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Results and Discussion in Scientific Articles as a Graduation Format: A Descriptive Study

Resultados Y Discusión En Los Artículos Científicos Como Forma De Titulación: Un Estudio Descriptivo

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Abstract

The experience in collaborating and developing legal research within the undergraduate program in Law at Universidad Regional Autónoma de los Andes, as well as the interaction with the academic advisors and evaluators of thesis works, prompts reflection on the structure, content, and arguments in the specific context of the scientific articles presented in accordance with the methodology accepted by the program. In this research, a descriptive document analysis is conducted, based on a sample of 96 scientific articles that have been defended as part of the graduation process in the field of Law. Since its implementation in 2017, an evaluation of compliance with the requirements and structure of these articles, with a particular focus on the sections related to results and discussion, has been carried out. These articles serve as practical examples of the research competencies acquired through formative research and as prospective generators of both formative and generative research. A critical examination of these aspects is undertaken, and strategic measures for improvement are considered in collaboration with the thesis advisors and evaluators of this graduation format.

Keywords: Scientific paper; graduation formats; results; discussion; IMRyD methodology.

Resumen

La experiencia en la colaboración y desarrollo de las investigaciones jurídicas, en el pregrado de la carrera de Derecho de la Universidad Regional Autónoma de los Andes, y la interacción con los docentes tutores y evaluadores de los trabajos de titulación, hacen reflexionar sobre la estructura, contenidos y argumentos en la particularidad de los artículos científicos presentados, en los acápite referidos a los resultados y discusión, de la metodología aceptada por la carrera. En la presente investigación se realiza un estudio documental descriptivo, a partir de una muestra de 96 artículos científicos que se han defendido como forma de titulación en la carrera de Derecho. A partir de la implementación de esta en 2017, haciendo una valoración del cumplimiento de los requisitos y estructura de estos, en especial lo referido a las secciones de resultados y discusión, como muestras prácticas de las competencias investigativas logradas desde la investigación formativa, y como generadores

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prospectivos de las investigaciones formativa y generativa. Se realiza un estudio crítico sobre lo anterior y se reflexiona sobre acciones estratégicas de mejoras con los tutores y evaluadores de esta forma de titulación.

Palabras Clave: *Artículo científico; formas de titulación; resultados; discusión; metodología IMRyD.*

Introduction

The evolution of graduation formats in undergraduate programs within Ecuadorian higher education institutions has traversed a path from free choice in their definition and types to the imposition of specific formats mandated by the Council of Higher Education (CES). It has also included the establishment of certain standards emphasizing the significance of theory and practice, as well as the interaction between academia and research.

In the most recent Academic Regime Regulations approved by the CES, it is explicitly stated that "Each IES (Higher Education Institution) will determine, in its internal regulations, the requirements for graduation and the options for their approval" (Council of Higher Education of Ecuador, 2022). This grants full autonomy to universities in determining the forms or options for graduation, bearing in mind that the curricula approved before this regulation will apply the provisions of the previous and current academic regime regulations for graduation.

This is the case with the curricula in place at Universidad Regional Autónoma de los Andes (UNIANDES) during the period from 2017 to 2022. They adhere to the guidelines outlined in the Graduation Instructions of 2017 (UNIANDES, 2017) and 2021 (UNIANDES, 2021), which include the scientific article as a form of graduation.

In the specific case of UNIANDES, regarding the recommendations provided for the sections on results and discussion in scientific articles, (Gomez Armijos et al., 2017) emphasize the following elements:

- For results: there is a strong emphasis on the logical presentation of results based on the main findings, presenting them from both quantitative and qualitative perspectives that stem from the methodology. This should avoid the duplication of data and results through various avenues.
- For discussion: the results are interpreted by making comparisons with previous studies and identifying barriers, advantages, and contributions. Key findings and their implications for the field of study are summarized.

Scientific writing, as the communicative vehicle for research, is how their contributions are conveyed, and it stands as one of the most critical aspects for acceptance and publication in global and regional impact articles. (Abreu et al., 2020)

Arnaiz, Arias, Galarza, and Matos (2020), concerned about the main deficiencies found in texts written by undergraduate students, argue that these texts should define clear, specific, and argumentative knowledge. However, the relationship between content and form is not yet sufficiently consolidated, given the rigor demanded by scientific articles. This highlights one of the argumentative components of scientific communication in presenting research results for undergraduate graduation.

In the development of research competencies in the technical, methodological, and social dimensions, which include the communication and discussion of research results from the undergraduate students of the Law program, progress is observed. However, the barriers to

social interaction are more frequent (Velazquez et al., 2022). This indicates the deficiencies that students may later encounter in the development of their graduation projects at the end of their academic careers.

