Psychometric Testing of the Pecka Grading Rubric for Evaluating Higher-Order Thinking in Distance Learning

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This article describes development of the Pecka Grading Rubric (PGR) as a strategy to facilitate and evaluate students’ higher-order thinking in discussion boards. The purpose of this study was to describe psychometric properties of the PGR. Rubric reliability was pilot tested on a discussion board assignment used by 15 senior student registered nurse anesthetist enrolled in an Advanced Principles of Anesthesia course. Interrater and intrarater reliabilities were tested using an interclass correlation coefficient (ICC) to evaluate absolute agreement of scoring. Raters gave each category a score, scores of the categories were summed, and a total score was calculated for the entire rubric. Interrater (ICC = 0.939, P < .001) and intrarater (ICC = 0.902 to 0.994, P < .001) reliabilities were excellent for total point scores. A content validity index was used to evaluate content validity. Raters evaluated content validity of each cell of the PGR. The content validity index (0.8-1.0) was acceptable. Known-group validity was evaluated by comparing graduate student registered nurse anesthetists (N = 7) with undergraduate senior nursing students (N = 13). Beginning evidence indicates a valid and reliable instrument that measures higher-order thinking in the student registered nurse anesthetist.

Keywords: Distance learning, grading rubric, higher-order thinking, reliability, validity.

Certified Registered Nurse Anesthetists (CRNAs) make daily lifesaving, split-second decisions. The quality of decisions made by CRNAs is influenced by the ability to use higher-order thinking. The development of higher-order thinking begins in undergraduate nursing education and continues throughout the nurse anesthesia educational program. Higher-order thinking is the ability to recall and manipulate information at the highest levels of Bloom’s taxonomy. Nurse educators agree that the development of higher-order thinking skills is vital to the education of nurses. Teachers have attempted to focus on higher-order thinking skills by using collaborative learning strategies on discussion boards in distance learning. However, studies reveal that students who use discussion boards for distance collaborative learning progress inconsistently to the highest levels of thinking.

Distance collaborative learning strategies are needed that improve a student’s ability to think at the highest levels. The Pecka Grading Rubric (PGR) (Table 1) was developed as a strategy to facilitate and evaluate students’ higher-order thinking on discussion boards. The purpose of this article is to discuss the development of the PGR and to present tested psychometric properties, including reliability (interrater and intrarater) and validity (content and construct with known groups) estimates. Previous knowledge regarding rubrics, higher-order thinking, and the collaborative learning process guided the development of the PGR.

Literature Review

• Rubrics. Student teaching, learning, and evaluation strategies are frequently driven by educator-developed rubrics. Rubrics are scaled tools used by students and educators to facilitate and evaluate educational experiences. Rows and columns create a matrix of cells. Each cell contains the level of achievement and performance criteria necessary to meet a requirement.

In distance learning, rubrics facilitate several of the 7 principles of good practice as defined by the American Association of Higher Education Accreditation. Rubrics improve student learning by: (1) guiding learning activities, (2) defining assignment expectations, (3) promoting deeper learning, (4) identifying strengths and weaknesses, and (5) facilitating self-assessment. Educators use rubrics to clarify student grading standards, increase grading objectivity, and evaluate a student’s ability to think critically. Rubrics improve educational processes by facilitating timely feedback and educator/student communication.

Shipman et al identified limitations with students’ and educators’ use of rubrics. Students may find it difficult to interpret educational expectations when definitions of criteria are unclear. Rubrics may introduce...
grading subjectivity by educators and lack of reliability between different raters. Rubrics may lead to student conformity and a narrow student interpretation of concepts and ideas.

Rubrics are often used to facilitate and evaluate student's discussion board postings for distance learning. Research that examines rubric rater-reliability when using discussion boards for distance learning in nursing is limited. Lunney and Sammarco\(^7\) have studied rubric use with discussion boards for distance learning in nursing. They analyzed correlation coefficients using Spearman \(\rho\). Consistency of score assignments between 2 raters was found \((r = 0.749 \text{ to } 0.952)\) but interclass correlation coefficients (ICCs) were not evaluated. Interclass correlation coefficient evaluates absolute agreement between raters and takes chance agreement into consideration.\(^1\) Absolute agreement is important to student grading to improve evaluation consistently across raters and time.

