Empowering Medical Education: Unveiling the Impact of Reflective Writing and Tailored Assessment on Deep Learning

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Abstract

Introduction: Reflective thinking offers learners insight and encourages deeper understanding by leveraging past experiences. This study explores the impact of reflective writing, a self-assessment tool, on undergraduate medical students. The focus is on training students using author-specific reflection rubrics based on Moon's model.

Methods: A mixed-methods study involving 32 volunteered students undertaking an interactive 3-hour session on reflective thinking and writing (RT&W). 19 students submitted reflections, which were self-graded by students and two faculties independently. The perceptions of students were gathered through questionnaires and focus group discussions. The analysis was done using the mean, inter-class correlational coefficient, and thematic analysis.

Results: Inter-rater reliability and inter-class correlation coefficient for reflective writing rubric scores was 63.2%, i.e. below the acceptable threshold. Cronbach's Alpha for the learner perception questionnaire was 0.90. The outcome of the student's perception questionnaire recognized the value of reflective writing in terms of professional skills enhancement (4.83±0.39) and improvement after feedback (4.17±0.72). However, satisfaction with overall training was comparatively lower (2.5±0.52). Focus group discussions revealed six themes.

Conclusion: Reflective writing enhances the learning outcomes, deepens understanding, and refines judgment. The author-specific reflection rubric, though reliable, warrants empirical validation with a larger and more diverse participant pool. Undergraduate programs should prioritize mastery of reflection and meta-cognitive learning approaches to optimize educational outcomes.

Keywords: Cognitive reflections, Medical education, Personality assessments, Educational measurement, Formative feedback

Introduction

Medical education is undergoing a transformative shift, recognizing the profound impact of reflective thinking and writing in shaping the competencies and attitudes of future healthcare professionals (1, 2). In this evolving landscape, the perspective of undergraduate medical students is of paramount importance as they are the direct beneficiaries of curricular and pedagogical strategies designed to foster reflective thinking and writing skills (3). Reflective thinking and writing are often underemphasized in the undergraduate medical curriculum despite their significant role in

enhancing personal growth and understanding in clinical and classroom settings.

Through practitioners examining their practice, reflection has been found to improve optimal efficacy and efficiency in a complex and ever-evolving healthcare system. It contributes to the growth and development of clinical expertise (4-8). A systematic review on reflective writing enlists the themes regarding the benefits of a reflective writing program "Supporting the professional formation of physicians, a tool for learning enhancement, aiding self-understanding, enhancing self-assessment and assisting in the development of clinical behaviour and patient care" (8). The holistic development of these attributes is fundamental to producing healthcare providers who can navigate the multifaceted healthcare landscape successfully.

Medical schools worldwide have begun to appreciate the critical role of reflective thinking and writing in medical education (3, 8).

The integration of reflective practices is deemed essential in nurturing empathy, fostering professionalism, and improving decision-making skills in medical students (2). Reflective practice enhances the students' metacognition, self-evaluation, critical thinking, problem-solving, decision-making, and teacher understanding while enhancing self-assessment, evidence-based work quality, and critical thinking (9). It is evident that these skills, when acquired during undergraduate medical education, equip students with tools for lifelong learning and for delivering patient-centered, quality care (10).

Critical reflection challenges three major cultural assumptions: interpersonal communication, professional helping to cultures, knowledge, learning, and research. Emotional readiness, professional development, self-disclosure, and cultural context are crucial aspects of a learning environment that cater to all learner types (11).

The literature shows that reflection in higher education faces challenges such as employability agendas and policies, concerns about artificial or unauthentic results, the complexity of reflective writing, and disciplinary settings. Additionally, focusing on documentation and outcomes may hinder genuine participation and learning as it may overlook the process itself (12).

To address this important aspect, this research project investigates undergraduate medical students' opinions about how they are prepared for and supported in developing reflective writing and thinking skills within the framework of medical education. By exploring the experiences and perspectives of medical students through qualitative research methodologies, we seek to uncover the challenges they encounter and to identify areas in which educational practices can be improved.

