



Research Article

Theoretical and Methodological Foundations to Revalue Evaluation in Medical Microbiology and Parasitology

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Abstract

Assessment in Medical Microbiology and Parasitology has traditionally relied on memorization-based written tests, which often fail to capture clinical competencies. To analyze the theoretical and methodological foundations that enable the re-signification of evaluation in this discipline, proposing strategies that integrate scientific practice with professional training, and contribute to raising the educational quality of medical teaching. A mixed-method study with a documentary and applied design was conducted using the analytical-descriptive approach. The research included a literature review of recent scientific publications, consultations with experts in microbiology, parasitology, and medical pedagogy, and methodological triangulation. The procedure comprised three phases: (1) diagnosis of prevailing assessment practices, (2) design of instruments such as rubrics, checklists, and practical tests, and (3) application of these instruments in simulated clinical scenarios. The diagnostic phase revealed a predominance of traditional written examinations focused on rote learning, which limited the evaluation of clinical competencies. The implementation of innovative instruments allowed 75% of students to achieve positive outcomes in simulated scenarios. These results demonstrated improvements in knowledge integration, practical skills, and professional attitudes, highlighting the effectiveness of formative and performance-based assessment strategies. The revaluation of assessment in the subject of MMP, through the integration of formative instruments such as rubrics and checklists in simulated clinical scenarios, contributes to a more comprehensive and relevant education in the health sciences. The results of this study demonstrate that this strategy not only enhances academic performance but also strengthens students' motivation, confidence, and reflective capacity. Methodological triangulation confirmed the consistency of these findings, showing that the combination of written examinations, practical performance, and critical reflection increases the validity and reliability of the evaluative process.

Keywords

Educational Assessment, Medical Microbiology, Medical Parasitology, Clinical Simulation, Formative Assessment, Professional Competencies

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1. Introduction

At the global level, medical education faces the challenge of training professionals capable of responding to increasingly complex clinical scenarios. Evaluation, as an essential component of the educational process, has evolved from approaches focused solely on verifying knowledge to models that emphasize feedback, reflective practice, and the integration of competencies [1, 2]. In this context [3], international organizations and universities have promoted innovative methodologies aimed at ensuring the quality and relevance of health sciences education.

In Latin America and the Caribbean, the need to strengthen the teaching of basic subjects such as Medical Microbiology and Parasitology (MMP) is directly linked to the region's epidemiological challenges [4]. Evaluation in these disciplines must not only measure conceptual mastery but also assess the student's ability to apply knowledge in both simulated and real clinical situations [5]. However, traditional evaluative practices persist, limiting the comprehensive development of future professionals. This reality demands a critical review of the theoretical and methodological foundations that support evaluation [6, 7].

Asserted that, in the particular case of MMP, revaluing evaluation implies recognizing it as a formative process that enhances meaningful learning and the construction of clinical competencies [8].

The objective of this article is to analyze the theoretical and methodological foundations that enable the re-signification of evaluation in this discipline, proposing strategies that integrate scientific practice with professional training, and contribute to raising the educational quality of medical teaching.

2. Methodology

2.1. Methodological Approach

This study adopted a qualitative approach with quantitative elements, aimed at understanding evaluation as a formative process in the subject of MMP. An analytical-descriptive method was employed to identify the limitations of traditional models and to contrast them with innovative proposals grounded in clinical simulation and authentic assessment.

2.2. Research Design

A documentary and applied design were conducted.

- 1) Literature review: Scientific literature on evaluation in medical education was analyzed, with emphasis on constructivist approaches and simulation-based models.
- 2) Expert consultation: Theoretical and methodological foundations were validated through the judgment of specialists in Microbiology, Parasitology, and Medical Pedagogy.

- 3) Methodological triangulation: The integration of theoretical sources, teaching experiences, and outcomes from simulated practices was carried out to ensure validity and reliability.

3. Procedure

The process was implemented in three phases:

- 1) *Initial diagnosis*: Predominant evaluative practices in the subject were identified, along with their limitations.
- 2) *Instrument design*: Rubrics, checklists, and practical tests adapted to simulated clinical scenarios were developed.
- 3) *Implementation and analysis*: The instruments were applied in academic activities, data were collected, and a critical analysis of the results was conducted to assess the relevance of the proposal.

