

# Tuning Journal for Higher Education

Volume 12, Issue No. 1, June 2025

DOI: <https://doi.org/10.18543/tjhe1212025>

Generational differences in University Students:  
Challenges or opportunities?

## ARTICLES

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doi: <https://doi.org/10.18543/tjhe.3057>

Received: 21 May 2024  
Accepted: 28 February 2025  
E-published: June 2025

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# Determinants of the successful graduation of undergraduate students from a Peruvian university dental school over six years

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Accepted: 28 February 2025  
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**Abstract:** Terminal efficiency is an indicator that evaluates the productivity of a higher education institution and reflects a crucial aspect of the quality of its offered programmes. This study aimed to determine the successful graduation of undergraduate students from a dental school at a Peruvian university over six years, using the terminal efficiency indicator. The database was created using information

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**Acknowledgements:** Authors would like to thank the Facultad de Estomatología de la Universidad Peruana Cayetano Heredia (UPCH), Peru.

**Funding:** None.

**Conflict of interests:** None.

from the institutional repository of the Universidad Peruana Cayetano Heredia; graduates from 2017 to 2022 were selected, their data was downloaded, and statistical analyses were performed. Considering the graduates with documents to qualify for degrees and titles published in the institutional repository ( $n=291$ ), 70.10% ( $n=204$ ) of the graduates demonstrated a categorised terminal efficiency as “Up to 1 year”, with a mean terminal efficiency of 1.23 years ( $SD=0.78$ ). The analysis revealed a statistically significant association between the categorised terminal efficiency and the graduation year ( $p<0.001$ ). Furthermore, a statistically significant difference was observed when examining the mean terminal efficiency across different graduation years ( $p<0.001$ ). This study reveals a positive trend in the successful graduation of undergraduate students from a Peruvian university dental school, with a notable improvement in recent years.

**Keywords:** Education; efficiency; students; dental; universities.

## I. Introduction

Higher education plays a vital role in economic development through the provision of advanced knowledge, skills, and competencies beyond secondary education. Universities, as the primary delivery institutions of higher education, are crucial in training highly qualified professionals who contribute significantly to the labour market and, consequently, to national development. The efficiency of these educational institutions is largely determined by their ability to successfully graduate students (Hernández-Falcón, Vargas-Jiménez, and Almuiñas-Rivero 2020, 4).

The conceptual foundation of this study is grounded in established literature on educational efficiency and university trajectories. Terminal efficiency (TE) is an indicator used to evaluate the training activity and, to some extent, the success of a higher education institution, especially in terms of its performance as part of the educational system (Hernández-Falcón, Vargas-Jiménez, and Almuiñas-Rivero 2020, 5). In this context, TE is recognised as the main recommended indicator for evaluating the efficiency of a higher education institution (Hernández-Falcón et al. 2015, 57). However, since it has been calculated in different ways over time, it has given rise to a series of conceptualisations, including those described in the studies by Hernández-Falcón et al. 2020, which defines TE as a percentage proportion between the total number of graduates from a study programme and the total number of students who entered the study programme “ $n$ ” years earlier, where “ $n$ ” is the number of years proposed for the completion of said study programme; and Girano-Arévalo et al. 2021, which defines TE as the time that elapses from graduation from a university study programme until obtaining the corresponding professional title.

Although there is a great variation in the way TE is measured, it can be said that it is optimal when all students complete an academic programme within the established time and that it will not be when they do so over a longer period (Pérez-Reveles 2016, 136). This indicator is used by higher education institutions to measure their productivity and determine how well they are functioning; it also shows the achievements obtained by the educational institutions and reflects, in some way, the quality of the programs offered by the institution (Vanegas-Pissa and Sancho-Ugalde 2019).

