Prompts Given to Students by Instructor
Report: Mrs. J is a 71 y/o female being admitted to med/surg after 1 hour in PACU post Rt Hip Arthroplasty. Received 10mg Morphine Sulfate IVP, stable. HX: MI, stent, COPD, arthritis, past Lt Hip Arthroplasty. Married, retired schoolteacher.	What do you know about Mrs. J before you even meet her?	Same surgery in past • Likely has pre-existing expectations/knowledge about plan of care Schoolteacher • Likely able to read and understand written instructions Married • Likely social support	Expectations and knowledge may or may not be accurate Does she read and understand English? Vision or hearing impairments? Does husband live in home? Is he able to assist her with recovery?
	What factors increase her risk for post-operative complications?	Age Comorbidities Receiving opioids	Ask students to identify specific complications Would IMC be more appropriate than med-surg?
	What home medications were likely discontinued or alternatively continued prior to surgery?	Students ideally will recognize that: • depending on when stent placed anticoagulant may have been discontinued for surgery • likely on beta blocker (hx MI)	Prompt if they don't recognize expected medications. Discuss: • potentially elevated thrombosis risk • confirm beta blocker received prior to surgery
Mrs. J. has arrived on the Med-Surg unit	What are you going to do?	Students say, "Assess her!"	What specifically do you want to assess? Tell me.
Assessment Mrs. J. is drowsy, awakens easily HR 87, RR 12, BP 128/76, Temp 98.9 (37.2), Sat 94% O2 at 2lpm via NC Pain 3/10 at rest, 8/10 when moving PCA Morphine programmed for 1mg every 10 minutes	What do you think? Is she stable? Any interventions needed? Is there anything you're worried about?	Students usually pleased with this situation. They focus on PCA, pain levels, and identify opioids may depress her breathing • rarely notice RR already depressed	Tell me what you know about PCAs? Discuss PCAs. What are you thinking about her pain? Are you expecting her to be completely pain free? How do you know what her pain level should be?
	What are you thinking about related to her vital signs?	With continued thinking and discussing students sometimes identify that: • RR 12 low (Hx COPD) • HR 87 high (MI, beta blocker)	Prompts if points not identified: • "What do you think about a RR 12 with COPD Hx?" • "What could HR 87 indicate in patient on a beta blocker?" Discuss medications, chronic conditions may "mask" abnormalities. Prompt & discuss as needed if they don't identify interventions.
	Considering elevated risks and status, what interventions will you implement?	• Frequent checks • Awaken, Cough & Deep Breathe • Hourly rounding by RN • Continuous CO2, Sat, Telemetry monitoring	Prompt & discuss as needed if they don't identify interventions.
1 hour later: Resting quietly. HR 92, RR 10, BP 118/64, Temp 99.5 (37.6C), Sat 93%, O2 @ 2lpm. Received 6mg of morphine in last hour via PCA	What do you think? Should you let her sleep or wake her up? Is there something else you need to do?	Students overwhelmingly identify that they need to wake her up, some call a rapid response.	What interventions will you implement when you awaken her? What if you allowed her to continue to rest quietly?
1 hour later: Mrs. J. is sleeping. HR 110, RR 8, BP 108/66, Sat 89%, O2 @ 2lpm. Somnolent, mumbling	What do you need to do right now?	Students overwhelmingly identify need to call rapid response team. • Discuss interventions to implement while awaiting rapid response team.	Discuss role of rapid response team, who will arrive, ask students to identify likely interventions.

Discussion

These two assignments provide examples of how to actively engage students in the learning process through scaffolding. Each assignment uniquely breaks up the content and process of learning through scaffolding and demonstrate Van Lier's (1996) six principles, which are discussed below:

Contextual Support

Students are offered a safe but challenging environment where errors are accepted as part of the learning process. In example 1, the research critique paper, the online written group discussion provides a way to support students in learning the critique process before they write their individual papers. Groups of 15 students all critique the same research study and each student writes about one of the fifteen criteria for the critique. Students are informed that they will have to repost if their answer is not accurate. The instructor coaches these students, and most students are able to repost correctly. Seeing peer responses also help the students

reflect on their answer. In example 2, the unfolding case study, contextual support during these highly social, interactive case study activities hinges largely on positive role modeling by the instructor. The first case study activity occurs in the third week of the semester to allow time for students to settle into the course, build foundational knowledge, and gain an understanding of the instructor's way of being. During the activity all answers are acknowledged with constructive feedback and discussed as a full class. If students spontaneously laugh at a peer's response the instructor will note reasons why that response might be valid for consideration or will briefly discuss their own experiences as a nurse, noting that all nurses have times when they may not know what to do and need to look something up or seek out assistance from peers in the moment. This helps build a supportive and safe learning environment where students recognize all answer attempts are welcome.

