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Progress test in the undergraduate nursing course at a São Paulo public university: progressive knowledge gain reflects curricular characteristics

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Abstract

Background The Progress Test is a tool for evaluating student performance and diagnosing weaknesses in the teaching–learning process. This study aimed to evaluate the knowledge progression of nursing students throughout the course, through the application of the Progress Test (PT) in a public university in São Paulo.

Methods A cross-sectional study was conducted, using data from PTs applied to students in the years 2019, 2021, 2022, and 2023.

Results The results showed that there was a progression of knowledge throughout the course ($p < 0.001$), with significant gains in areas such as public health, health management, child health, and women's health. However, the performance of fourth-year students was lower than that of third-year students in 2019 ($p < 0.05$).

Conclusion It is concluded that PT is a useful tool for evaluating the knowledge progression of nursing students, but it is important to consider the possible causes of the lower performance of fourth-year students. The results of this study can be used to improve nursing education and adapt the curriculum to the needs of students.

Clinical trial number Not applicable.

Keywords Progress testing, Nursing, Educational measurement, Teaching, Academic performance

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Introduction

The Progress Test (PT), which includes multiple-choice questions, is employed by higher education institutions to assess students' cognitive performance, verify progression and continuity of knowledge gain in test areas, and diagnose curricular deficiencies [1–4]. Additionally, the PT is a feedback opportunity for students, teachers, and the institution it self [5–7].

The test results can be used to diagnose weaknesses in the teaching–learning process, and thus, encourage planning for possible adjustments to curricular components and the overall structure, such as curriculum restructuring [8–12]. Additionally, it can help identify performance patterns, both individual and collective, and enable the implementation of more targeted pedagogical interventions [8, 13].

The PT was developed during the early 1970s in the United States, at the University of Missouri School of Medicine, and in the Netherlands, at the University of Limburg in Maastricht [14, 15]. These universities pioneered the implementation of this innovative methodology of continuous assessment throughout the medical course. After consolidation in these countries, the PT was disseminated worldwide.

In Brazil, the PT was first employed during the 1990s, also in medical education [16]. Initially, the focus was on problem-based learning assessment to innovate the previously traditional assessment process. Currently, it is applied across different curriculum designs and has proven to be a useful tool for predicting student performance in external assessments and professional performance [17–19].

Today, PT is widely recognized as a tool that assesses the knowledge acquired by students, promotes continuous learning, and helps identify areas requiring academic training. Its worldwide implementation indicates the significance of integrated and dynamic assessment and tracking of students' progress [8, 19].

In Brazil, there were isolated experiences of the application of the PT in nursing courses [20]. Towards the end of 2018, the Consortium of São Paulo Nursing Courses for the PT was launched at the eight public universities in the state of São Paulo. The consortium's activities are structured as follows: planning; reviewing topics; distributing and requesting items; training teachers; preparing, receiving, selecting, and validating items; enrolling students; administering the test; and analysing and disseminating results [21].

Each institution nominated two participants to the group. In 2019, the first version of the PT was conducted with 120 questions, encompassing six major areas of knowledge: adult health, child health, women's health, mental health, collective health, and management.

The PT in nursing maintains the objectives discussed above for the undergraduate course in medicine. Additionally, it promotes integration among teaching institutions, encouraging debate on the quality of nursing education and enabling students to self-assess the acquired knowledge by monitoring their progress throughout the course. To date, the São Paulo State Consortium has conducted the PT four times: in 2019, 2021, 2022, and 2023 [22].

The systematic assessment of nursing education through TP provides valuable information for students, faculty, and academic management, enabling the identification of areas for improvement and the adaptation of pedagogical strategies. Its results can be directly applied in the classroom to enhance teaching methods, strengthen student learning, and support institutional decision-making [23].

Evaluating student performance is a fundamental aspect of the teaching–learning process in nursing courses. The Progress Test (PT) is a tool used to assess the knowledge progression of students throughout the course, identifying areas of knowledge in which students show greater or lesser progression. In Brazil, the PT has been used in medical courses, but its application in nursing courses is still limited. This study aimed to evaluate the knowledge progression of nursing students throughout the course, through the application of the PT in a public university in São Paulo. We believe that the results of this study can contribute to improving nursing education and adapting the curriculum to the needs of students.