The ultimate objective of this study is to enhance the preparedness of undergraduate medical students for their future roles as healthcare professionals. By understanding and addressing their perspectives on reflective thinking and writing, we aim to contribute to the cultivation of self-reflective practitioners capable of delivering patient-centered, evidence-based care, thereby ensuring the quality and efficacy of healthcare services in an ever-evolving healthcare environment.

Also, the study aims to prepare undergraduate medical students for learning through reflections, using author-specific reflect rubrics.

Methods

An interventional, mixed-method approach was undertaken after seeking permission from the institutional ethics committee (IEC/ BU/2021/ Ex. 41/S80).

Undergraduate medical students of batch 2020 were invited for the study, and 32 out of 150 volunteered for the activity. The volunteer students were asked to respond to a question "Why did you agree to join the session?" An interactive session with hands-on practice for reflective thinking and writing was conducted for 3 hours duration by 1 hour of debriefing session after two days. The enrolled students were asked to reflect on any one of the student-centrered learning activities using a reflection guideline. 19 out of 32 submitted their reflections which were graded by two facilitators independently.

An extensive literature search was done by the authors to identify a reflection rubric that could be used for grading the students' reflections. Most of the reflection rubrics were found to be difficult to use by faculty and/or students from non-English native countries like India. So, the author used a copyrighted reflection rubric (DPV reflection rubric) (13), which was a concise, and simple grading tool for reflection.

Self-assessment was also done by the students before they received feedback for the same by the authors. Feedback provided inputs for better writing and probed the students towards thinking about their present experience and future action.

Students' perception was recorded via a face-validated questionnaire using Google Forms, having two open-ended and 17 closed-ended questions, and a focus group discussion session regarding learning from reflective writing activity, the grading process, and the feedback approach. The discussion was audio-tapped using

a Sony voice recorder maintaining complete confidentiality at all levels.

The content validity ratio for the feedback questionnaire with 6 experts was +1 for 14 and 0.61 for 3 items, thus having the content validity index (CVI) of 0.93. Face validity for 18 items of author-specific rubrics with 6 experts was an agreement for 12 items and suggested few modifications for 6 items. Language clarity was recommended at selective places for those 6 items, while the remaining 12 items of the rubric were accepted by all, thus having Content Validity Ration (CVR) and Content Validity Index (CVI) for the rubrics as 1.0. The suggested modification of the items was done before implementing it for the training session.

The Cronbach's Alpha for 17 closed-ended perception questionnaires was 0.900, while Cronbach's Alpha, if the items were deleted, ranged from 0.906 to 0.884. Two of the item values for the total correlation were less than 0.3, while most of them were above 0.5.

The inter-rater variability (13-14) was assessed for the Sentiment analysis (SA) (15, 16) attained from the reflection write-up regarding the topic and grading of reflection via an author-prepared grading rubric. The sentiment analysis method was used to determine the attitude expressed concerning some themes or the overall contextual polarity of a reflection write-up. Manual labelling of the excerpts for positiveness/negativeness towards having a student-centric learning activity was recorded. The standard inter-rater reliability method was done by rating each excerpt by two different assessors. The rating scale is Likert's five-point scale where 1 is the most negative, 5 is the most positive, and 3 is neutral (when they do not pick or report any good or off comment for student-centric activity in general).

Inclusion criteria

Participants who completed their training session wrote a reflection on the student-centric learning approach using the given guidelines, and received feedback.

Statistical approach

The statistical analysis of the perception questionnaire was done by calculating the frequency of the items in terms of mean, standard deviation, and percentage. For the focus group discussion and open-ended questions, data was deductively analyzed manually using a 6-step thematic analysis of Braun and Clarke's (17). Inter-rater reliability [IRR] and Intraclass Correlation Coefficient [ICC] (18) were done for the Sentimental Analysis Scale Score and Reflection Writing Score among two independent assessors.

Results

The responses to the pre-training question "Why did you agree to join the session for reflective thinking and writing?" led to the derivation of six themes (Desire for Self-Improvement; Reflective Learning and Personal Growth; Clinical Relevance and Patient Care; Self-awareness and Observational Skills; Holistic Growth; and Motivation for Writing Improvement) (Table 1).

