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Training Graduate Pharmacy Students in Scientific Critique through the Implementation of a Transparent Peer Review Policy

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Abstract

Acknowledging the critical role of training graduate students in scientific critique and peer review, we implemented a novel teaching method based on the transparent peer review policy (TPRP). This study sought to examine students' feedback and reflections on how exposure to published peer review reports shaped their scientific critique abilities and reasoning processes. We incorporated publicly available peer review reports from journals adopting TPRP into the curriculum for Master of Science in Pharmacy students. Participants examined authentic cases encompassing original author submissions, reviewer feedback, author rebuttals, editorial decisions, and the final published articles. Students completed a reflective assignment detailing their observations on the review processes in TPRP journals and the impact on their reviewing skills. Qualitative content analysis of these reflections was performed by two independent instructors uninvolved in the design or delivery of this course component. Reflections were submitted by eleven students describing their learning through this open peer review process. The analysis indicated that TPRP heightened students' understanding of peer review mechanics and core principles of scientific critique. Five primary themes emerged: deeper comprehension of research content, generation of new ideas, promotion of objectivity, enhanced grasp of peer review, and assessment of the advantages and disadvantages of transparent peer review. Overall, students expressed positive views toward this instructional strategy for developing the intended competencies. By employing peer review reports from TPRP-adopting journals as a teaching resource, we offered practical instruction in the essentials of peer review and scientific critique. The findings support the recommendation of TPRP journal reports as an effective educational resource for fostering scientific critique and peer review skills in graduate students.

Keywords: Transparent peer review policy, Scientific critique skills, Qualitative content analysis, Educational pedagogy

Introduction

Scientific critique and peer review are regarded as essential mechanisms for upholding the integrity and quality of scholarly publications [1]. Preparing graduate students in these areas is vital for cultivating proficient researchers. Nevertheless, formal training programs remain scarce in many academic institutions. Common approaches to bridge this gap involve student-led peer review exercises [2–6], where learners critique peers' work. Journal clubs, in which students analyze and debate published papers, have proven valuable for building critical appraisal and manuscript composition skills in undergraduate pharmacy and medical training [7–10]. More recently, innovative methods leveraging preprints have emerged: students select a preprint, summarize key findings, conduct critical assessments, and submit formal referee reports to the authors while sharing them on platforms such as PREreview or The Winnower [11–13]. In another contemporary approach, An and colleagues [14] employed the eLife review model to educate graduate and postdoctoral trainees through collaborative exercises, where participants assumed

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reviewer and editor roles to evaluate unreviewed bioRxiv preprints.

While activities like journal clubs provide excellent opportunities for practicing scientific critique and peer review, they present a core limitation: can novices effectively serve as reviewers without sufficient prior training and exposure? Simpson and Clifton noted that students frequently face difficulties in evaluating referencing quality and analytical depth [15]. Consistent with these observations, we have found that students often encounter challenges when acting as reviewers in journal club settings. To address this, we introduced a different strategy: immersing students in real-world examples that include submitted manuscripts, published reviewer reports, editorial decisions, and revised final versions.

Drawing on our institutional experience, we integrated openly accessible peer review reports from TPRP-supporting journals to educate graduate students through authentic cases. Under this system, authors submit manuscripts, reviewers offer constructive critiques, authors provide rebuttals, editors render decisions, and—for accepted papers—all correspondence is published alongside the article at no charge. Journals such as eLife and Nature Communications have led the adoption of TPRP [16–19]. This report outlines the use of these real peer review materials from TPRP journals as a pedagogical activity to instruct graduate students in the basics of peer review and scientific critique, followed by a reflective assignment capturing their insights on the experience.

Study objectives

The main goal of this study was to investigate the feedback and reflections provided by Master of Science (MSc) students concerning the advantages (or potential shortcomings) of published peer review reports in enhancing their knowledge and abilities in scientific critique.

Materials and Methods

Study design and setting

This report outlines an innovative educational method for instructing graduate students in peer review and scientific critique, accompanied by a qualitative content analysis of their reflective submissions on this strategy. The study was carried out at the College of Pharmacy, Qatar University, and included first-year MSc students who examined published peer review reports from journals implementing the transparent peer review policy (TPRP). A qualitative methodology was selected as it is well-suited for exploratory research at an early stage, allowing students to express detailed insights, emotions, and perspectives [17]. Ethical approval was granted by the Qatar University Institutional Review Board (approval number: QU-IRB-1868-E/23).