Nursing research lacks studies that evaluate the use of rubrics that promote higher-order thinking and their impact in preparing nurse clinicians for professional practice.\(^1\) The ability to think at a higher level will improve student decision making and lead to better-prepared clinicians.

**Higher-Order Thinking in Distance Learning.** Research studies lack clear definitions for the term higher-order thinking.\(^1\) Common attributes have been identified. Based on these attributes, the authors define higher-order thinking as the ability to manipulate information\(^1,16\) at the highest levels of Bloom's taxonomy.\(^2,15\) Analysis, synthesis, and evaluation comprise the upper levels of thinking.\(^1,17-19\) Higher-order thinking is necessary to retrieve and manipulate foundational knowledge from memory for the purpose of finding answers to new, perplexing situations.\(^16\)

Studies are lacking that examine higher-order thinking by student registered nurse anesthetists (SRNAs) in distance learning. A recent meta-analysis examining distance learning in the health professions found only 7 studies evaluating distance learning using discussion boards.\(^20\) None of these studies examined SRNAs' higher-order thinking in discussion boards.

Early research studies in the face-to-face setting provide the foundation for evaluating students' high-

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### Table 1. Pecka Grading Rubric\(^3\)

| Levels of thinking include (1) knowledge; (2) understanding and application; (3) analysis and evaluation; and (4) creation. Elements of the collaborative learning process include (1) critique of peer perspectives; (2) peer interaction; and (3) original parent post. Revisions made to the PGR are in italics. |
|---|---|---|---|
| **Knowledge** | Incorporates past clinical experience, past work experience, or additional reference into post. Additional reference must introduce new information. | No discussion of past clinical experience, work experience, or additional references. | Failed to post. |
| **Understanding & Application** | Explains and/or applies specific details of the assigned journal article. | Superficial explanation or application of assigned journal article. | Failed to post. |
| **Analysis & Evaluation** | Analyzes and/or discriminates implications of different anesthetic management options in relation to the assigned journal article. | Superficial analysis and/or discrimination of anesthetic implications in relation to assigned journal article. | Failed to post. |
| **Creation** | Formulates own or modifies a peer's BRIEF plan of care. (General salient points of overall plan only please). | No formulation or discussion of plan of care. | Failed to post. |
| **Critique of Peer Perspectives** | Meaningfully critiques peer experiences, discussions, anesthetic management options, or plan of care. | Peer interaction lacks analysis or critique of peer perspectives. | Failed to interact with peers. |
| **Peer Interaction** | Several meaningful peer interactions by due date. | Several peer interactions 1 day late. | Few peer interactions or 2 days late. | Peer interaction 3 or more days late. |
| **Original Parent Post** | Original post by due date. | Original post 1 day late. | Original post 2 days late. | Original post 3 or more days late. |
| **Point Total** | | | | |
er-order thinking in collaborative learning groups. Gokhale\textsuperscript{21} found that collaborative learning significantly \((P < .001)\) improved analysis, synthesis, and evaluation of concepts compared with individual learning. Posttest scores were higher among students who completed tasks collaboratively.

Grading rubrics have improved student’s higher-order thinking using discussion boards in distance learning.\textsuperscript{15,22} Eccarius\textsuperscript{15} developed a grading rubric using levels of thinking in Bloom’s revised taxonomy.\textsuperscript{2} Interrater reliability was excellent \((ICC = 0.94)\). Graduate education students’ discussion board postings were used to evaluate higher-order thinking over 2 consecutive years. Higher-order thinking was divided into levels 0 to 6; higher values indicated higher levels of thinking. During year 1, level 3 contained the largest percentage of posts; in year 2, higher percentages of levels 4 and 5 were seen as well as decreases in levels 0, 1, and 2. Eccarius\textsuperscript{15} did not provide a potential explanation for the differences found. The levels of thinking within the rubric may have facilitated the development of student’s higher-order thinking and an ability to think at a higher level over time. Or, it may be that student’s level of thinking changed because of a learned effect from use of the rubric. Student maturity or content differences also may have changed the level of thinking. A small sample and narrow population limits the generalizability of the study. The study did not report exact percentages or a statistical analysis between levels of thinking.