The Peruvian higher education system has historically grappled with a myriad of challenges, particularly in the domains of quality assurance and regulatory oversight, prompting recent reforms aimed at establishing more rigorous standards, especially in the training of health science professionals (Asencio Aguedo et al. 2019, 9). Within this context, dentistry assumes a pivotal role in the nation's healthcare infrastructure, making substantial contributions to the prevention, diagnosis, and treatment of oral diseases that affect a significant proportion of the populace (Congreso de la República de Perú 2002). Nevertheless, the persistently high prevalence of dental caries, periodontal diseases, and edentulism across various age cohorts within the Peruvian population raises pertinent questions about the efficacy of current dental education programmes and the prioritisation of oral health within the broader public health agenda (Ministerio de Salud 2015; Ministerio de Salud 2017; Ministerio de Salud 2019). These epidemiological indicators suggest potential inadequacies in both the educational processes designed to produce competent dental surgeons and the establishment of public health priorities at a national level, thereby underscoring the pressing need for dental professionals who are not only technically proficient but also deeply committed to addressing the complex oral health needs of the population (Castillo, Palma, and Cabrera-Matta 2019).

Since 2014, with the approval of Law No. 30220 - University Law, the Peruvian higher education system has instituted a policy whereby the conferment of academic degrees and professional titles is conducted in strict adherence to the academic requirements delineated by individual universities within their respective internal regulations. The minimum prerequisites for attaining a professional title encompass two primary components: firstly, the prior acquisition of a bachelor's degree, and secondly, the successful defence of a thesis or the completion and approval of a professional sufficiency dissertation. Although universities with accreditation may establish additional modalities to those mentioned, and the professional title can only be obtained from the universities where the bachelor's degree was obtained (Congreso de la República de Perú 2014). Thus, within the current legal framework, the

Universidad Peruana Cayetano Heredia, for example, established in 2021 the following modalities for obtaining the professional title of dental surgeon: professional sufficiency dissertation, professional sufficiency exam, research, thesis and publication of original research (Universidad Peruana Cayetano Heredia 2021, 3).

Undergraduate academic programmes in dentistry in Peru are characterised by their comprehensive approach, combining a solid theoretical base with extensive clinical practice. Typically, these programmes span five to six years and have a curricular structure that usually comprises two years of basic and preclinical sciences, followed by three years of intensive clinical training, and culminates with a year of rural and hospital internship. This organisation allows students to progressively acquire the knowledge and skills necessary for their professional practice (Komabayashi et al. 2008, 342). Upon completion of the academic programme, the student graduates with a Bachelor's degree in Stomatology. Then, after the approval of a thesis or professional sufficiency dissertation, or through an additional modality in the case of the Universidad Peruana Cayetano Heredia, they obtain the Professional Title of Dental Surgeon (Komabayashi et al. 2008; Congreso de la República de Perú 2014; Universidad Peruana Cayetano Heredia 2021).

Students who have completed secondary education can access these dentistry programmes through a rigorous selection process, which generally includes an admission exam and, in some cases, the assessment of academic performance in a pre-university study centre. This selectivity seeks to ensure that admitted students have the necessary aptitudes to face the demands of the programme (Komabayashi et al. 2008, 342). Regarding financing, undergraduate dentistry students in Peru have various options available. These include government scholarship programmes such as Beca 18, educational credits offered by government institutions, and self-financing, which promote equity in access to higher education in private and public universities (Komabayashi et al. 2008; Guzmán Centeno 2024). Enrolment in dental schools or faculties of public universities is free; however, an investment is required for the purchase of educational materials, as well as dental supplies and instruments necessary for theoretical and practical academic activities. In private universities, such as the Universidad Peruana Cayetano Heredia, the costs of enrolment and fees per semester or academic year vary, reaching approximate figures of \$10,000 per year (Komabayashi et al. 2008, 342).

Thus, these academic programmes are oriented towards developing technical and behavioural competencies that aim to train professionals

capable of preventing, diagnosing and effectively treating the most common pathologies of the stomatognathic system, implementing oral health promotion strategies, conducting research that contributes to the advancement of the discipline, and managing dental services efficiently and ethically (Ministerio de Salud 2023). To achieve these objectives, many Peruvian universities invest in modern infrastructure, including laboratories, simulation equipment and public care clinics. This investment in resources and infrastructure is fundamental to provide students with the necessary tools and experiences for their professional development (Komabayashi et al. 2008, 342).

The university journey that a student or a group of students from the same cohort undertakes, from admission to the completion of their university studies, is called the university trajectory. This concept is associated with the monitoring that higher education institutions carry out on the academic performance of their students, including metrics such as approvals and failures. This monitoring allows universities to evaluate various indicators, thus facilitating informed decision-making through effective planning (González-Tirado et al. 2019, 2).