The Inter-rater reliability (IRR) for the Sentimental Analysis Score was 68.4%, and that for the Reflective Writing Rubric Score was 63.2%. The value is less than the acceptable value. Ideally, it should be above 80% so that it is considered desirable for most fields (13-15). The average measures Intraclass Correlation Coefficient [ICC] between the two assessors for the sentimental score was 0.80, showing the

Table 1: Themes derived for the question "Why did you agree to join the session for reflective thinking and writing?"

No.	Themes	Response
1	Desire for Self-Improvement	"I want to work more on myself in a way where I can improve." "I want to grow each and every day and reach the infinite heights of excellence." "I should be able to differentiate myself as a better person from the previous day."
2	Reflective Learning and Personal Growth	"I want to learn reflective writing so that I can improve myself." "It would help me figure out where I lag behind and in which areas I should focus more to improve myself." "Helps to become a better thinker and in turn a better learner."
3	Clinical Relevance and Patient Care	"It will also help me in the future while practicing medicine to reflect upon my failures and will also help me to analyze where I have come short in providing my utmost care and knowledge to the patient!"
4	Self-awareness and Observational Skills	"Increases my self-awareness." "Encourages to make observations about our experiences."
5	Holistic Growth	"This is not only in the context of academics but also personal growth in terms of social relationships." "Help me to link my past experiences with the current or any future situations that I'll face."
6	Motivation for Writing Improvement	"Expect to improvise over my writing abilities."

average ICC between the groups while that of the reflective writing score was 0.967, showing the higher ICC between the two assessors (Table 2). The ICC values above 0.8 or 0.9 are often regarded as a sign of good or excellent reliability (18), thus the reliability score for the sentimental analysis and reflection writing score is well accepted.

The perception questionnaire of students for the RT&W session followed by its self-grading and faculty grading and feedback shows the most agreement for the item "I know reflection will improve my learning outcome" (4.83±0.39) followed by "Reflective writing will improve my professional skills" (4.75±0.45). However, the lowest score belonged to the item "My score and facilitator grade score for my reflection matched" (3.67±0.89). Most of the participants were satisfied with the "Individual reflective writing activity"; "Overall training for reflective writing." and "Interactive discussion during the training" although they were less satisfied with the "Question and Answer activity" (Table 3).

The open-ended questions for the suggestion to improve the RT&W activity emphasize the opportunities for reflection writing and further improvement in the present training approach. It also highlights how the grading and feedback were beneficial and how it can be made much better so that there is better clarity for the approach (Table 4).

The response outcome of the focus group discussion with 6 participants had six themes (Emotional Release and Well-Being; Personal Development and Learning; Cognitive Benefits and Memory Enhancement; Language and Expression in Reflection; Personal and Professional Development; Reflective Process and Practice), with further subdivision into categories (Table 5), thereby providing a comprehensive understanding of the participant's experiences regarding training, feedback, and grading of the reflective practice. It covers emotional, cognitive, and professional aspects, as well as the challenges with scope for improvement. These categories and themes help to structure the data and provide a comprehensive understanding of the participants' experiences with reflective writing, covering emotional, cognitive, and professional aspects, as well as the challenges and suggestions for improvement.

Table 2: Inter-rater reliability (IRR) and Inter-Class CorrelationalCoefficient (ICC) for Sentimental Analysis and Reflective writing score

Participant No.	Assessor-1	Assessor-2	Agreement	Assessor-1	Assessor-2	Agreement
	Sentimental Analysis Scale Score	Sentimental Analysis Scale Score	For Sentimental Analysis Scale Score	Reflection writing Score	Reflection writing Score	For Reflective Writing Score
1	4	5	0	C1	C1	1
2	4	4	1	C2	C2	1
3	5	5	1	B3	B3	1
4	4	5	0	E	D2	0
5	4	5	0	E	E	1
6	4	5	0	E	D1	0
7	5	5	1	D3	D3	1
8	5	5	1	E	E	1
9	4	4	1	D3	D3	1
10	5	4	0	D3	D3	1
11	5	5	1	C1	D3	0
12	5	5	1	D3	C1	0
13	5	4	0	D1	D3	0
14	5	5	1	D1	D1	1
15	3	3	1	D1	D1	1
16	3	3	1	E	E	1
17	4	4	1	C2	C1	0
18	5	5	1	C1	C1	1
19	4	4	1	E	D1	0
	IRR	=13/19; =0.684		IRR	=12/19; =0.632	
Intraclass Correlation- Sentimental Score				**Intraclass Correlation- Reflective Writing Score**		
Inter-Item Correlation Matrix	Assessor 1 & 2=0.663	Assessor 2 & 1=0.663	Average Measures=0.800	Assessor 1 & 2=0.945	Assessor 2 & 1=0.945	Average Measures= 0.967
Mean±SD		Variance		Mean±SD	Variance	
8.84±1.26		1.59		9.11±4.56	2.08	