This social interaction in the communication of results is further complicated by the fact that the article, as a form of graduation, involves scientific writing. This scientific writing must ensure the possibility of publication, emphasizing the quality and originality of research results and their alignment with the learning outcomes contained in the professional profile. This encourages the elevation of formative research to the highest level (Gomez Armijos et al., 2017; Ricardo Velázquez, 2017).

On the other hand, in a study on the scientific results of biomedical research, Travieso Ramos (2017) argues for the importance of research in this area of knowledge, which is no different from others. He also indicates that "...the need to produce, disseminate, and appropriate knowledge...", together with the need to address problems from a scientific and humanistic perspective, also promotes the improvement of education.

Moving from the content to how the results of research are presented, based on scientific articles, the methodology called Introduction-Methods-Results-Discussion (IMRyD) is investigated and assumed. According to Codina (2022), IMRyD is a standardized structural concept that most academic journals impose as a condition for the acceptance of the products they expect to publish.

Therefore, the adoption of the scientific article as a form of graduation by a university involves an approach to it, taking into account the interactions between tutors (research faculty members regularly but not indispensable) and students as a response to formative research (Ricardo Velázquez, *University Formative Research: Possibility or Necessity?* 2017).

The presentation of results typically utilizes various methods to include information in the most concise manner possible, ensuring that it is understandable to the target audience, especially if the article is intended for publication. These methods can include tables, graphs, plain text, statistics, and narratives, each of which corresponds to the assumed research focus, establishing significant differences between quantitative and qualitative approaches.

Reynosa Navarro (2020) agrees with the ideas previously mentioned, regarding how results are presented. He highlights the need to keep in mind, in their logical development, the coherence with the declared methodology, and the presentation of the evidence that should generate debate. In addition, in the description of the results, precise, clean, and direct writing must be guaranteed, avoiding unnecessary adjectives, and achieving the greatest possible objectivity.

Villegas, Paucar, García, Villar, & Arana (2023), in the context of presenting research results using the IMRyD methodology for scientific articles, identify the following key concepts: the priority is to convey precise information about the most relevant findings or the response to the recognized problem. Redundancy of data should be avoided to affirm the findings, and it should align with what was stated in the materials and methods section.

The presentation of results should be in the past tense, utilizing tables, figures, or tables, and/or through an interpretative, logical, and rational analysis. This depends on the methodological approach to data treatment. Avoid clustering ideas in the same paragraph; they should be brief and concise. Results should demonstrate novelty, and the ultimate goal, in generative research, is to generate new hypotheses or theories (Villegas et al., 2023).

The discussion, as part of the scientific article in the IMRyD methodology, according to Escamilla Ortiz (2018), should be detached from that writing that replicates the results already presented in the section that corresponds to it, and demonstrate the freedom of the researcher for an objective writing and consistent with his thinking in relation to the scientific environment in which he develops the research.

Therefore, the discussion has the challenge of achieving to express several deliberate structural components in the IMRyD methodology itself, such as the summary of findings to guide the reader; the comparison of what was achieved in the research versus the work of others; the barriers presented in the process; the failures in it, indicating if there was a response to what the general objective was posed as a challenge. Emphasis should not be placed on what was wanted to be achieved, but on what was achieved. Sometimes, the researcher, recommends useful aspects for those interested in the same topic. (Escamilla Ortiz, 2018)

Reynosa Navarro (2020) suggests the possibility of merging the discussion with the results, provided that scientific publications allow it, although this is less common. In the discussion, the primary focus is on providing an answer to the research question or problem stated in the introduction or initial phase of the study. It should revolve around critical-reflective and argumentative-contrasting language, all of which reveal the novelty and contributions made without using pejorative terms. The use of tables and figures can support the results.

The purpose of this research is to describe the use of the results and discussion sections in the scientific article as a form of graduation in the UNIANDES Law program. This description is based on a critical analysis of what the university has established and the application of the IMRyD methodology within the defined sample in the methods section.

Methods

The applied methodology was based on a mixed approach, with initial interactions involving the collection of quantitative information through the application of a review guide for the results of the graduation activity through scientific articles. This guide delves into the descriptive scale of the main characteristics assumed in two of the structural components, namely, the results and discussion, based on the IMRyD methodology for writing scientific articles, which is embraced by most scientific journals, particularly those publishing results of legal research (Codina, 2022).

The structure for scientific articles as proposed by Gómez et al. (2017) was used as a reference, aligning with the IMRyD methodology, for the assessments conducted on the documentary sample. The research is retrospective and descriptive, encompassing both theoretical foundations and empirical interaction.