Publications on the PT in nursing at national and levels remain scarce [23, 24]. No international studies have been analysed on the application of PT in nursing courses. Scientific production in this area should be stimulated, given the need for health courses, especially nursing, to reflect on the practice of care. This would enable institutions to evaluate the adequacy of their pedagogical projects to meet students' requirements. This study uniquely examines the PT's reflection of curriculum structure and knowledge progression in an undergraduate nursing course at a Brazilian public university, addressing a gap in longitudinal PT analysis in nursing education. This study aimed to evaluate the knowledge progression of nursing students throughout the course, through the application of the Progress Test (PT) in a public university in São Paulo.

Materials and methods

Study settings and design

This cross-sectional study is conducted in a city in the São Paulo State, with data drawn from the PTs administered to undergraduate nursing students in 2019 and from 2021 to 2023. The tests, conducted at eight nursing

schools in the São Paulo State, are designed to assess the level of final-year nursing students' expected knowledge. It is developed by a consortium of schools using original questions, thereby eliminating the need for translation.

On the day of the assessment, an attendance sheet is provided, listing all students alongside their personal identification documents for verification purposes. However, during the data tabulation and analysis phase, individual student names are not disclosed. Each participant is identified solely by a unique alphanumeric code, ensuring confidentiality and compliance with ethical research standards.

All the students at the eight schools simultaneously take the test, which contains 120 multiple-choice questions divided into six areas: public health (20 items), health management (15 items), children's health (20 items), women's health (20 items), adults' health (35 items), and mental health (10 items). This study utilized data from the 480 items administered in the tests in 2019, 2021, 2022, and 2023 (the test was not administered in 2020 owing to the COVID-19 pandemic).

The study was conducted by a public nursing school in a city in the São Paulo State, Brazil. The four-year nursing undergraduate course at this institution has 30 vacancies. Until 2022, the nursing course curriculum was disciplinary, divided into basic sciences in the 1st year and a part of the 2nd year, and applied sciences in the 2nd, 3rd, and early 4th years, with supervised curricular internship in the 4th year. Starting in 2023, the implementation of a new integrated curriculum began, guided by four professional competency areas: individual care, collective care, education and research, and management and administration, organized into curricular units. These educational purposes facilitate the gradual development of competency levels. In 2023, students in the 2nd, 3rd, and 4th years followed the existing curriculum, with only the 1st year enrolled in the new curriculum. Comparisons were made between consecutive academic years and between the same academic years across different calendar years (i.e., 2019 vs. 2021, 2019 vs. 2022, 2021 vs. 2022, and 2022 vs. 2023) for each knowledge area.

Inclusion and exclusion criteria

The participants were all students enrolled in the undergraduate nursing course at a public university in São Paulo in the years 2019, 2021, 2022, and 2023. Data were

collected through the PTs applied to students at the end of each academic year.

This database contains the averages of correct answers for each knowledge area by academic year. No information about individual students' performance was used. Besides, the test is not mandatory for all undergraduate students (~30 students per undergraduate level). However, the calculation of averages excludes the students' whose response pattern suggests casual correct answers (i.e., fewer than 25% of correct answers, which corresponds to ¼ choices for each item).

Ethical considerations

We dealt with secondary data and no individual was identified. Therefore, according to the national ethics guidelines for research, ethics committee approval was not necessary.

Statistical analysis

This study used a cross-sectional study to evaluate the knowledge progression of nursing students throughout the course. The data were analysed using the Shapiro-Wilk test to verify the normality of the distribution and analysis of variance (ANOVA) to compare student performance over time. The significance level adopted was 5%. The analysis was performed using the GraphPad v. 9.5.0 software (GraphPad Software Inc. San Diego, CA, USA).

Results

The PTs were conducted in 2019, 2021, 2022, and 2023. Over the four years studied, there existed a trend towards high student participation in the assessment, with a consistently high participation rate, reflecting low absenteeism (Table 1).