The university trajectory has been the subject of extensive research from both the perspective of the educational system and that of the student. However, despite the various approaches to this topic, special attention has been paid to issues such as university dropout rates, additional time required to complete university programmes, the use of ineffective study techniques, among other factors. While studies that focus specifically on university graduation, or research aimed at determining whether students successfully obtain their professional titles, are relatively less common (Petric 2019, 62).

It is known that planning is of utmost importance for any higher education institution, as it ensures the fulfilment of institutional objectives. In this way, effective planning involves the evaluation of various indicators that demonstrate the functioning of the educational system and provide information on the state of the teaching-learning process. This includes the evaluation of university plans and programmes, educational infrastructure and other related factors (González-Tirado et al. 2019, 3). Thus, the terminal efficiency indicator is used to evaluate university phenomena and attempt to measure the completion of academic programmes within the time suggested by the university curriculum (Petric 2019, 65).

Graduation from a university programme occurs when an enrolled student accumulates the total credits required by the curriculum and qualifies as a graduate (Román-Gálvez 2023, 2). This status is achieved even if the student has not yet met all the requirements to obtain a degree or a professional

title (González-Tirado et al. 2019, 3). Studies conducted in different countries indicate that many students who complete their university programmes do not obtain a professional title due to a series of factors. These factors include the students' prior academic preparation, the quality of teaching and available educational resources, socioeconomic and personal factors of the students, and the complexity and demands of the academic programme. Understanding these factors is essential to develop strategies that improve student retention and academic success (Millo and González 2016, 42).

Successful graduation can be defined as the achievement of all academic and administrative requirements established by an educational programme within the expected or reasonable time frame, as determined by the curricular structure. This achievement reflects both the student's academic preparation and the programme's efficiency in supporting progress towards obtaining a professional title (Hernández-Falcón, Vargas-Jiménez, and Almuñías-Rivero 2020; González-Tirado et al. 2019).

In the case of dentistry, TE has significant implications not only for educational institutions but also for the health system and society in general (Komabayashi et al. 2008). High TE rates suggests that the programme is effective in training professionals, while low rates may indicate the need for interventions to improve the educational process (Pérez-Reveles 2016, 136).

The importance of TE in quality assurance is evidenced by its inclusion in evaluation guidelines across regional accreditation agencies. However, there remains a lack of clarity in defining this concept, which implicitly refers to a quantitative estimation (Herrera et al. 2024). Despite the importance of this indicator, there is a scarcity of updated studies on successful graduation, using the TE, in dentistry programmes in Peru (Girano-Arévalo et al. 2021). This lack of information hinders informed decision-making to improve educational quality and resource planning in the sector. Thus, it is recognised that obtaining professional titles on time is essential, as prolonged delays can harm graduates' employment opportunities and financial security. Therefore, higher education institutions have a great responsibility in optimising the processes that lead to obtaining a professional title. This includes providing adequate academic support, reducing bureaucratic obstacles, and offering guidance to help students meet requirements efficiently.

In this context, the institution's ability to facilitate the process of obtaining a professional title effectively is a critical measure of its overall performance and commitment to student success. In the same vein, the present study seeks to fill this gap by aiming to determine the successful graduation of undergraduate students from a dental school at a Peruvian university over six years, using the terminal efficiency indicator.

## II. Materials and methods

### II.1. Study design and population

This cross-sectional study analysed records of undergraduate students from the Dental School of the Universidad Peruana Cayetano Heredia (UPCH) between 2017 and 2022. This timeframe was selected to provide a comprehensive six-year analysis period, following established methodologies from previous studies in dental education (Girano-Arévalo et al. 2021; Carrizales-Poma et al. 2024). The study population comprised all undergraduate dental students who met the inclusion criteria, eliminating potential selection bias that might arise from sampling.

The inclusion criteria were precisely defined to ensure the quality and relevance of the analysed data. Records of all students enrolled in the UPCH's dental academic programme between 2017 and 2022 were included, provided they contained complete information on their current academic status (graduated, or not graduated), and, for students who completed the programme, the graduation date. It is important to note that, due to the public nature of the information used, personal student data such as date of birth, previous educational institution, or other similar details were not accessible.