Study population and subjects

The target population consisted of all full-time first-year MSc Pharmacy students enrolled in the graduate course titled English-based Communication Skills for Graduate Students (PHAR650), which focuses on scientific writing skills.

Sample size and sampling

We employed a nonprobability convenience sampling method, selecting participants based on their accessibility and availability to the researchers. The PHAR650 course had eleven enrolled students (n = 11). Given the small population size and the nature of this study as a content analysis of a required reflective assignment, we applied whole-population sampling.

Description of the new instructional activity and the study procedures

Initially, we conducted interactive discussions with the students about our own previous manuscript submissions and the associated peer review correspondence. This enabled students to directly observe how expert reviewers and editors handled real submissions. Although students responded positively to this method, a key limitation emerged: our published works might not match each student's specific area of interest. The MSc Pharmacy program attracts learners from varied backgrounds (including pharmacy, chemistry, and biology) and diverse research foci (such as clinical pharmacy, pharmaceutics and drug delivery, nanotechnology, natural products chemistry, and pharmacology). This heterogeneity made it difficult to choose examples that were equally accessible, interesting, and relevant to everyone, thereby hindering their capacity to effectively discuss and defend reviewer feedback—an important aspect of mastering scientific critique and peer review fundamentals.

To overcome these obstacles, we designed a self-directed learning task in which students independently identified TPRP-adopting journals and chose publications aligned

with their personal research interests. Students were directed to select a published article in the pharmacy field from such a journal, ensuring it included openly available reviewer reports, author rebuttals, and editorial decisions to illustrate authentic peer review dynamics. This personalization aimed to leverage their existing knowledge of the topic, thereby deepening their appreciation of the review process. Participants then carefully reviewed the article and accompanying materials independently at home.

Subsequently, each student delivered an oral presentation (using PowerPoint, lasting 15 minutes) on their chosen paper and reports, offering critical analysis and personal reflections, followed by facilitated in-class discussions led by the third and fourth authors. Students also submitted written responses to this experience via a structured reflective assignment with six questions. The figure illustrates the activity phases and components. All instructions—for the self-directed reading, classroom sessions, and reflective assignment—were provided in English and completed at times convenient to the participants. The reflection task featured six open-ended questions centered on the transparent peer review reports, addressing their advantages, contributions to process understanding, strengths and limitations, supporting arguments, overall pros and cons, and potential inspiration for future research **(Table 1)**. Students were encouraged to elaborate on their encounters with this TPRP-based educational approach.

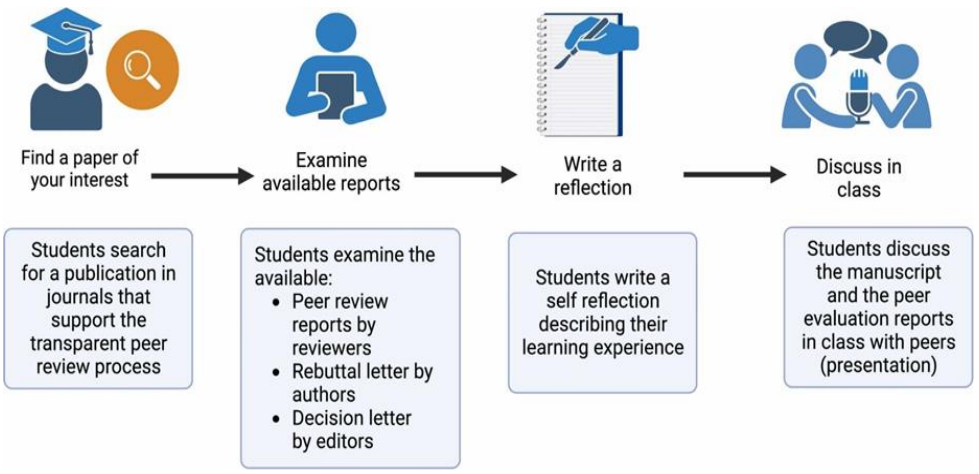

Figure 1. The sketch summarizes stages involved in the developed educational activities to train students on peer review critique using available peer review reports form journals adopting TPRP

Table 1. Main questions addressed in the take-home reflective assignment completed by students after reviewing peer review reports from journals implementing TPRP

Question No.	Rephrased Question
1	To what extent did the accessible peer-review documents assist you in interpreting and comprehending the research presented in the article? Elaborate with detailed explanations and concrete illustrations.
2	How effectively did the available peer-review information support your ability to recognize the key strengths and limitations of the reported research?
3	In what ways did this independent learning task deepen your understanding of the peer-review mechanism and the scholarly publication process? Please describe.
4	Did exposure to the peer-review content motivate you to pursue new lines of investigation or formulate an original research idea within the field? Explain your reasoning.
5	How would you evaluate the objectivity and constructiveness of the critiques and discussions offered by editors, reviewers, and authors within the peer-review materials?
6	Based on this experience, critically discuss the advantages and disadvantages of a transparent peer-review policy, and indicate whether you would choose this review model for a future manuscript submission.