Notably, a numerical yearly progressive increase in the mean score occurred in the 2021 test. In 2019 and 2022, the mean scores showed a numerical increase across all academic years, except for the fourth year, which exhibited a decline. (Fig. 1). However, in 2021, a progressive and significant increase was observed across all academic series. Throughout the four years, a significant increase in the mean score repeatedly occurred from the second to the third academic years ($p < 0.0001$, $p = 0.048$, $p = 0.002$, and $p < 0.001$). Additionally, a significant increase from the first to the second year was observed in 2021 and 2022. In contrast, 2019 showed a statistically significant decrease from the third to the fourth year ($p = 0.038$).

Regarding the different content areas of the test, significant increases were observed from the second to the third series in public health, health management, children's health, and women's health. Adults' health, on the other hand, showed significant increases from the first to the second and from the second to the third academic

Table 1 Student participation in the progress test

	2019	2021	2022	2023
Enrolled	129	126	118	114
Attendance	114	122	107	105
Absent	15	4	11	9
% Participation	88,4	96,8	90,7	92,1

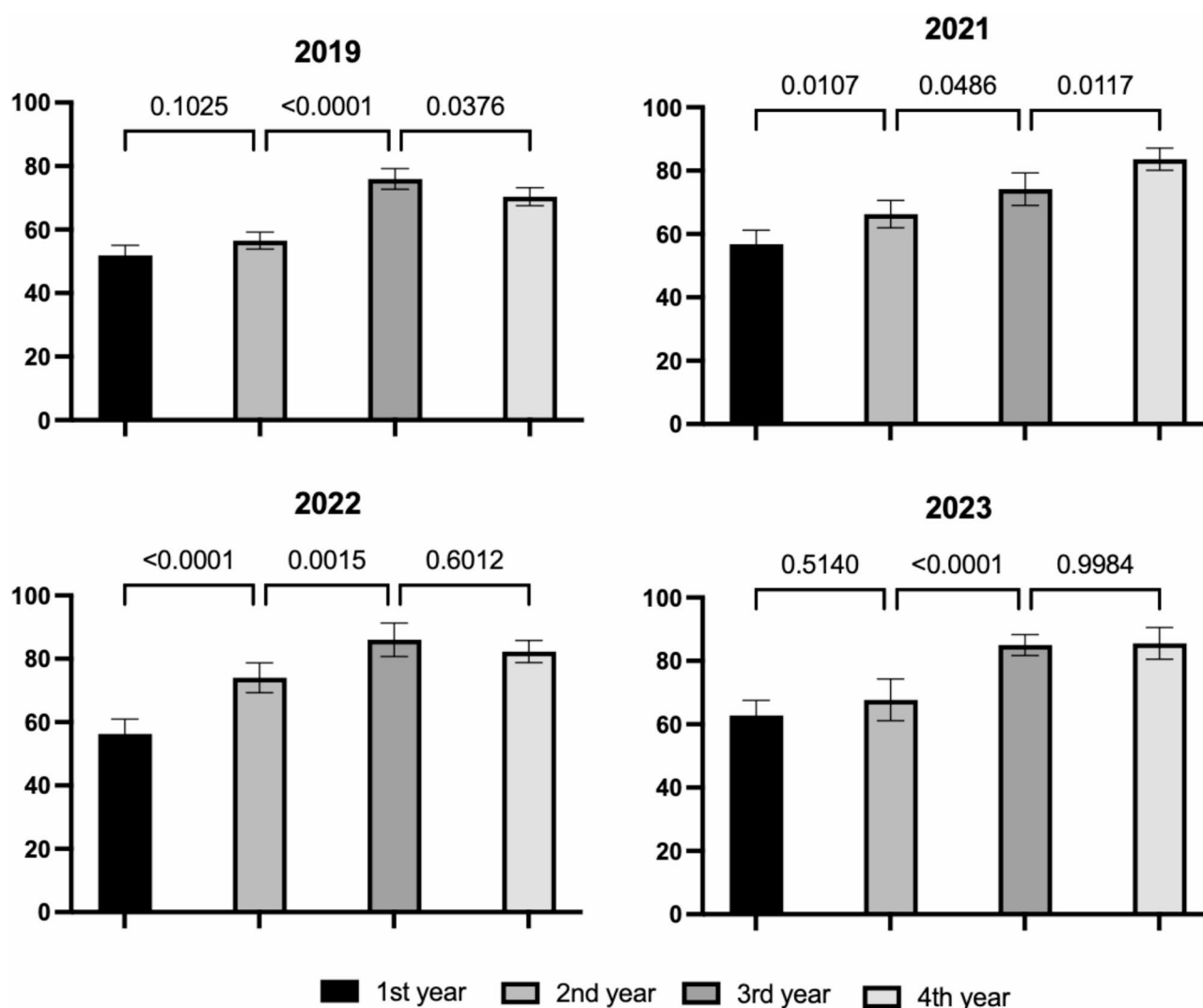


Fig. 1 Comparisons of mean scores across the undergraduate levels in the PTs of 2019, 2021, 2022, and 2023. The pairs of comparisons presented refer to subsequent undergraduate years only

series. Mental health presented a more variable pattern, with the most notable gains in the third series, though without statistical significance. Interestingly, these patterns remained consistent across the four observed years (Fig. 2). However, the decrease in the fourth series' mean score was evident in almost all six areas in both 2019 and 2023.

Finally, when comparing content areas across the four years, no significant changes were observed for public health and children's health. However, for health management, adults' health, and mental health, 2019 consistently showed the lowest scores for all academic years, whereas 2022 presented the highest scores, particularly in adults' health. Notably, for women's health, 2023 had the highest scores across all series, with a significant difference compared to 2019 (Fig. 3). It is still unclear which factors led

to the fluctuations in student performance growth and decline.

Discussion

The results of this study demonstrated a progression of knowledge among nursing students throughout the course, which is consistent with findings from other studies that employed the PT as an assessment tool [25–27]. The improved student performance observed in our study may be attributed to the presence of a teaching hospital affiliated with the university. This aligns with findings from previous research suggesting that professionals in teaching hospitals are more actively engaged in research and education, which contributes to more consistently updated knowledge [28].

However, the lower performance of fourth-year students in 2019 is a worrying finding that deserves a more