4. Results

4.1. Diagnostic Phase (Pre-test)

The initial diagnosis revealed that, out of a total of 60 students evaluated, 70% ($n = 42$) reported difficulties in applying theoretical knowledge to simulated clinical scenarios when only traditional written examinations were used. This finding confirmed the need to introduce more comprehensive instruments capable of assessing practical performance and professional attitudes (see Table 1).

4.2. Intervention Phase (Post-test)

Following the implementation of rubrics and checklists in simulated activities, a significant improvement was observed: 45 of the 60 students (75%) achieved positive outcomes in the assessment of clinical performance, demonstrating greater ability to integrate basic knowledge with problem-solving skills ($\chi^2 = 14.28$, $p = 0.001$). In addition, 48 participants (80%) emphasized the usefulness of continuous feedback in strengthening reflective learning.

4.3. Qualitative Analysis

Methodological triangulation corroborated that the combination of written examinations, practical performance, and critical reflection enhanced both the validity and reliability of the evaluation process. From a qualitative perspective, students expressed feeling more motivated and better prepared to face real clinical situations.

Table 1. Comparison of Results Obtained with Traditional and Innovative Evaluation Practices in Medical Microbiology and Parasitology Students

Aspect Evaluated	Traditional Practices	Innovative Practices
Type of instrument	Memorization-based written tests	Rubrics and checklists in simulated scenarios
Competencies assessed	Limited conceptual mastery	Knowledge, practical skills, and professional attitudes
Feedback	Scarce or nonexistent	Continuous and formative, oriented toward reflective learning
Quantitative results	70% with difficulties in practical application (n = 42)	75% with positive performance (n = 45)
Qualitative results	Low motivation and perceived usefulness	Greater motivation, comprehensive preparation, and confidence
Impact on training	Gap between theory and practice	Integration of knowledge and strengthening of clinical competencies

Source: Author's elaboration (2026).

4.4. Triangulation Analysis

Methodological triangulation, which integrated quantitative data (written examinations and performance rubrics) with qualitative data (student perceptions and faculty observation), allowed for the corroboration of the consistency of the findings. A convergence of 85% was observed between the quantitative results and the qualitative perceptions of the students. From a qualitative standpoint, participants reported feeling more motivated, more confident, and better prepared to face real clinical situations, thereby reinforcing the internal validity of the study.

5. Discussion

5.1. Interpretation of the Main Findings

This study demonstrated that the implementation of innovative evaluation instruments rubrics and checklists in simulated clinical scenarios significantly improved the performance of students in MMP. Whereas 70% of participants experienced difficulties in transferring theoretical knowledge to practical situations when assessed with traditional written tests, following the intervention 75% achieved positive clinical performance ($\chi^2 = 14.28, p = .001$). This change reflects not only a quantitative improvement but also a qualitative transformation in student perceptions, as 80% valued continuous feedback as a key factor in their reflective learning.

These findings confirm that traditional evaluation, focused on memorization and content reproduction, is insufficient to assess complex clinical competencies. As argue, the validity of an assessment system does not depend solely on the instrument but on the coherence between what is assessed and the

competencies intended to be developed. In this regard, the introduction of simulated scenarios and rubrics enabled the alignment of evaluation with the formative objectives of the subject, fostering genuine integration between theory and practice [9].

5.2. Comparison With Existing Literature

The findings of this study are consistent with previous research in health sciences education [10] demonstrated that clinical simulation, when accompanied by structured evaluation instruments, enhances knowledge retention and decision-making capacity in controlled environments. Similarly, in their systematic review of simulation in medical education, concluded that formative feedback is one of the components with the greatest impact on learning a result mirrored in our study, where 80% of students highlighted its usefulness [11].

In addition, the results align with the model of authentic assessment proposed [12], which argues that evaluative tasks should be as close as possible to real professional performance situations. The improvement observed in students' ability to solve simulated clinical problems suggests that authentic assessment not only measures learning but also promotes it, by providing opportunities to apply knowledge in meaningful contexts.