The research employed theoretical-level methods that facilitated the fragmentation of articles into components of interest (results and discussion), enabling the analysis of their characteristics and qualitative synthesis of their contributions. Additionally, due to its prospective nature, a historical-logical study was conducted on the practical manifestations of this graduation format and the theoretical significance of the consulted sources.

Among the empirical-level methods, the study of graduation activity products (Blanco Gómez & Valledor Estevill, 2013) is prioritized, specifically, the scientific articles in the Law program at UNIANDES. The technique used was the review guide for the results of the graduation activity products, focusing on the results and discussion section. Prior to and concurrently with

the research process, interviews were conducted with the instructors responsible for supervising, validating, and evaluating graduation formats at the Puyo campus of UNIANDES.

The sample was intentional, consisting of 96 scientific articles used as graduation formats from all Law programs at the university, including those from the Ambato main campus (20), Quevedo extension (20), Santo Domingo campus (20), Tulcán campus (20), and Puyo campus (16). The time frame for the initial perspective covered the years 2020, 2021, and 2022 as selection criteria.

The indicators evaluated in the analysis of graduation activity results through scientific articles were distributed as indicated in Table 1.

Table 1: Matrix of Indicators for Documentary Inquiry.

Indicators	In Results	In discussion
Extension	x	x
Clarity	x	x
Spelling	x	x
Grammatical tense	x	x
Internal segmentation	x	
Unique theorizing	x	
Techniques	x	
Findings	x	
Data tables	x	
Data Figures	x	
Data Paragraphs	x	
Data Duplication	x	
Quantitative/qualitative interpretation	x	
Comparison with previous studies		x
Barriers		x
Advantages		x
Contributions		x
Summary of findings		x
Implications of findings		x

Source: Own Elaboration Based on Gomez Armijos and Others (2017).

Results

In the bibliographical and normative document review (in this case, only for the university sample) of the theoretical foundations of the article as a modality, form, or option for graduation, and the sections on results and discussion as components under study, within the IMRyD methodology for presenting articles in academic and scientific publications, the following key findings were identified:

- The scientific article is a form or option for graduation commonly used in Ecuadorian universities in the last five years.
- The IMRyD methodology is frequently used by academic and scientific journals, which present this structure as a prerequisite for publication.
- The writing of results and discussion demands general requirements such as conciseness, clarity of ideas, brevity, objectivity, and research ethics.
- In the results section, the main requirements focus on the treatment of the techniques and/or instruments declared in the methodology section, the declaration of findings, the use of tables, figures, and texts for their presentation without duplicating information, and the logical quantitative-qualitative interpretation of results.

- For the discussion, the emphasis is on not repeating what was found in the results but rather comparing them with other previously published studies, addressing the barriers encountered in the process, highlighting the advantages of the methodology and the achieved results, presenting key contributions through a critical-reflective-propositional analysis, and finally, summarizing the implications of these findings.

Furthermore, in the review of the articles included in the sample, following the identified indicators in the study methodology, the presentation was organized into three dimensions: the first related to writing indicators, the second pertaining to the results section, and finally, the one describing the discussion section of the scientific articles.

Regarding the indicators representing the writing components of both sections (results and discussion), the behavior is depicted in Table 2.

Table 2: Frequencies of Manifestations of Deficiencies in the Writing of the Results Section of the Article as a Graduation Format.

Indicators	Extension	Clarity	Spelling	Grammatical tense
Absolute frequency	50	40	1	13
Percentage	52.1%	41.7%	1%	13.5%

Source: Analysis of the Results of the Graduation Activity Through Scientific Articles.

Regarding the writing of results in the scientific articles from the sample, the most significant deficiencies were observed in the length dedicated to these within the article - in most cases, due to brevity, and the clarity with which they are presented, in the wording of ideas, to ensure alignment with the proposed methodology.

Table 3: Frequencies of Manifestations of Deficiencies in the Writing of the Discussion Section of the Article as a Graduation Format.

Indicators	Extension	Clarity	Spelling	Grammatical tense
Absolute frequency	57	45	4	5
Percentage	59.4%	46.9%	4.2%	5.2%

Source: Analysis of the Results of the Graduation Activity Through Scientific Articles.

In Table 3, it is worth noting that, in this discussion section, the main problems are repeated, particularly in terms of the minimum length dedicated to it and the clarity of ideas, this time in relation to what was expressed in the results.

The dimension related to the data obtained from the review of the results section in the scientific articles of the study sample is reflected in the ten indicators specified in the methodology of this research, as shown in Table 4.