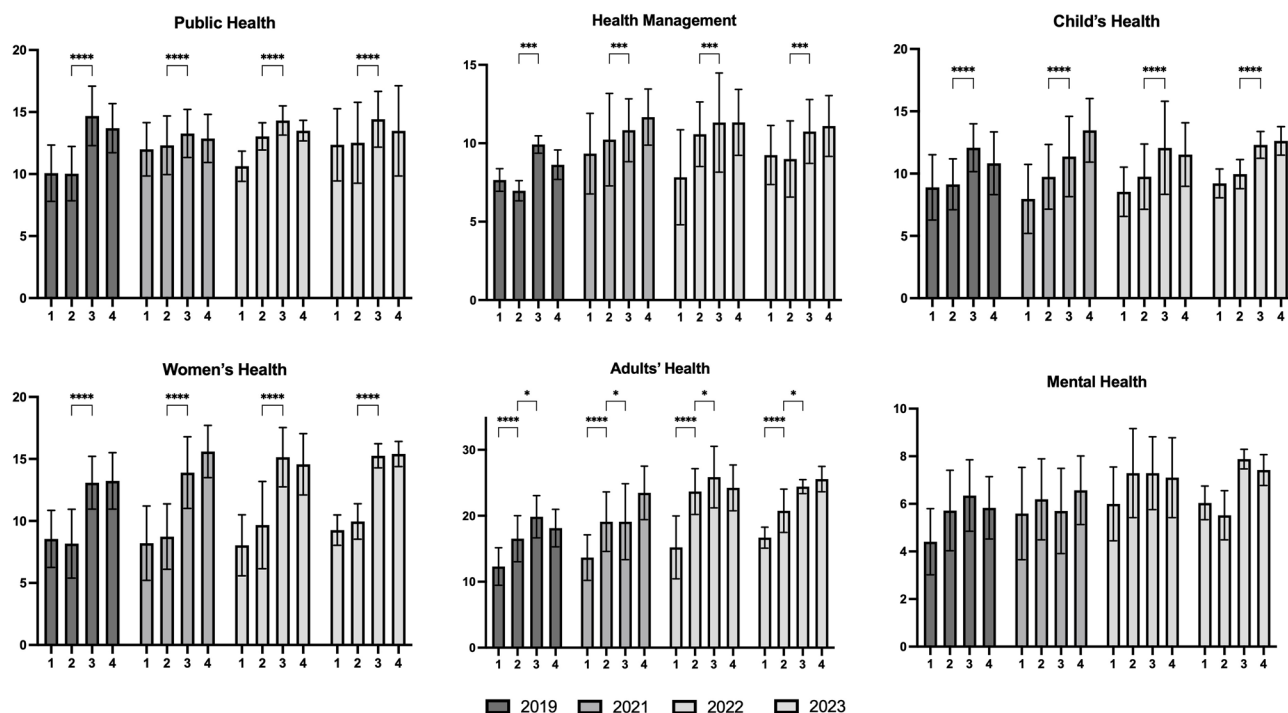


Fig. 2 Comparisons of mean scores according to knowledge areas (public health, health management, child's health, women's health, adults' health, and mental health) in the years 2019, 2021, 2022, and 2023. The pairs of comparisons refer to subsequent undergraduate levels. * $p < 0.05$, *** $p < 0.001$, **** $p < 0.0001$