Data analysis

This study employed qualitative content analysis to examine students' submitted reflection assignments, adopting McCracken's long interview–based qualitative analytical approach [20]. The analysis was conducted by two authors (RA and OR) who had no role in designing or delivering the learning activities or the reflection task, thereby minimizing potential bias. Methodological rigor in theme development was ensured by applying Braun and Clarke's thematic analysis framework [21]. Initially, RA and OR independently coded a portion of the dataset to generate provisional themes, after which they compared interpretations, discussed differences, and refined the emerging themes through consensus. The thematic structure was finalized through repeated cycles of review and verification against the original data. Any disagreements were addressed through discussion until full agreement was reached, and comprehensive records of the coding procedures and theme development were maintained to support transparency and reliability [21].

Data handling and analysis were performed manually using a thematic approach [22], with Microsoft Excel and Word spreadsheets facilitating organization. Color-coding techniques were applied to systematically classify the content of students' written reflections. Each reflection was coded and labeled using terms and concepts related to transparent publishing policy, with codes articulated using language closely aligned with participants' own expressions. These codes and labels were subsequently compared and reviewed to confirm their descriptive accuracy and grounding in the collected data [23]. During the second phase of analysis, codes were organized into distinct categories, which were then clustered into higher-order categories. Related categories were further synthesized into micro-themes, and these micro-themes were subsequently integrated into broader macro-themes. To ensure faithful representation of participants' perspectives, verbatim quotations were included in the results section.

Results and Discussion

A total of eleven students submitted reflective responses regarding their experiences with this public-facing peer-review model. The qualitative analysis identified five overarching themes, each comprising several subthemes, as summarized in **Table 2**. A detailed description of each theme is presented in the subsequent subsections (Sections 4.1–4.5).

Table 2. Primary themes, sub-themes, and illustrative quotes from participants regarding students' reflections on the transparent peer review policy

Themes	Subthemes	Examples of participants' quotes
1- Grasping the Research Content	a- Comprehensive understanding	"Explained the paper in a simpler, clearer and comprehensive way, the main essential points."
	b- Overall opinion	Providing "reviewers' overall opinion about the paper comprehensively and concisely."
	c- Adequate review material	"The peer review material was adequate in directing the readers to which sections were weak and needs improvements"
2- Generating New Ideas	a- Think out of the box	"Reading the article, then the peer review has inspired me a lot to further think outside the box and to think if we were to repeat this trial, how will I do it taking in consideration the peer review comments."
	b- Research refinement	"This hypothesis could be studied using different statistical analysis designs, such as a more constrained model."
3- Promoting Objectivity	a- Professional objectivity	"Peer reviewers were professionally objective in their evaluation process, and they presented constructive criticisms in their report."
	b- Impersonality	"All comments provided by the reviewers were very objective, as they did not show any of their personal opinions in the project. All the comments focused on the methodology of doing an appropriate implementation."
4- Deepening Understanding of the Peer Review Process	a- In-depth explanation	"Helped me understand how the reviewers show an in-depth explanation of the method in which it is reproducible and whether the author has thought to conduct the research in a different way or add more information."

	b- "Know how walk the walk and talk the talk."	"Prepares us as students to critically appraise our manuscripts (think like a reviewer, expert in the field) and others' publications as well 'know how walk the walk and talk the talk.'"
5 - Assessing Advantages and Disadvantages of TPRP	a- Accountability	"Providing more accountability for authors, reviewers, and editors during the peer review process."
	b- Learning opportunity for future researchers	"Provides educational opportunities for new and early-career researchers to learn from constructive reviews and responses to reviewer comments."
	c- Costly	"The process itself is time-consuming and expensive for the journals."