On the other hand, exclusion criteria were established to ensure the integrity and consistency of the analysed data. Records with incomplete or inconsistent information in any of the fields mentioned in the inclusion criteria were excluded. Additionally, records of exchange students or those who transferred from another university during the study period were not considered, as their academic trajectories might not be representative of the typical experience in UPCH's dental academic programme.

### II.2. Variables

The present research considered publication in the UPCH institutional repository as qualitative variable and terminal efficiency as both quantitative and qualitative variables. This metric was selected as a key indicator of successful programme completion, consistent with previous research in dental education (Girano-Arévalo et al. 2021; Carrizales-Poma et al. 2024). Additionally, several covariables were examined, including graduation year, type of document to qualify for degrees and titles, modality for obtaining the professional title of dental surgeon and sex.

Publication in the UPCH institutional repository, as a qualitative variable, comprised two categories: “No”, when the document to qualify for degrees and titles was not published at the UPCH institutional repository and “Yes”,



when the document to qualify for degrees and titles was published at the UPCH institutional repository. Terminal efficiency (TE), as a quantitative variable, was calculated as the difference in years between the year of submission of the document to qualify for degrees and titles, verified by publication in the UPCH institutional repository, and the graduation year. As a qualitative variable, TE was categorised as “Up to 1 year”, when the TE was less than or equal to 1 and “2 years and older”, when the TE was greater than or equal to 2. The study period spanned from the first graduate of 2017 to the last graduate of 2022.

Graduation year, a quantitative variable, indicated the year of programme completion at the UPCH Dental School. The type of document to qualify for degrees and titles, a qualitative variable, was categorised as “Individual”, when the document to qualify for degrees and titles was prepared by only one university dental school undergraduate student and “Collective”, when the document to qualify for degrees and titles was prepared by two or more university dental school undergraduate students.

The modality for obtaining the professional title of dental surgeon refers to the various mechanisms through which the students who have completed the university study programme can obtain their professional title, as a qualitative variable, included several categories as per UPCH regulations. These categories encompass the “professional sufficiency dissertation”, an in-service teaching program through which the bachelor demonstrates the graduation competencies acquired throughout the career in a practical way; the “professional sufficiency exam”, an exam by which the bachelor demonstrates the professional competences acquired during studies in a theoretical and practical way; “research”, a work of an academic nature, through which the graduate must demonstrate that he/she has a general domain of the central aspects developed in the curriculum; “thesis”, a work that aims to evaluate and quantify professional competencies within a particular scholarly domain or discipline, it specifically focuses on areas where a knowledge deficit or a practical requirement for professional practice has been identified, thereby addressing crucial gaps in the field; and “publication of original research”, which refers to an original research developed by students with the participation of a university professor that has been accepted for publication or published in an indexed scientific journal (Universidad Peruana Cayetano Heredia 2021, 4-7).

Sex, a qualitative variable, denoted the biological and physiological characteristics of university dental school undergraduate students, categorised as “Man” or “Woman”.

### *II.3. Statistics*

The database was constructed using information obtained from the UPCH Dental School and the UPCH institutional repository. Descriptive analysis was employed to calculate absolute and relative frequencies, whilst associations were assessed using the Chi-square statistical test. In conducting the bivariate analysis, to evaluate whether the data followed a normal distribution, the Kolmogorov-Smirnov test was applied, ensuring the appropriateness of subsequent statistical analyses according to the distribution characteristics. Subsequently, the nonparametric Mann Whitney U and Kruskal Wallis tests were applied as appropriate. These were complemented by relevant post hoc analyses to further elucidate significant findings and explore specific group differences within the dataset. The study adhered to a 95% confidence level, with statistical significance being identified through the application of a p-value threshold of less than 0.05. All statistical analyses were performed using the Stata v. 18.0 software package.

### *II.4. Ethics*

Prior to commencing the administrative processes, approval was obtained from the UPCH Integrated Unit of Research, Science and Technology Management of the Schools of Medicine, Dentistry, and Nursing. The study was conducted in strict accordance with the ethical principles set forth in the Declaration of Helsinki and received formal approval from the Institutional Research Ethics Committee at UPCH (ethics file CONSTANCIA-CIEI-427-39-23, approved on 2 October 2023). It is important to note that the data were published in the UPCH institutional repository. All records were coded to ensure anonymity, this approach guaranteed the confidentiality of the information whilst allowing for comprehensive analysis of the data.