Table 4: Main Limitations in the Results Section of Articles as a Form of Graduation.

Indicators	Absolute frequency	Percentage
Internal segmentation	48	50.0
Unique theorizing	50	52.1
Techniques	55	57.3
Findings	70	72.9
Data tables	41	42.7
Data Figures	34	35.4
Data Paragraphs	45	46.9
Data Duplication	46	47.9
Quantitative interpretation	44	45.8
Qualitative interpretation	38	39.6

Source: Analysis of the Results of the Graduation Activity Through Scientific Articles.

Across the 10 evaluated indicators, as shown in Table 4, it can be observed that they exhibit an impact that affects more than one-third of the sampled articles in all cases. The indicators with the most significant negative implications, in descending order, are: the presentation of the main findings; the consistency with the declaration and development of results, as per the techniques declared in the materials and methods section; theorization as the sole development of results, influenced by dogmatic-doctrinal treatment as the primary way to express bibliographic-documentary research; and lastly, the external segmentation of the presentation of results, based on theoretical categories, keywords, or by areas or dimensions of the type of law implicitly declared as the object of research.

The results obtained in the dimension of the discussion section are reflected based on the observation of six indicators, which can be analyzed using Table 5.

Table 5: Main Limitations in the Discussion Section of Articles as a Form of Graduation.

Indicators	Absolute frequency	Relative frequency
Comparison with previous studies	62	64.6
Barriers	48	50.0
Advantages	64	66.7
Contributions	83	86.5
Summary of findings	84	87.5
Implications of findings	84	87.5

Source: Analysis of the Results of the Graduation Activity Through Scientific Articles.

Within its main deficiencies, this section shows that the majority of the indicators have a negative impact of over 64% on the presented arguments. In order of priority, the most affected aspect is the conclusive treatment of findings and their implications, followed by the recognition of the contributions made by the research, indicating its novelty. Finally, the comparison of the results obtained by the researcher with previous studies on the same topic is also negatively impacted.

Thus, the indicators that present the main findings comprehensively are concentrated in the discussion section. However, those presented as findings in the results section do not diminish their projection and analysis to the same level as the former. In general, the most significant aspects are related to the recognition of the main findings of the research, their implications, the advantages and contributions of the study, and the comparison of these with other research.

Discussion

The analysis of the graduation activity's products, as a technique within the method of analyzing pedagogical activity (Blanco Gómez & Valledor Estevill, 2013), along with documentary literature review, allowed for an analysis of the incorporation of the Ecuadorian universities in the use of the scientific article as a modality, form, or option for graduation, both in undergraduate and academic master's degrees in postgraduate studies. This allows, within the advantages it offers, the evaluation of the development of research competencies from the perspective of formative research (Ricardo Velázquez, University Formative Research. Possibility or Necessity? 2017).

Another advantage, integrated with the previous one but of paramount importance, is the ability to observe the levels of concretization exhibited by graduates of the Law program to present the main results of an entire research process that they have been developing

throughout their academic history, starting from the integrative projects (Ricardo Velázquez y otros, 2016).

The structure conceived by UNIANDES for scientific articles as a form of graduation does not differ from what Codina (2022) and Villegas and others (2023) have presented. What is interesting is not the established structural conception itself but the practice of writing the results. This practice highlights limitations in both the results and discussion sections, primarily in the recognition of findings, the presentation of the main findings, their implications in the legal field, and the tacit acknowledgment of their novelty.

The practice of graduation through the presentation of scientific articles, from the Academic Regime Regulation of 2017 and maintained in the current one (Higher Education Council of Ecuador, 2022), offers advantages in the graduation process. It allows students to present their research results in a relatively concise scientific text with a structure that informs the main stages of the process clearly and concisely.

However, there are limitations in all structural aspects of the IMRyD methodology (Villegas et Al., 2023), primarily due to the complexity of condensing an entire research process into a minimum of 10 and a maximum of 15 pages while maintaining a high level of concreteness. This approach departs from traditional research paper writing, which typically includes a problem statement, theoretical framework, methodological framework, proposal for solving the problem, and the results of implementing the proposed solution in practice.

The dimension of writing can evaluate several indicators. In the case of scientific articles used as a form of graduation, as evaluated in this study, the requirements for this dimension, particularly for the results and discussion sections, are not significantly different. The main shortcomings are a lack of dedicated space for writing the main results and their analysis, as well as repetitive emphasis on expressing ideas clearly in both the results and discussion sections.