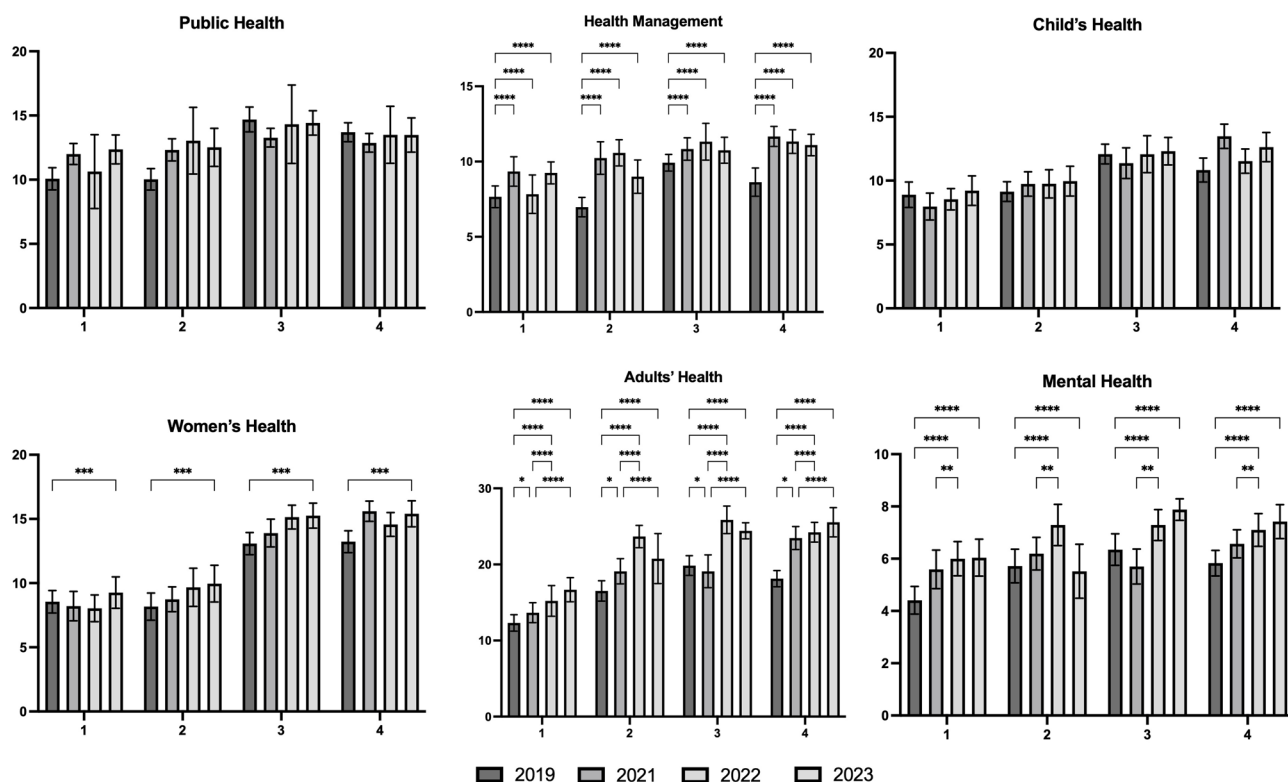


Fig. 3 Comparisons of mean scores according to knowledge areas (public health, health management, child health, women's health, adults' health, and mental health). In this case, the pairs of comparison refer to the same undergraduate levels across the years 2019, 2021, 2022, and 2023. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; **** $p < 0.0001$