Giacumo et al\textsuperscript{22} designed a grading rubric for use by undergraduate general education student instructors. The rubric evaluated the depth and breadth of contribution to understanding and the quality of writing. They used the revised Bloom’s taxonomy to code students’ discussion board postings for levels of thinking. They found that student learning improved significantly with discussion board prompts by instructors \((P = .041)\), discussion board prompts combined with student’s use of a rubric \((P = .001)\), and rubric use alone \((P = .001)\).

Student’s higher-order thinking has been studied more extensively in the education literature using the Community of Inquiry (COI) model.\textsuperscript{23} The COI model uses 4 phases of inquiry to operationalize distance learning: (1) triggering (an initial question/event prompts a response), (2) exploration (students brainstorm and offer individual perspectives), (3) integration (students use the ideas generated in exploration and build a deeper meaning), and (4) resolution (students come to a conclusion or solution).\textsuperscript{24} Students’ higher-order thinking in discussion boards was inconsistent when using the 4 phases of inquiry.\textsuperscript{1,4,25} McLoughlin and Mynard\textsuperscript{4} found that most thinking by undergraduate students occurred at the exploration (52.5%) and integration (34.3%) phases. They found little thinking in the resolution (5.4%) and triggering (3.4%) phases. A final category of social or other (4.4%) did not pertain to this article. Resolution and integration were defined as the higher levels of thinking in the study.

Akyol and Garrison\textsuperscript{4} compared distance learning between fully online and blended learning courses in graduate general education students. Student achievement scores were virtually identical between groups. They used the 4 phases of inquiry to evaluate discussion board postings. Findings included the following: (1) resolution (4%-10%), (2) integration (43%-57%), (3) exploration (10%-30%), and (4) triggering (2%-15%). Researchers concluded that the resolution phase was achieved inconsistently because of course time constraints. Students ran out of time to put assigned projects into action.

Darabi et al\textsuperscript{25} also found inconsistent student higher-order thinking. Undergraduate general education students were divided into 4 groups using differing discussion board learning strategies: (1) structured, (2) scaffolded, (3) debate, and (4) role-play. Each strategy was evaluated using the 4 phases of inquiry. A \(\chi^2\) test revealed statistically significant differences between the strategy used and the phase of thinking reached \((P = .012)\). Statistically significant differences were noted in each phase for types of strategy used, including triggering \((P = .05)\), exploration \((P < .001)\), and integration \((P < .001)\). No statistical difference was found in the resolution phase.

- **Collaborative Learning Process.** The COI model provides the theoretical framework for evaluating and facilitating the collaborative learning process in distance learning.\textsuperscript{23} Core elements of the COI model include cognitive presence, teacher presence, and social presence.\textsuperscript{23} Cognitive presence is operationalized using 4 phases of inquiry (triggering, exploration, integration, and resolution).\textsuperscript{24} Cognitive presence is the creation of conceptual meaning using sustained group communication\textsuperscript{23} and is required for higher knowledge gain.\textsuperscript{26}

The triggering phase sets the stage for the completion of a collaborative task. An issue or problem is introduced to the group that requires a solution. Throughout the collaborative learning process, students may introduce additional triggering events. The instructor’s role is to ensure that student discussion remains on task.\textsuperscript{24} Exploration is brainstorming or divergent thinking whereby members offer their individual perspectives to the group for consideration.\textsuperscript{24} High-quality divergent thinking is necessary for the development of higher-order thinking. It is the idea-generating phase in which diverse individual ideas are shared.\textsuperscript{27} Integration is the convergence of individual ideas where group members synthesize and connect ideas for the purpose of creating a solution.\textsuperscript{24} Ideas are organized and discussed for relevance to find a solution to a problem. Weaker ideas are discarded and stronger ideas are manipulated.\textsuperscript{27} High-quality peer interaction is neces-
sary to facilitate the integration phase. Resolution is the testing and defending of solutions. The phase requires clearly defined expectations and the introduction of a problem that requires a solution.24

Collaborative learning has been an effective student learning strategy. However, studies have found progression to the highest levels of thinking to be inconsistent and infrequent in distance learning. The PGR was designed to facilitate students’ higher-order thinking. Development of the PGR was guided by prior knowledge of rubrics, Bloom’s revised taxonomy, and the collaborative learning process.