Table 3: Perception of students for training and feedback for Reflective writing

No.	Items	Mean±SD	1	2	3	4	5
A	How satisfied are you with the:		Not Satisfied	Partially Satisfied	Satisfied	Strongly Satisfied	
1	Interactive discussion during the training.	3.25±0.62	0	1	7	4	
2	Question and Answer session.	3.08±0.67	0	2	7	3	
3	Individual reflective writing activity.	3.58±0.51	0	0	5	7	
4	Overall training for reflective writing.	3.42±0.51	0	0	7	5	
B.	Agreement Survey:		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
5	I completely learned about writing reflection.	3.75±0.62	0	0	4	7	1
6	I know when to write my reflection.	4.25±0.62	0	0	1	7	4
7	I know reflection will improve my learning outcome.	4.83±0.39	0	0	0	2	10
8	Reflective writing will improve my professional skills.	4.75±0.45	0	0	0	3	9
9	I am capable of training my peers for reflective writing.	3.75±0.87	0	0	6	3	3
C.	Feedback & Scoring Survey:		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
10	Appropriate time was spent on the feedback session.	4.08±0.67	0	0	2	7	3
11	I improved my Reflective writing skills after receiving feedback.	4.17±0.72	0	0	3	4	5
12	Feedback was given aptly.	4.25±0.62	0	0	0	8	4
13	Feedback for my reflection was good.	4.17±0.58	0	0	2	9	1
14	I liked the grading scheme for reflective writing.	4.08±1.0	0	2	1	3	6
15	My score and facilitator grade score for my reflection matched.	3.67±0.89	0	2	3	6	1
16	Feedback will be useful to me.	4.33±0.89	0	0	0	5	7
17	A reflective writing score will be useful to me.	4.42±0.67	0	0	1	5	6

Table 4: Themes and responses for suggestions and improvement for the training, feedback, and scoring for reflective writing

No	Themes	Responses
Suggestion to improve training sessions for reflective writing.		
1	Increased Training Sessions	More sessions should be conducted "for training us in writing reflection."
2	Identification of Mistakes and Improvement	"To figure out his/her mistake so they first identified and worked upon that."
3	Providing Sample Reflections	"Sample Reflections written by students and/or teachers should be given to the participants."
4	Enhanced Practice Opportunities	"So that more practice can be done which could lead to better learning."
5	Clarity on When and How to Write Reflections	"A bit more information on how and most importantly when to write a reflection should be provided."
Suggestion to improve feedback and scoring for reflective writing.		
1	Increase Frequency of Scoring and Feedback	"More reflections should be scored and feedback should be given for improvement." "More frequent feedback may improve the writing skills."
2	Diverse Feedback Sources	"Every time feedback from different faculties may also help in improving." "1-on-1 feedback session works a lot."
3	Satisfaction with the Current Process	"I am satisfied with the current version." "This process of grading for reflective writing is absolutely wonderful, no need to change."
4	Clarity in Scoring	"Some more clarification or details are required in scoring."
5	Comprehensive Feedback Emphasis	"More emphasis on the feedback procedure may help one with showing the points that had been left out and the same points are covered by others."