Regarding the specificity of the results dimension, there is a lack of an appropriate relationship between what is presented in the methodology and what is dedicated to determining the main findings. A predominant theoretical segmentation is observed in most of the sampled articles, and in cases where empirical techniques like surveys and interviews are applied, there is a lack of care in avoiding the repetition of quantitative data through various means (text, figures, and tables), which diminishes the quality of the presentation of these identified findings.

In the dimension of discussion, three fundamental indicators for the discussion are identified. These indicators, due to the limitations found, are interrelated with the results dimension: summarizing and understanding the implications of the main findings. Additionally, the identification of the advantages the study has for the field of knowledge, based on regulations and reflections from consulted authors, is left to the discretion of the researcher and is generally omitted in the writing.

After the analysis, it is important to note that this study was limited to a convenience sample, selecting some UNIANDES campuses and the Quevedo extension, which limits the holistic analysis that could be provided by a simple random sample of all scientific articles presented as graduation options for undergraduates. Furthermore, the complexity of evaluating qualitative and subjective indicators can yield results that may not be generalized to the universe of scientific articles presented as undergraduate graduation options.

The findings tend to have didactic-methodological implications involving graduating students, tutoring professors, and evaluating professors of graduation forms. These implications can be observed in Table 6, as a summary.

Table 6: Implications of the Main Findings for Graduating Students in the Graduation Process.

Findings	Students
Capacity to Summarize Findings	- Expanded approach. - Loss of the main ones. - Unjustified significance. - Inadequate response to the problem.
Determining the implications of the findings	- Socio-legal importance of the research. - Definition of open areas for future research.
Definition of contributions (novelty)	- Recognition of the novelty of what is presented in the study. - Identification of the impact areas of the contributions.
Identification of advantages of your study	- Promote monitoring of the proposed methodology. - Promote the transformation of the study problem from a comprehensive vision that contemplates its results.
Comparison with previous studies	- Recognize the similarities and differences of the study with previous ones. - Respect for what was contributed by those who preceded the research topic.

Source: Analysis of the Results of the Graduation Activity Through Scientific Articles.

In the case of mentors of scientific articles as a form of graduation, for the same findings presented in Table 6, the immediate implications to address the deficiencies are as follows:

- Self-preparation focused on the results and discussion of scientific papers. In this regard, the study of the relationships between the topic, objectives, and methodology in their entirety and what is manifested as results and discussion should be promoted.
- Diagnosis based on article section indicators. This recommendation should allow for a retrospective-prospective review of the articles being supervised to determine difficulties regarding indicators that are not fully met.
- Evaluation of the dimensions and indicators of the scientific article's writing. In this case, the recommendation is aimed at establishing a rubric that allows for an objective evaluation of the presentation of results and their discussion, including novelty, advantages, limitations, comparisons with previous studies, and the implications of the findings from the subjectivity of the indicators.
- Personalized mentoring. This recommendation enables the creation of an individualized action plan to transform the presentation of results and discussion based on the evaluation indicators of the dimensions.

For evaluators, as the determining factor in the quality of the scientific article, it is also necessary to identify transformation actions, focusing on aspects such as systematic self-improvement in the structure and concept of the article as a form of graduation. Clear definition of the indicators to be evaluated in the presentation and defense of the graduation work, as well as the strict adherence to indicators related to writing and the presentation of results, including their discussion.

Conclusions

The option of a scientific article as a form of graduation for undergraduate programs in higher education institutions in Ecuador is an approach aimed at providing alternative means to achieve the graduation profile based on the results of professional learning in conjunction with research activities, among others.

The selection of scientific articles as a form of graduation has been on the rise at the Universidad Regional Autónoma de los Andes, with a significant presence in the main campus, branches, and extensions. This has led to a collective effort involving students, mentors, and evaluators, shedding light on the need to transform the way the defense takes place, particularly in the manner of writing results and discussion sections.

The methodology adopted by the university for writing scientific articles follows the IMRyD structure, which is the most commonly used and required by major journals publishing scientific results.

In the dimension of writing, concerning the form evaluation process of the sampled articles, the most affected aspects are the length of the sections, primarily because they often fall short of what could be considered adequate in terms of the number of pages, though this is a subjective criterion. Additionally, excessive segmentation exists in the presentation of the consulted theories.

Regarding the indicators in the results dimension, the assessments showed that the ones most affected are those related to the declaration of findings, the coherence of the presented information with the techniques declared in the methodology section, and the heavy emphasis on doctrinal and legal theory within this section.

In the evaluation of the discussion, as the third dimension, most indicators exhibit deficiencies, particularly those related to summarizing the main findings and their implications, declaring novelty based on the contributions made, and defining the advantages of the study and comparing it with previous research.

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