Materials and Methods

• Sample and Setting. The sample for reliability testing of this instrument-development pilot study included discussion board postings from 15 senior SRNAs enrolled in an Advanced Principles of Anesthesia hybrid (partially online) course at a midwestern, private, accredited school of nurse anesthesia. The course included a 15% hybrid component divided into 4 peer discussion board assignments. This assignment included a 1-week peer discussion of an assigned journal article28 via asynchronous discussion board using the PGR as a student scoring tool. Students ranged in age from 28 to 37 years; 60% were female and 40% were male. The sample for known-groups validity testing included senior SRNAs (N = 7) and undergraduate nursing students (N = 13).

• Instrument. The PGR was designed by the first author (SLP) to facilitate and evaluate SRNAs’ higher-order thinking when using discussion boards. Bloom’s revised taxonomy,2 the COI model,23 and the collaborative learning process guided development of the PGR. Grading criteria (rows) consist of 2 main components: (1) Bloom’s levels of thinking and (2) cognitive presence.23 Levels of thinking are divided into higher-order1 (analysis, evaluation, creation, and synthesis) and lower-order (knowledge, understanding, and application). Levels of thinking increase in complexity with progression through the taxonomy. The PGR compresses levels of thinking into 4 categories that reflect lower-order (rows 1 and 2 in Table 1) and higher-order thinking (rows 3 and 4 in Table 1).

Columns are divided into 4 point-discrimination levels (3, 2, 1, and 0). Points are assigned based on levels of achievement defined in each cell. The 4 levels of thinking do not include point options for the “2-points” column. The elimination of this level was designed to decrease the ambiguity between point values. At these levels, the achievement is scored on a dichotomy of met or not met. Scores are assigned using a Likert scale from 0 to 3. Higher scores indicate greater achievement, progression to higher levels of thinking, and cognitive presence.

Knowledge (row 1) is the first dimension of the PGR. Bloom’s taxonomy defines “remember” as retrieving knowledge from long-term memory.2 “Knowledge” was chosen as a label for row 1 to emphasize the importance of SRNAs’ experiential knowledge to learning. Experiential learning occurs as individuals reflect on previous experiences and create meaning.29 Prior clinical and work experiences are a substantial source of foundational knowledge for the SRNA and may differ greatly among students. Sharing experiences provides a rich source of knowledge for learning. Student prior knowledge is one of the most important determinants of the quality of student contributions in distance learning.30

Understanding and application2 (row 2), lower-order thinking levels,2 correspond to the second dimension of the PGR. Analysis and evaluation2 (row 3) correspond to the third dimension and are levels of higher-order thinking.1 Creation and synthesis (row 4), the upper levels of Bloom’s taxonomy,2 correspond to the fourth dimension and refer to synthesis and formulation of a plan of care based on the ability to understand, apply, analyze, and evaluate foundational knowledge.

The second grading component consists of the collaborative learning process and its impact on cognitive presence.23 Interaction frequency is important to the collaborative learning process and improves student outcomes in distance learning.31 Cognitive presence is necessary for higher knowledge gain in distance learning.26 The PGR facilitates interaction and cognitive presence using the dimensions of critique of peer perspectives (row 5), peer interaction (row 6), and original parent post (row 7). Original parent post (row 7) evaluates student promptness for posting of original posts. The original post reflects beginning individual student perspectives of an assignment that are necessary for later group manipulation. Original parent post is the beginning idea generation or individual student perspective (divergent thinking).23,32 Individual ideas are generated and used for group manipulation.27 Timely posting is required for quality peer interaction.33

The frequency of peer interaction is rated in row 6. The rationale for this item is that timeliness of discussion impacts the quality of collaborative learning.35 The PGR deducts for late or superficial posts based on the number of days late. Late individual student posting (divergent thinking) is likely to decrease the number of students reading the posts. If students are not reading the posts, the chance for quality student interaction (convergent thinking) decreases. High-quality interaction among peers is necessary to share multiple perspectives and reach a group consensus.

Critique of peer perspectives (row 5) evaluates the quality of peer interaction. Students are graded on the quality of their responses to peers’ postings. Interaction is important because it serves as the means to communicate students’ ideas26,32 and improve learning.31 Point total
of interest. Content validity was evaluated using 5 mines content validity by adequately defining the domain referring to the original scores.

The variable of interest was points total. Interrater reliability was evaluated using ICCs and were calculated using absolute agreement and a 2-way random model. The variable of interest was points total. Individual items on the PGR were analyzed to identify items requiring revision.