in-depth analysis. In response, changes to the supervised curricular internship were implemented in 2020. These included the definition of a set of compulsory activities both in community health and in hospital care, as well as an increase in the number of meetings dedicated to discussing the cases experienced by students in practice settings. One possible explanation for this result is the lack of experience of teachers in preparing for the PT, which may have led to the preparation of questions that are inadequate for the level of knowledge of fourth-year students. Additionally, the intensive workload of internship activities may have hindered students' ability to study and review content effectively. The lack of integration between disciplines could have further contributed to difficulties in applying knowledge across different areas.

A systematic review identified that academic engagement, motivation and learning and teaching styles can impact academic development [29]. The results of this study have important implications for nursing education. It is essential that teachers are trained in the preparation of appropriate assessment instruments, and that the curriculum is revised to promote integration between disciplines. In addition, it is important that students have sufficient time to study and review the contents.

The fourth year is designed for professional practice of the students' choice, which could reduce access to generalist knowledge. A German study applied a PT to identify factors related to different performances and identified that the time since graduation and specialization were factors associated with different performances [28]. It cannot be said that our fourth year is a specialization. Nonetheless, by allowing students different and individualized experiences according to their preferences for practice scenarios, some effect may emerge, which could hinder the upward trend of the knowledge-gain curve. According to a systematic review, a key challenge during the supervised internship is the perceived gap between theoretical knowledge and practical application [30]. Furthermore, the fact that the fourth grade did not show an increase in performance may be related to the fact that at this point in the course they are immersed in practice and not as much in theory/practice as in the previous grades. Therefore, it is urgent to think of an effective strategy so that the student connects with theory at this point in practice, even with the implementation of a new curriculum.

Generally, there was a progressive gain in knowledge over the years (2019, 2021, to 2023) in the PT of an undergraduate nursing course at a public university in São Paulo—overall and by area of knowledge. Over the course of the four years, there was high student participation in the tests, with a consistently high participation rate, reflecting low absenteeism. Low absenteeism, especially during 2021 and 2023, may be related to factors

such as student engagement, the perceived relevance of the test, and the effectiveness of the strategies adopted by the institution to ensure participation in the TP. Analysing this data is fundamental for planning and implementing actions aimed at maintaining or even improving adherence to the test in future years.

In this process of teacher improvement in the preparation of the test, the study highlights the experience and good practice observed, underlining the importance of an organized process for the preparation of high-quality items. Monitoring the quality of tests and their psychometric indicators improves the assessment process, ensuring greater reliability of results over the years [31]. Furthermore, this process has been revealed as a development opportunity for teachers in the field of knowledge assessment. Strategies such as feedback for item writers and training workshops on good practices for designing multiple-choice items have proven useful in faculty development for knowledge assessment [32–34]. This suggests that the initial assumption is well-founded, as the unexpected result was not significantly repeated in subsequent editions of the PT.

In any case, it is necessary to extend the historical series of PT applications, as the consortium has had four editions to date. It is essential for the faculty to focus on the fourth year and verify the possible causes of the results shown in Fig. 1, in addition to the changes already made. A study examining the impact of the PT on licensing exam performance indicated that taking the test itself contributes to improving students' academic performance and guides the teaching–learning process [35].

Significant increases were recorded in several areas of assessment, especially in public health, health management, child health, and women's health, during the transition from the second to the third academic year. Subjects related to public health are introduced from the first year of the degree course, while health management, child health, and women's health are covered in the third year. This distribution may help explain the results obtained in the study.

Conversely, adult health and mental health showed notable increase from the first year to the second year, and these patterns remained consistent throughout the four years analysed. In the second year of the nursing course, students take two courses that focus on adult health. Meanwhile, the content related to mental health is covered transversally from the first year onwards; psychiatric illnesses are covered only in the third year. This structure of the curriculum may help to elucidate the results of the study.