## **III. Results**

Between 2017 and 2022, 86.87% of students (n=291 graduates) from a Peruvian university dental school published some type of document in the institutional repository to qualify for degrees and titles. In 2017, 100% of the students (n=59) complied with repository publication, whilst 2022 saw the lowest percentage, with only 47.83% (n=22) publishing. The 92.10% (n=268) of graduates prepared some type of document to qualify for degrees and titles collectively, whilst 7.90% (n=23) did so individually. For professional title obtainment, 72.16% (n=210) choose research, with professional sufficiency dissertation being the least adopted modality with 2.41% (n=7). Among graduates, 254 were women, of whom 87.40% (n=222)

published some document to qualify for degrees and titles in the institutional repository. Of the male graduates (n=81), 85.19% (n=69) also published. A statistically significant association was found between the publication of some document to qualify for degrees and titles in the institutional repository and graduation year (p<0.001) (Table 1).

**Table 1**  
Peruvian university dental school undergraduate students over six years, with publication in the institutional repository of documents to qualify for degrees and titles

Variables	n	%	Publication in the institutional repository					p*
			No		Yes			
			n	%	n	%		
Total	335	100.00	44	13.13	291	86.87		
Graduation year								
2017	59	17.61	0	0.00	59	100.00	<0.001	
2018	56	16.72	2	3.57	54	96.43		
2019	67	20.00	4	5.97	63	94.03		
2020	55	16.42	7	12.73	48	87.27		
2021	52	15.52	7	13.46	45	86.54		
2022	46	13.73	24	52.17	22	47.83		
Type of document to qualify for degrees and titles								
Individual	23	7.90	0	0.00	23	7.90	-	
Collective	268	92.10	0	0.00	268	92.10		
Modality for obtaining the professional title								
Research	210	72.16	0	0.00	210	72.16	-	
Thesis	64	21.99	0	0.00	64	21.99		
Professional sufficiency dissertation	7	2.41	0	0.00	7	2.41		
Publication of original research	10	3.44	0	0.00	10	3.44		
Sex								
Man	81	24.18	12	14.81	69	85.19	0.607	
Woman	254	75.82	32	12.60	222	87.40		

n: Absolute frequency. %: Relative frequency. p: Statistical significance.

\* Chi-square test.

**Table 2**  
Categorised terminal efficiency of Peruvian university dental school undergraduate students over six years

Variables		Terminal efficiency (Categorised)					
		Up to 1 year		2 years and older		p*	
		n	%	n	%		
Total		204	70.10	87	29.90		
Graduation year							
	2017	58	98.31	1	1.69	<0.001	
	2018	45	83.33	9	16.67		
	2019	31	49.21	32	50.79		
	2020	24	50.00	24	50.00		
	2021	24	53.33	21	46.67		
	2022	22	100.00	0	0.00		
Type of document to qualify for degrees and titles							
	Individual	19	82.61	4	17.39	0.172	
	Collective	185	69.03	83	30.97		
Modality for obtaining the professional title							
	Research	151	71.90	59	28.10	0.433	
	Thesis	41	64.06	23	35.94		
	Professional sufficiency dissertation	6	85.71	1	14.29		
	Publication of original research	6	60.00	4	40.00		
Sex							
	Man	44	63.77	25	36.23	0.188	
	Woman	160	72.07	62	27.93		

n: Absolute frequency. %: Relative frequency. p: Statistical significance.

\* Chi-square test.

Considering only the graduates with some document for the qualification of degrees and titles published in the institutional repository, 70.10% (n=204) presented a categorised terminal efficiency (TE) of “up to 1 year”. In 2022, 100.00% (n=22) of graduates achieved this TE, whilst 2019 saw the lowest percentage at 49.21% (n=31). Among graduates who collectively prepared some document to qualify for degrees and titles, 69.03% (n=185) had a TE of

“up to 1 year”, compared to 82.61% (n=19) of those who worked individually. Research, as a modality for obtaining the professional title, presented the highest percentage of TE of “up to 1 year” at 71.90% (n=151), whilst publication of original research showed the lowest at 60.00% (n=6). Of female graduates with some document published in the institutional repository (n=222), 72.07% (n=160) had a TE of “up to 1 year”, compared to 63.77% (n=44) of male graduates (n=69). A statistically significant association was identified between categorised TE and graduation year ( $p<0.001$ ) (Table 2).