Theme one: grasping the research content

The initial theme identified from analyzing the participants' responses was the role of the Transparent Peer Review Policy (TPRP) in assisting them to better absorb the core elements and substance of the evaluated research article. The openly available peer review reports aid in comprehending the objectives, justification, and methods of the study. For instance, one participant observed that these published reports "explained the paper in a simpler, clearer, and comprehensive way, the main essential points." Another highlighted how they deliver "reviewers' overall opinion about the paper comprehensively and concisely." The TPRP improves comprehension of the study, as one participant affirmed: "I strongly believe that the suggested modifications by reviewers increase the clarity of the presented study." Likewise, another mentioned that the reports "opened my eyes on points I have gone through quickly, without having a critical appraisal of them."

However, certain participants pointed out that published peer review reports do not invariably improve understanding, since some suggestions appear irrelevant. One participant, for example, commented that "the peer review report did not result in better understanding as some comments seemed irrelevant to the topic." Another clarified that such reports may not always enhance comprehension fully, noting that authors typically address reviewers' queries, which might not encompass all aspects of the study. This participant further stated that "here is a need to read the article itself, and if you are not familiar with the subject, there is a need to read further on the topic."

Theme two: generating new ideas

From the responses in the self-directed learning exercise, the second theme that surfaced was the way published peer review reports motivate participants to develop or formulate novel research concepts. Furthermore, engaging with these reports assists researchers in staying current with cutting-edge advancements in their field. As noted by the students, identifying limitations in the original work reveals research gaps for future investigation.

One participant, who chose an article on vaccine hesitancy among individuals, mentioned that the published reports "made me think about research to conduct and identify whether educating people about the side effects of vaccines would have an impact on their willingness to take the vaccine and if so which type of information or educational material is more helpful to achieve this goal." Another, reviewing a study on aspirin's role in preventing brain infarcts, shared: "Reading the article and then the peer review has inspired me a lot to further think outside the box and to think if we were to repeat this trial how will I do it taking in consideration the peer review comments." The same individual added inspiration by noting: "In my new research ideas, I might include patients with HIV-positive and TBM to assess the efficacy of aspirin further." Additionally, participants might suggest alternative or contrasting hypotheses or improve the approach to studying the variables. For instance, one stated: "This hypothesis could be studied using different statistical analysis designs."

Theme three: promoting objectivity

Students commented on the reviewers' impartiality, structured methodology, and helpful feedback to authors. One participant, for example, remarked that "peer reviewers were professionally objective in their evaluation process, and they presented constructive criticisms in their report. For example, they emphasized the good points like the importance, the novelty, and the quality of the work and findings of the research." Another

indicated that "In my opinion, the argument is objective and constructive." A further participant noted: "All comments provided by the reviewers were very objective, as they did not show any of their personal opinions on the project. All the comments focused on the methodology of doing an appropriate implementation." Additionally, one described the constructive nature by observing: "The tones of critique were soft and respectful. The authors' responses were detailed and explanatory, as well as they responded to all the revisions."

Notably, a small number of participants perceived some reviewers as overly directive, using commanding language. One reported: "The reviewer appeared to be aggressive and his/her argument was: remove the word innovative as this approach has been used previously and the level of the innovation has been substantially reduced." Similarly, another mentioned "The reviewer appeared to be less constructive and accusing at some points."

Theme four: deepening understanding of the peer review process

The fourth theme arising from the self-directed learning experience concerned how published peer review reports contribute to students' greater grasp of the key principles of the peer review system. This process is essential for refining all scholarly papers. Through this activity, participants indicated that the TPRP broadened their knowledge, perspectives, and expertise regarding peer review. One participant described how the activity offered "an insight of real-life examples for the complete reviewing process, as how communications between the author and journal occur and what type of language is used." They also noted that "the process prepares us as students to critically appraise our manuscripts (think like a reviewer, expert in the field) and others' publications as well. Know how walk the walk and talk the talk." Another similarly said: "It was helpful to read the reviews and explore or familiarize myself on what reviewers look for in order to consider them during my next publication or project."

Scholars work hard to improve their manuscripts' chances of acceptance in reputable journals. In this regard, one participant observed that reviewing published reports "helps researchers to produce high-quality papers and avoid rejection in the future." Another stated: "This activity highlighted and provided a better picture on the publication process dynamics and to help in what to expect during applying for any publication in that matter." Such reflections were common and underscored the value of TPRP in improving submission quality and, consequently, published research.