The CVI was calculated manually for each item by counting the number of experts rating the item as 3 or 4 and dividing that number by the total number of experts. Known-groups validity was evaluated using a Mann-Whitney U nonparametric t test.

**Results**

- **Reliability.** Interrater and intrarater reliability for total points were examined using ICCs (Table 2). Interrater (ICC = 0.939, P < .001) and intrarater (ICC = 0.902 to 0.994, P < .001) reliability were excellent. Interrater reliabilities for the lower levels of thinking were lower. Rater 2 had an ICC of −0.235 (P = .644) for knowledge while the remaining 2 raters were high with ICCs of 1.0 and 0.788 (P = .003). This was consistent for understanding and application where rater 3 was 0.315 (not significant), while raters 1 (ICC = 1.0) and 2 (ICC = 0.854, P = .001) were high. Interrater reliabilities for the upper levels of thinking were high. The ICC for analysis and evaluation was 0.664 (P < .001). The ICC for creation and synthesis was 0.739 (P < .001). Intrarater reliabilities for analysis and evaluation included ICCs of 1.0, 0.650 (P = .035), and 0.641 (P = .033). Intrarater reliabilities for creation and synthesis included ICCs of 0.920 (P = .001), 0.788 (P = .003), and 0.417 (P = .139). Intrarater reliability for critique of peer perspectives (ICC = 0.975, P < .001), peer interaction (ICC = 0.990, P < .001), and original parent post (ICC = 1.0) were high. Intrarater reliability scores ranged from 0.911 to 1.0 across the 3 categories.

- **Validity.** The CVI ranged from 0.8 to 1.0 on all items. The CVI was 1.0 for all items for relevance of item and simplicity of use. The CVI for clarity of language was 1.0 for all items except understanding and application (CVI = 0.8) and critique of peer perspectives (CVI = 0.8). The CVI for ambiguity of terms was 1.0 for analysis and evaluation and original parent post. The CVI for ambiguity of terms was 0.8 for: knowledge, understanding and application, creation and synthesis, critique of peer perspectives, and peer interaction. Known-groups validity (comparing senior SRNAs and undergraduate nursing
students) using the Mann-Whitney U nonparametric t test was statistically significant for all levels of thinking including total score \((P < .001)\), knowledge \((P < .001)\), understanding and application \((P = .001)\), analysis and evaluation \((P < .001)\), creation \((P = .012)\), lower-order thinking \((P = .001)\), and higher-order thinking \((P = .001)\).

Table 2 summarizes psychometric findings including reliability, content, and construct validity.

**Discussion**

The PGR was developed using the domains of Bloom's higher-order thinking\(^2\) and the collaborative learning process.\(^{23,32}\) Rater training for reliability analyses identified items that required minor changes to the rubric. Psychometric properties of the PGR, including interrater and intrarater reliability of the total points, were excellent. However, data analyses identified that minor item revisions were warranted for the lower-order thinking levels of knowledge and understanding and application. In exploring reasons for the lowest ICC, the authors realized that the definition for knowledge (row 1) in the 3-points cell was inadequate. Rater 2 noted during data collection that 2 students' postings introduced a reference that merely agreed with the assigned journal article. The purpose of introducing an additional reference is to incorporate new ideas and information into the discussion. This led to revision of the cell wording by adding the phrase *Additional reference must introduce new information.*

The row with the lowest interrater and intrarater reliabilities was understanding and application. The inconsistency between raters indicated an item that is unclear and ambiguous. Two of the 3 raters demonstrated good intrarater reliabilities, indicating consistent interpretations for the definition in the understanding and application cell. The rater with the lowest intrarater reliability was unclear about the definition, which became more evident over time. In response to ICC results for the understanding and application row, the wording for the 3-points column was revised. The prior wording of the 3-points cell included *Describes or discusses an aspect of the assigned journal article.* The cell was revised to state *Describes or applies specific details of the assigned journal article.*

Results for the CVI identified items on the PGR in need of minor changes. For improved clarity of language and improved consistency with the revised Bloom's taxonomy,\(^2\) the term *discuss* was changed to *explains.* The term *meaningful* was added to the critique of peer perspectives and peer interaction items. Based on reviewer comments, the term *synthesis* was dropped from the creation and synthesis heading. The term *synthesis* appears in the original Bloom's taxonomy. This was dropped to improve consistency with the revised Bloom's taxonomy.\(^2\)

Development of the PGR is similar to other strategies\(^3\) in that it promotes active learning in a distance learning context. The innovative feature of the PGR is that it adds the direct integration of higher-order thinking\(^2\) into the collaborative learning process.\(^{23}\) Prior studies have found progression to the highest levels of thinking inconsistent and infrequent.\(^1,4,24,25\) The PGR has the potential to improve progression to the highest levels of thinking more frequently and consistently.