5.3. Contributions of Methodological Triangulation

The methodological triangulation employed in this study, which integrated quantitative data (written examinations and performance rubrics) with qualitative data (student perceptions and faculty observation), enabled the corroboration of the consistency of the findings. The 85% convergence between both data sources reinforces the internal validity of the

study and provides a more holistic understanding of the evaluative phenomenon. As argue, the combination of methods not only increases the credibility of the results but also allows for the identification of nuances that a single approach would overlook. [13].

In this case, quantitative data evidenced improvement in performance, while qualitative data revealed dimensions such as student motivation and confidence elements that are difficult to capture through standardized instruments. This methodological complementarity constitutes a strength of the study, although it also poses challenges in terms of time and resources for its implementation in educational contexts with institutional limitations.

5.4. Implications for Educational Practice

The results of this study have direct implications for teaching in the health sciences. First, they suggest that educational institutions should reconsider their evaluation systems, incorporating instruments that assess not only conceptual mastery but also procedural skills and professional attitudes, as required by the graduate profile in health-related programs.

Second, the improvement observed in student performance demonstrates that clinical simulation, accompanied by structured rubrics, constitutes an effective pedagogical strategy to reduce the gap between theory and practice. Therefore, it is recommended that programs in MMP, as well as basic sciences more broadly, progressively integrate simulated scenarios into their curricular activities, rather than limiting them to isolated events.

Third, continuous and formative feedback emerged as an essential component of the evaluation process. This implies that faculty should receive training not only in the design of instruments but also in strategies for providing effective feedback that fosters self-regulated learning.

Finally, these findings support the need to advance toward authentic, student-centered evaluation, where error is regarded as an opportunity for learning rather than as a penalty. This paradigm shift requires institutional commitment that includes time, resources, and pedagogical support for faculty.

5.5. Limitations of the Study

Despite the significant findings, this study presents limitations that must be considered when interpreting the results. First, the sample consisted of 60 students from a single educational institution, which restricts the generalization of the findings to other contexts with different characteristics. Future studies could replicate this methodology with larger and more diverse samples.

Second, the pre-experimental design (pre-test/post-test without a control group) does not allow for the establishment of a definitive causal relationship between the intervention and the observed improvement. Although methodological tri-

angulation strengthens internal validity, the absence of a comparison group represents a methodological limitation that must be acknowledged.

Third, the implementation of the intervention required considerable time for the design of rubrics, faculty training, and the organization of simulated scenarios. This investment of resources may not be feasible in institutions with limited infrastructure or personnel.

Finally, the measurement of student perceptions was conducted through self-administered instruments, which may be subject to social desirability bias. Future research could complement these data with external observations or more in-depth focus groups.

6. Conclusion

The revaluation of assessment in the subject of MMP, through the integration of formative instruments such as rubrics and checklists in simulated clinical scenarios, contributes to a more comprehensive and relevant education in the health sciences. The results of this study demonstrate that this strategy not only enhances academic performance but also strengthens students' motivation, confidence, and reflective capacity.

Methodological triangulation confirmed the consistency of these findings, showing that the combination of written examinations, practical performance, and critical reflection increases the validity and reliability of the evaluative process. Consequently, educational institutions are urged to adopt authentic assessment models that prepare future professionals to effectively meet the challenges of real clinical practice.

Beyond the local context, these findings contribute to the global debate on competency-based medical education, underscoring the importance of authentic, simulation-driven evaluation as a cornerstone for training health professionals capable of responding to complex clinical demands.

Abbreviations

MMP Medical Microbiology and Parasitology

Author Contributions

Rebeca Mabel Zayas Adasha: Conceptualization, Methodology, Validation, Visualization, Writing – original draft

Damasa Irene Lopez Santa Cruz: Data curation, Formal Analysis, Methodology, Supervision, Validation, Visualization Writing – original draft, Writing – review & editing

Adania Siva Guanche Martinez: Methodology, Supervision, Writing – original draft

Conflicts of Interest

The authors declare no conflicts of interest.

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