Theme five: assessing advantages and disadvantages of TPRP

Students explored the benefits and drawbacks of the Transparent Peer Review Policy (TPRP). **Table 3** outlines their key observations, with advantages outweighing disadvantages. For benefits, they emphasized accountability, helpful feedback, impartiality, detachment from personal views, and elevated research standards. One participant identified the key benefit as "providing more accountability for authors, reviewers, and editors during the peer review process." Another noted that it promotes "transparency in science communication and encourages constructive critique." Furthermore, one mentioned that "transparent peer review will lead to greater accountability and a lower chance for review fraud, bias, or subjective evaluation as the editor's and reviewers' reports will be published to the public." An additional benefit highlighted was that it "broadens the reader's scope of view and help to increase the reader's knowledge by looking at different points of view or different angles of the same topic." Some valued recognizing reviewers' contributions, stating that the policy "provides a mechanism for reviewers to obtain credit for their efforts." Others saw it as valuable for training emerging scholars, with one noting it "provides educational opportunities for new and early career researchers to learn from constructive reviews and responses to reviewer comments."

Table 3. Advantages and disadvantages of transparent (open) peer review as reported by study participants

Advantages	Disadvantages
1. Motivates reviewers to conduct thorough and accountable evaluations of manuscripts	1. Places additional burden on editors, increasing time, effort, and costs in managing the review process
2. Facilitates more constructive and diverse feedback from multiple viewpoints	2. Limits reviewers' ability to comment freely on the novelty of ideas or the underlying rationale of the study

3. Expands readers' understanding, perspectives, and knowledge of the subject matter	3. Demands reviewers with exceptional expertise and qualifications
4. Offers valuable learning experiences for early-career and novice researchers in conducting and defending their work	4. Can occasionally result in unconstructive or overly critical feedback that lacks practical suggestions
5. Recognizes and credits reviewers for their contributions	5. Negative or overly harsh remarks may discourage authors and hinder their motivation to improve
6. Reduces the likelihood of reviewers using inappropriate or aggressive language	6. Leads to extended timelines for publication
7. Promotes a more structured, detailed, and thoughtful review process	7. Many authors are reluctant to opt for this model, as it requires significant confidence and resilience
8. Improves overall transparency in the research and publication process	
9. Boosts authors' confidence and helps prevent major errors in their work	
10. Encourages innovation in how research findings are shared and discussed	
11. Fosters a more equitable and impartial approach to publishing scholarly work	
12. Helps researchers develop resilience to criticism and view feedback objectively	
13. Enables readers and fellow researchers to generate new ideas for future studies	
14. Offers greater insight into the editor's rationale for acceptance or rejection decisions	
15. Results in higher-quality publications and more reliable review reports	

When examining the drawbacks of transparent published review practices (TPRP), respondents highlighted concerns related to financial burdens, duration of evaluation, workload, delays in publication, and additional issues. For instance, one respondent emphasized the resource demands on publishers, noting that “the process itself is time-consuming and expensive for the journals.” Another pointed out that “an organization using transparent peer review stated that it uses an additional 30 min of additional time per paper.” Certain respondents worried that this approach could lead to critical, unconstructive, or prejudiced evaluations, potentially discouraging or upsetting submitting scholars. As one remarked, “Some reviews may be destructive or biased for some reasons, leads to some cases wholeheartedly embraced transparent peer review.”

The primary aim of this article is to investigate the pedagogical application of TPRP and existing evaluation methods to educate learners on core principles of manuscript assessment and assess their feedback and impressions. Open and transparent evaluation, increasingly viewed as a key component of open scholarship, has spurred extensive studies, enabling the scholarly community to scrutinize various stages of the assessment procedure collectively [16, 19]. Thematic review of responses reveals that openly available evaluation documents from outlets employing TPRP represent effective materials for guiding postgraduate learners in comprehending evaluation mechanisms and advancing goals tied to grasping essentials and participating in scholarly discourse. Findings suggest that TPRP aids postgraduate learners in better understanding the substance and essence of assessed submissions. Furthermore, respondents indicated that TPRP delivers detailed and beneficial insights for audiences and investigators. In Mehmani's research [24], 33% of surveyed outlet overseers noted that open evaluation improved review standards overall. Among them, 70% observed that publicly shared reports were more thorough and provided greater helpful suggestions [24]. The assessment procedure illustrates the thoroughness of debates in robust scholarly exchanges, offering impartial and supportive reasoning. Earlier studies have shown that openness in journal evaluation demonstrates strong consistency and effectiveness, reduces evaluator prejudices, encourages candor and frankness, and does not markedly reduce referees' participation [16, 25, 26].