A decrease in the fourth-year average score was noted in almost all the six areas for the years 2019 and 2023. When comparing the content areas over the four years, no significant changes were identified for public health,

child health, and women's health. This data underscores the importance of the nursing course evaluation process in this study, because via regular evaluations, the faculty can incorporate changes required to address areas of weakness. Thus, it reinforces the intention of the PT in evaluating students' knowledge gains, as well as serving as an academic management tool for implementing curricular improvements and identifying curricular strengths to maintain them [36].

It is noteworthy that in 2023 the nursing course in question began implementing a new curriculum based on the development of professional competencies divided into four areas of knowledge: individual care, collective care, education, and research and management. It was conducted by participatory methodologies to enhance contribution to the training for excellence for critical professionals committed to care [37]. It was possible to observe that the first year of 2023 performed well compared to the other first years. However, it is premature to make any comparison with the previous curriculum.

In this context, it is noteworthy that the results reflect the characteristics of the curriculum because the grades with the best performance in each area correspond to those in which the content of the area is addressed in greater depth during the test period. A similar effect was observed in a study that applied a cumulative deviation method and a trend for subdomains in the Dutch PT [38]. However, it is worth observing how this phenomenon will evolve with the implementation of the new integrated curriculum, in which the contents of the areas permeate all the undergraduate years.

Finally, the assessment of the PT conducted in the nursing course at a public University in the São Paulo State has proved to be helpful for monitoring academic progress, detecting areas of weakness in the curriculum, and identifying the potential of the nursing course. Additionally, it has enabled the students to self-monitor their development.

This study focused on just one course of those participating in the nursing PT and only four exams. Nonetheless, the analysis demonstrates the application of academic management based on the PT. This could facilitate consistent improvement in higher education.

This study presents some limitations. The analysis was conducted at a single public university, which may limit the generalization of the findings to other nursing programs. Additionally, the analysed period covers only four administrations of the PT, which may not be sufficient to capture long-term trends in students' knowledge development. The absence of data for the year 2020 may have also influenced the results, as the COVID-19 pandemic significantly impacted higher education, altering teaching and learning dynamics. Another relevant point is the potential influence of the curricular reform

implemented in 2023. Changes in the course structure may have impacted student performance, making it difficult to directly compare results across different years. The analysis considered year and knowledge area (two-factor ANOVA), but the aforementioned factors may have influenced the results.

Therefore, these limitations suggest that the results of this study should be interpreted with caution when extending them to other nursing programs or different national and international contexts. Future studies with broader samples, involving different institutions and longer timeframes, could offer a more comprehensive understanding of the effectiveness of the Progress Test in evaluating nursing education.

Conclusion

This study highlights the PT as a key tool for assessing student progress and guiding curriculum improvements. Significant knowledge gains were observed from 2019 to 2023, but challenges like the fourth-year performance drop in 2019 emerged. The findings informed targeted teaching adjustments, reinforcing the PT's role in curriculum management. Future studies with longitudinal designs should investigate the teaching-learning context in greater depth to identify factors influencing student performance on the PT, while also assessing the impact of the 2023 curriculum changes and expanding to multiple institutions for broader insights.

Abbreviations

PT Progress test

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-025-07346-w>.

Supplementary Material 1

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The study does not yet have acknowledgements.

Author contributions

RAA, JA and MTJ conceived the idea of study. FTR and DCMZ wrote the paper. PTHF performed statistical analysis. MTCD revised the manuscript. All authors reviewed the paper, gave final approval, and agreed to be accountable for all aspects of the work.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

According to Brazilian legislation, this type of research does not require IRB evaluation. Resolution no. 510, dated April 7, 2016, of the National Health Council [39], outlines the ethical guidelines for research in Human and Social Sciences, particularly for studies involving methodological procedures that utilize data obtained directly from participants, identifiable information, or pose risks beyond those encountered in daily life.

Article 1. This Resolution provides for the norms applicable to research in the fields of Human and Social Sciences involving methodological procedures that use data obtained directly from participants, identifiable information, or that may pose greater risks than those encountered in daily life, as defined in this Resolution.

Sole Paragraph. The following types of research will neither be registered nor evaluated by the CEP/CONEP system: V. Research using databases with aggregated information that do not allow individual identification. In our study, we dealt with secondary data from databases, and no students were identified.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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