The mean TE of graduates between 2017 and 2022 was 1.23 years ( $SD=0.78$ ). The year 2022 recorded the lowest mean TE at 0.55 years ( $SD=0.74$ ), whilst 2020 presented the highest at 1.60 years ( $SD=0.68$ ). Graduates who published some documents individually in the repository had a mean TE of 1.13 years ( $SD=0.81$ ), compared to 1.24 years ( $SD=0.77$ ) for those publishing collectively. The professional sufficiency dissertation modality showed the lowest mean TE at 1.14 years ( $SD=0.38$ ), whilst the thesis had the highest mean TE at 1.27 years ( $SD=0.78$ ). Female graduates with some documents published in the institutional repository to qualify for degrees and titles presented a mean TE of 1.21 years ( $SD=0.76$ ), compared to 1.28 years ( $SD=0.82$ ) for male graduates. Upon analysis, a statistically significant difference became evident when examining the graduation year. Specifically, the mean TE in 2022 exhibited a statistically significant difference compared to the preceding years ( $p<0.001$ ) (Table 3).

**Table 3**  
Terminal efficiency in years of Peruvian university dental school undergraduate students over six years

Variables		Terminal efficiency (In years)		
		X	SD	p
Total		1.23	0.78	
Graduation year				
	2017	1.02abcd	0.13	<0.001*
	2018	1.09efg	0.73	
	2019	1.44aeh	1.01	
	2020	1.60bfi	0.68	
	2021	1.29cj	0.76	
	2022	0.55dghij	0.74	

Variables		Terminal efficiency (In years)		
		X	SD	p
Type of document to qualify for degrees and titles				
	Individual	1.13	0.81	0.422**
	Collective	1.24	0.77	
Modality for obtaining the professional title				
	Research	1.22	0.78	0.903*
	Thesis	1.27	0.78	
	Professional sufficiency dissertation	1.14	0.38	
	Publication of original research	1.20	1.03	
Sex				
	Man	1.28	0.82	0.492**
	Woman	1.21	0.76	

X: Mean. SD: Standard deviation. p: Statistical significance.

\* Kruskal-Wallis test; post hoc Mann Whitney U test, same letters show statistically significant difference ( $p < 0.05$ ).

\*\* Mann Whitney U test.

## IV. Discussion

The findings of this study reveal notable patterns in terminal efficiency (TE) at the Dental School of Universidad Peruana Cayetano Heredia, with a mean TE of 1.23 years and a marked improvement trend culminating in an optimal value of 0.55 years in 2022. These results demonstrate a more favourable outcome compared to previous studies in Peru, such as that conducted by Girano-Arévalo et al. (2021), which reported a mean TE of 1.67 years.

The observed fluctuations in TE rates, particularly the decline between 2018 and 2020, can be attributed to multiple factors, including institutional preparations for the National System for Evaluation, Accreditation and Certification of Educational Quality (SINEACE) accreditation and the unprecedented impact of the coronavirus disease (COVID-19) pandemic. This period coincided with restrictions in modalities for obtaining the professional title and disruptions to clinical practices and research activities, which inherently affected graduation timeframes (Liu and You-Hsien Lin

2021). The subsequent improvement in TE rates, especially the marked enhancement in 2022, suggests the effectiveness of institutional adaptations and potentially reflects the positive influence of technological innovations implemented during the pandemic period.

The relationship between TE and educational quality merits careful consideration. As Herrera et al. (2024) emphasise, high TE rates alone do not necessarily indicate educational quality, nor do lower rates automatically suggest poor quality. Rather, TE serves as a valuable tool for academic monitoring and institutional improvement, encompassing both quantitative and qualitative aspects of educational delivery. This perspective aligns with contemporary approaches to higher education assessment, where TE is viewed as one component within a broader framework of quality indicators.