This method involving TPRP is poised to assist emerging investigators in comprehending and applying evaluation procedures, while offering structured techniques to elevate submission standards. Notably, most respondents expressed positive attitudes toward submitting future works to outlets implementing TPRP. As noted by Garakyaraghi and colleagues [27], open evaluation yields multiple advantages, particularly for inexperienced and developing scholars like those in this cohort. It enables audiences to observe evaluation dynamics, creating learning chances through actual examples of referee comments and author replies. Thus, TPRP tends to ensure superior outputs by strengthening scholarly oversight [25]. Emerging investigators are inclined to show enthusiasm for acquiring novel scholarly skills, such as those from TPRP. Bravo *et al*. observed that early-career academics were more prone to agree to assessment requests and deliver favorable, impartial suggestions [28]. Scholars strive to maximize opportunities for placement in respected outlets. From reviewing 231 articles in open-evaluated journals, Wicherts [25] identified a beneficial link between TPRP and evaluation standards, thereby boosting overall output quality.

Respondents noted greater advantages than limitations in adopting TPRP methods. Various investigations [29–31] argue that benefits of open and transparent evaluation systems—such as building confidence, promoting duty, and recognizing overseers and referees—outweigh any operational challenges. Consistent with prior work [26, 30], our respondents affirmed that TPRP demands significant duration and resources from outlets. Moylan and colleagues [30] underscored this by indicating that overseers needed to solicit additional referees to obtain adequate agreements, thereby extending administrative workload.

A key goal of this independent learning exercise on openly published evaluations is to present authentic illustrations of assessment procedures, enabling postgraduate learners to grasp the mechanics and characteristics of scholarly reviewing. This novel approach seeks to prepare postgraduate learners as competent future investigators. Hence, instructors should actively guide and support their postgraduate learners in mastering systematic dissemination, especially within research methodology curricula. Based on their responses to this exercise, respondents reported that TPRP greatly improved their knowledge, offered meaningful perspectives, and advanced their expertise in evaluation practices.

This investigation adds to prior scholarship by assessing the teaching potential of TPRP and accessible evaluation documents for instructing advanced learners in basic assessment procedures. In contrast to earlier works emphasizing conceptual elements or general teaching approaches, this effort particularly appraises how such resources can strengthen learners' abilities in analytical scholarly composition and evaluation. Through reviewing learners' responses and impressions, the work delivers actionable guidance and illustrates practical ways to refine teaching in assessment education. Outcomes supply useful proof for teachers aiming to create superior strategies for instructing evaluation and analytical skills.

This investigation is preliminary, targeting a novel area with scarce prior studies. It employed qualitative review of independent learning responses by scrutinizing reflection tasks. Qualitative approaches are vital for deep exploration of emotions, understandings, and opinions on the subject, drawing from respondents' own expressions, though results may not generalize broadly. Qualitative review is subjective by nature, where investigators' assumptions and views can affect data gathering, examination, and conclusions, potentially reducing study robustness unless properly managed.

In this work, respondents supplied responses on the independent activity concerning open published evaluation by addressing six author-designed questions. This could have unintentionally prioritized details aligning with preconceptions about public evaluation, risking confirmation prejudice. Additionally, social desirability effects were possible, as researchers served as respondents' teachers who created the activity and chose examples. Thus, learners might have portrayed the activity positively in reflections. Yet, questions permitted expression of contrary opinions (e.g., limited value in learning). To enhance reliability, the activity was created and presented by two researchers (AMAK and AA), while examination was conducted by the remaining two (RA and OR) uninvolved in delivery. Polls across scholarly groups show growing support for greater openness and recognition in evaluation efforts [32]. Upcoming studies could allow respondents to include additional comments from their experiences, fostering broader insights overlooked by designers.

Conclusion

This article outlines an original teaching method for instructing postgraduate learners in manuscript assessment and scholarly analysis. Publicly accessible evaluation documents from outlets supporting TPRP were incorporated into a learning exercise to educate advanced learners on core aspects of assessment and analytical discourse. Learners shared favorable impressions and views on this exercise, highlighting its role in deepening comprehension of scholarship and evaluation mechanisms, while motivating novel investigative concepts. The suggested exercise can integrate effortlessly into varied curricula, fields, and institutions. It stands as a robust teaching resource for preparing learners and early investigators in analytical evaluation and assessment techniques.

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