Discussion

According to research by Louise Aronson (2011), there are twelve guidelines have been proposed for teaching reflection at all levels of medical education, initiating by teaching students

Table 5: Themes and categories emerged from the focus group discussion: The student's voice (N=6)

Themes	Categories	Codes
1:Emotional Release and Well-Being	1.1: Emotional Catharsis	"Venting out our emotions," "Feeling free from the burden of the event," "Less burden on my mind about the event which happened," "we feel relaxed after reflecting," "it helped me clear my mind".
	1.2: Coping and Stress Reduction	"..If I do not reflect, then my mind would be occupied with all the unwanted thoughts: circle of thoughts," "…our mental well-being affects the surroundings".
2: Personal Development and Learning	2.1: Self-Improvement	"..Improved my approach for the next event," "learned an approach to writing reflection properly and sequentially," "I think we should write a reflection in one go rather than piece by piece".
	2.2: Self-Evaluation and Learning from Mistakes	"Helped me in the learning process of how to overcome my mistakes," "I realized my mistakes since I had to think upon my action and make an action plan," "realization of the mistakes/errors I did during the event," "made me realize which aspect I need to focus more and how to plan for it. Thus, improve our process of learning".
3: Cognitive Benefits and Memory Enhancement	3.1: Cognitive Processing and Critical Thinking	"We started exploring our thoughts and thinking critically," "taught me how to revisit to have active learning," "develops our critical thinking ability for a situation".
	3.2: Memory Improvement	"Improved my memory to uptake good things/concepts," "doubles our memory store for the learned things," "rereading my own reflection helped me to have a better understanding of the issue/problem".
4: Language and Expression in Reflection	4.1: Writing Style and Language Choice	"Reflection is not about the language we are using to write a reflection but about the way we describe the event and feeling," "Writing reflection in mother tongue/native language is better," "to pen-down our thoughts is more important than just keeping it in mind".
	4.2: Self-Expression and Feedback	"Reflective writing allowed me to assess the importance of many things in life," "feedback after writing the reflection gave us insight and scope for improvement for drafting our next reflection," "…grading rubrics guided us towards better reflecting writing approaches in an easy and understandable manner".
5: Personal and Professional Development	5.1: Personal Growth	Codes: "helps to change our behavior towards betterment," "will be beneficial towards our relationship with patients and doctors," "it is a self-development process".
	5.2: Professional Development	"If we reflect properly for our first incidence specifically while we are communicating with patients we become better prepared," "help us to work in a team i.e., team-building," "reflecting for a group task will make our skills of teamwork strong," "help us to identify team-dynamics thus have a better surrounding for the group task," "During our medical academic learning, we also learn many other non-academic aspects. Reflective writing would guide and help us to understand those non-academic skills in a better manner. Like how to think for a topic, how to express/behave/communicate".
6: Reflective Process and Practice	6.1: Reflection Process and Exploration	"…We got an opportunity to think in-depth about the event/episode," "..revisiting our reflection has its positivity. Increasing our thinking process power and makes us have a better understanding of the event," "This extensive training session gave better insight".
	6.2: Practice and Feedback	"..More and more practice and feedback for reflective writing would be better," "..more and more examples from our earlier reflections," "We can write more reflections and self-grade them then ask for faculty feedback for further improvement".

about reflection before being asked to conduct it (point 8), they should receive feedback and follow-up (tip 9), and that the reflection should be assessed (tip 10). Keeping in mind the pointers from the research (1), the authors trained the medical students for the reflection process and then asked them to reflect on a student-centered activity, providing them with feedback, and letting them evaluate their reflections before having two faculty members grading them independently.

The present study showed that reflection could empower students to make decisions about individual learning requirements and increase self-awareness, and development.

Despite showing lower inter-rater reliability, the author used a reflection rubric (DPV reflection rubric) regarded as a trustworthy, succinct, and easy grading instrument (13). Although, the inter-class correlation between the two independent assessors was excellent (0.967) (Table 3).

Early undergraduate medical education exposure to self-reflection assignments boosts awareness, personal meaning, and engagement in cognitive processes, potentially leading to the development of future reflective health professionals (19).

According to the research conducted by Aronson et al. (20), students learn more effectively when given a specialized guide

called the Learning from Your Experiences as a Professional (LEaP) guide. The current study found that reflective writing should be a core component of the undergraduate medical curriculum. Artioli et al. concluded in their study that the growing complexity of healthcare environments necessitates professionals to acquire advanced skills outside their clinical background, making reflective writing instruction and courses crucial for professional and human growth. Further, Artioli et al.'s (21) study indicated that professional training did not use reflective writing (RW) as frequently as academic training did for medical students.