In the context of accreditation, the findings gain additional significance. Latin American accreditation systems, including Peru's SINEACE, incorporate diverse quality indicators that reflect both institutional effectiveness and societal impact (Carvalho and Malavasi 2020). The improvement in TE rates at our institution coincides with successful accreditation efforts, suggesting effective alignment between institutional practices and quality standards. However, as Duarte and Vardasca (2023) note, accreditation approaches vary significantly across regions, emphasising the importance of contextualising performance metrics within local educational frameworks whilst maintaining international standards.

The absence of significant differences in TE across various parameters—including individual versus collective work, different modalities for obtaining the professional title, and student gender—suggests that other factors may more substantially influence graduation timing. This observation aligns with Millo and González's (2016) findings regarding the complex interplay of individual and institutional factors affecting degree completion. These factors may include socioeconomic circumstances, academic support structures, and institutional processes, aspects that warrant further investigation.

The study's limitations, particularly regarding the use of aggregated data, echo concerns raised by Herrera et al. (2024) about the traditional approach to TE calculation. The inability to control for individual variables that significantly impact TE calculations suggests the need for more nuanced evaluation methods. Future research would benefit from incorporating individualised data and considering additional variables that might influence graduation timing.

The substantial improvement in TE observed in 2022 deserves particular attention within the broader context of institutional quality assurance. As

Gerón-Piñón et al. (2021) argue, such indicators are crucial for improving educational quality and achieving accreditation standards. The positive trend in our institution's TE rates may reflect successful implementation of quality improvement initiatives, though sustained monitoring is necessary to confirm this trend's stability.

The implications of this study extend beyond mere statistical analysis. As emphasised by Herrera et al. (2024), TE should be viewed as an instrument for academic monitoring and improvement rather than solely as a quality metric. This perspective suggests that institutions should investigate not only their TE rates but also the underlying factors affecting these outcomes, regardless of whether the quantitative measures appear satisfactory.

For dental education specifically, our findings contribute to the broader understanding of professional training efficiency in health sciences. The improvement in TE rates suggests successful adaptation to changing educational demands whilst maintaining academic standards. However, as Liu and You-Hsien Lin (2021) note, professional training extends beyond knowledge transmission to include research capabilities and scientific competencies, aspects that may influence the time required for degree completion.

Future research should address the current study's limitations by incorporating more detailed individual student data and examining additional variables that might influence TE. This could include socioeconomic factors, previous academic preparation, and specific institutional interventions, providing a more comprehensive understanding of the factors affecting successful graduation in dental education.

## V. Conclusion

This study demonstrates a positive trajectory in the successful graduation of undergraduate students from a Peruvian university dental school, with marked improvement observed in recent years. These findings highlight the critical importance of continuous terminal efficiency (TE) indicator monitoring as a fundamental measure of dental education programme quality and productivity.

The results yield significant practical implications for university management and curriculum development. Educational institutions would benefit from implementing analogous monitoring systems to identify areas requiring enhancement and evaluate the effectiveness of educational interventions. Furthermore, increased attention should be directed towards factors potentially influencing TE, including academic programme structure, student support mechanisms and institutional resources.



This research contributes meaningfully to the existing knowledge base regarding dental education in Peru and Latin America, offering valuable insights into TE and its potential determinants. However, it also underscores the necessity for more comprehensive investigations exploring these determinants and assessing the efficacy of specific interventions aimed at improving TE indicator.

Several recommendations emerge from this study. First, future research should employ mixed-methods approaches, combining robust quantitative analyses with qualitative investigations to capture the perspectives and experiences of both students and academic staff. Second, longitudinal studies incorporating dropout and academic delay indicators are essential for developing a comprehensive understanding of programme performance. Third, comparative analyses between institutions and academic programmes are recommended to identify best practices and facilitate knowledge exchange.

Additionally, future investigations should consider either extending data collection periods to increase sample sizes for less common modalities or focusing analyses on primary modalities with more balanced sample distributions. The incorporation of qualitative methodologies would provide deeper insights into factors influencing TE rates.

Ultimately, enhancing successful graduation rates, as reflected in favourable TE indicator rates, should be recognised as a crucial component of educational quality in health sciences. This has direct implications for the training of competent professionals and the optimisation of educational resources. The sustained commitment to evaluating and improving this indicator will not only benefit higher education institutions and their students but will also contribute to strengthening healthcare systems through the timely and efficient preparation of qualified professionals.

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