Results of this study align with prior studies that found consistency between raters.\(^7,17\) Dunfee et al\(^{17}\) found acceptable agreement between raters scoring student postings for higher-order thinking. However, this study did not incorporate a grading rubric with clearly defined expectations for students and instructors. Lunney and Summarco\(^7\) also found consistency in rater scoring using correlations. What this study adds is the evaluation of absolute agreements using ICCs and a focus on the facilitation of higher-order thinking. Absolute agreement

| Table 2. Psychometric Properties (Reliability, Content Validity, and Construct Validity) |
|----------------------------------------|---------------------------------|---------|--------|-------|-----------------|-----------------|---------|
| Interclass correlation coefficient (ICC) | P value | Relevance of terms and simplicity of use | Clarity of language | Ambiguity of terms | Mann-Whitney U | P value |
| Knowledge                             | 0.533 | .019 | 1.0 | 1.0 | 0.8 | 3.5 | < .001 |
| Understanding and application          | 0.364 | .061 | 1.0 | 0.8 | 0.8 | 5.5 | .001 |
| Analysis and evaluation                | 0.664 | < .001 | 1.0 | 1.0 | 1.0 | 2.0 | < .001 |
| Creation and synthesis                 | 0.739 | < .001 | 1.0 | 1.0 | 0.8 | 15 | .012 |
| Critique of peer perspectives          | 0.975 | < .001 | 1.0 | 0.8 | 0.8 | Not evaluated |
| Peer interaction                       | 0.990 | < .001 | 1.0 | 1.0 | 0.8 | Not evaluated |
| Original parent post                   | 1.0 | 1.0 | 1.0 | 1.0 | Not evaluated |
| Point total                            | 0.939 | < .001 | 1.0 | 1.0 | 0.5 | < .001 |
of scores indicates that grades given to students are fair and consistent between raters and across time and may indicate a greater level of grading objectivity of student assignments.

Prior authors have identified that rubrics may introduce a component of grading subjectivity to student assessment.8 Results of this study indicate that by incorporating clearly defined cells using the revised Bloom’s taxonomy,2 objectivity in grading may be improved, making it possible for multiple graders to decrease the instructor burden for large class sizes.

The ICC results of our study agree with those of Eccarius.15 What this study adds is the integration of the collaborative learning process into student assessment. Development of the PGR is a step toward examining relationships between higher-order thinking and the collaborative learning process on discussion boards. The next step is to test the rubric’s effect on students’ levels of thinking using discussion boards.

Study limitations include the small, single-institution, convenience sample. Preliminary findings reveal excellent interrater and intrarater reliabilities for the PGR. However, generalizations of results are premature. Recommendations for future research include testing the rubric using a larger, more diverse sample of nurse anesthesia faculty and students from multiple institutions.

A potential threat to internal validity includes the possibility that raters may have remembered exact postings and scored students identically based on recall of previous scores. In addition, the subject postings were not shuffled between ratings. Pages of postings must remain in the same order so that student discussions are not taken out of context. To control for this, a 2-week timeframe was created between scoring of student postings. Rater bias may be an issue. The author was the instructor for the course, the second rater was the program director, and the third rater was chosen from another program; however, raters were evaluating deidentified postings. Finally, the assignment was mandatory for graduate students and voluntary for undergraduate students. Although this known-groups validity test between graduate and undergraduate students is limited, it does provide some beginning evidence of validity, and it would be important to obtain additional validity evidence in the future. A future study should include a mandatory assignment for undergraduate students.

Main findings of this study support fair and consistent grading of students by multiple trained raters over time when using the PGR. This may aid in taking the grading burden off a single educator when class size is large. Findings also support continued testing of the PGR as a distance learning tool to facilitate higher-order thinking in discussion boards for SRNAs. Improving students’ higher-order thinking may ultimately lead to better decision making by clinicians.

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