In the present study, students revealed that reflective writing enhanced empathy and sensitivity to one's own and others' feelings, perspectives, and ideas, thus improving professional skills like communication; this is in the same line with previous studies conducted by different researchers (21-25).

The present study talks about self-assessments and learning from mistakes as other researchers have specified in terms of self-awareness (22, 26-29), providing insight into one own strengths and weaknesses (30-33).

The present study allowed the participants to vent out their emotions by writing their reflections, thus lessening the burden on themselves; this is also consistent with that of the researcher for having emotional stability (34), validating their emotions, and allowing them to deal with their emotions via reflective practice (35), and having a sense of emotional detachment (36).

Bruno and Aversana (37) in their study motivated students to experiment and explore their reflection via effective feedback, thus guiding them to enhance reflexivity. Their results are in the same line with those of our study where grading of the reflection by self and faculty using a simple rubric with timely feedback improved the confidence of students as well as clarity for writing the reflection subsequently. Although few participants suggested having more elaborative feedback for their reflection, Standal and Rugseth (33) suggested monitoring students' reflections to create progression and continuity.

Flexibility for the medium of the language to be used for writing the reflection was advantageous since it allowed the participants to think and write their thoughts in the language they were comfortable with, taking into account the mental language of the reflection (37). A reflective narrative exercise approach by Gupta and Charon enabled medical students to articulate and examine their feelings and witness others' experiences, allowing them to view the

incidence from a third person and learn from the experiences of others (36).

Sukhato et al. (35) suggest that reflection provides a deeper understanding of the events and helps to develop professional identity, which was one of the themes for our focus group discussion, developing personal and professional growth via the process of reflection. A study by Shiozawa et al. (38) showed that oral and written reflection both were vital for promoting professional development. Artioli et al. (21) in their scoping review concluded with practical implications that professionals and students can identify reflective writing as a capacity for higher professional learning abilities and development.

The present study showed that there was a cognitive gain from the reflective writing process, they were able to prepare a plan for their learning process. These results are on similar lines to those of other researchers who concluded that reflection led to consolidation of past experiences and application to future practice (38-40). Reflective student narratives are a helpful and entertaining technique to teach students about topics in the affective domain that are not often taught, according to the findings of Dhaliwal et al. (41). Artioli et al. (21) concluded that professionals and students may encounter challenges when writing reflectively; thus, there is a need for the guidance and support of the faculty.

Some of the challenges regarding the process of reflection, as suggested by a few participants were that it requires time to write a good reflection, and sometimes it is difficult to think about the off-full situation which was also identified by some of the researchers (42, 43).

Limitations

The sample size was limited, so there is a need to explore with a larger number of participants for a specified approach of training and assessing undergraduate students for reflective writing. It is recommended that two focus group discussion sessions should be held, allowing more ideas to be explored.

For greater acceptance and future applicability, a larger sample size is needed to validate the DPV reflection rubric, given the limited data available.

Conclusion

The study found that teaching reflective thinking and writing, using a reliable grading method like the DPV reflection rubric, significantly improved the students' self-awareness, personal purpose, cognitive participation, and promoted communication abilities, empathy, and professional identity development.

Flexibility in language and emotional expression enhances emotional stability and personal development. Instructors' prompt feedback improves self-assurance and clarity in reflective writing.

Students identified time constraints and memory issues as limitations in RT&W training sessions. Addressing these issues and conducting larger-scale research is crucial for improvement of teaching and evaluation of reflective writing. This will equip future healthcare workers with the necessary skills for healthcare settings and promote professional and personal growth.

Future Scope

There is a need to investigate the validity of the scale empirically such as exploring the external validity by comparing the scores of this instrument with other reflection scales and measures of reflective practice outcomes as well as using a larger sample, within and outside the institute, to ensure a more rigorous psychometric soundness of the scale.

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Authors' Contribution

All authors contributed to the discussion, read and approved the manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated resolved.

Conflict of Interest

The authors declare no conflicts of interest.

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