Continuity

Students are provided the opportunity to practice complex actions multiple times through repeated occurrences. In example 1,

the research critique paper, the multiple components of the course such as textbook readings, knowledge check quizzes, lecture, class activities, online group discussions, peer feedback inside and outside of class, and individual or group consultations with the instructor and Writing Center, all contribute to students' knowledge of the final quantitative research critique process. The course provides many ways for students to learn and to receive formal and informal feedback on their writing. In example 2, the unfolding case study, continuity is accomplished by following the cycle of noticing, interpreting, responding, and reflecting-on-action (Tanner, 2006). Students receive, report, request additional information, and interpret relevant data prior to responding with their planned actions. Reflecting-on-action occurs as the instructor provides feedback and uses prompts to redirect in the moment. After the activity, further reflection occurs as the class identifies what went well and what they would do differently in the future.

Intersubjectivity

There is mutual engagement and support between student (the novice) and peers and/or the instructor. This allows for knowledge to be co-constructed to develop a mutual understanding of a concept and “two minds to think as one” such as between a student and instructor or between a student and other students. The time it takes to reach this understanding varies greatly for different students. In example 1, for the research critique paper, if a student has taken a research course in another field, such as psychology, the zone of proximal development (ZPD) may be close enough that a student can ask questions in class or the online discussion, read assignment instructions, and then write the critique paper on their own. Other students with less background may require individual meetings with the instructor (expert) as well as peer discussions to determine answers to the criteria, followed by further review of their writing by the instructor, in order to have a successful paper. In example 2, the unfolding case study, intersubjectivity occurs naturally as students become engaged in the activity. At first, they will consult with peers before offering an answer. As the case moves forward, a response from one student with intermittent feedback from the instructor will seem to prompt a thought by another student and answers will be offered more rapidly as students understand the situation. Sometimes the instructor will prompt with “what did we talk about earlier?” to direct them toward a previously shared thought.

Flow

Communication between peers and with the instructor is not forced. In example 1, for the research critique paper, the instructor communicates to students the recommended steps to follow when developing the paper. This includes both the “process” of writing, by which a student develops an assignment over time, and the “content” or chunks of information, which are included within the criteria or outline of the paper. While the chunks of content are evaluated in the grading rubric, the process or timeline for completing the work varies by student. One limitation is students who procrastinate, despite instructor advice, tend to have poorer achievement. In example 2, the unfolding case study, flow is enhanced through question prompts from the instructor designed to engage and direct students towards solutions. Students are encouraged to call out answers to create the sense that the situation is moving forward. If no one offers a solution the instructor will state “you are the nurse, your patient needs help, what will you do?” to create a sense of urgency and motivate student responses. When it's flowing well, the instructor cannot keep up with writing the answers on the white board as students think of interventions to implement.

Contingency

Elements of the scaffolded process depend on the learners' reactions and are adjusted throughout the process as needed. In example 1, the research critique paper has been altered over time, as students' needs and learning preferences change. Modifications were made when the course went online during the pandemic. In the online environment, more structured group sessions were planned for peer discussion and for consultation with the instructor. In example 2, the unfolding case study, student responses drive the case forward in the moment. Sometimes students call a rapid response sooner than expected, or sometimes they implement interventions that prevent the need for a rapid response. If they respond rapidly to rescue the patient, the case study can shift towards system issues that may have impacted the patient's care or the nurses' decisions in the moment. The use of “what if” questions aid in directing the case and contribute to the flexibility of the activity.

Handover

When the students are ready to complete similar tasks without assistance, the ZPD closes and students complete assignments on their own. In example 1, for the research critique paper, there is a natural handover when students submit their paper to the LMS drop box and receive a *TurnItIn* Similarity (plagiarism) score. Students are encouraged to submit early, allowing time to modify their papers if the Similarity score is high. In example 2, for the unfolding case study, students also attend clinical each week with clinical instructors who are aware of class topics for the week and attempt to provide students with related activities. Students often report subsequent clinical experiences to the instructor and discuss how these experiences were similar (or dissimilar) to the cases utilized in class.

Conclusion

Scaffolding allows assignments to be broken down into smaller, more manageable chunks that fall within students' ZPD. These assignments represent two examples of how scaffolding can be applied in nursing education through a research paper and an in-class unfolding case study. However, the instructional method of scaffolding can be applied to many different types of assignments, and even across multiple assignments in a class, to ensure students are building skills at strategic learning levels and with appropriate instructional supports. Instructors are encouraged to apply the principles of scaffolding and these examples to their own classes in ways that are the most effective to meet their needs.

Declaration of Competing Interest

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