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Research article

Relevance of Humanistic Education in Faculties of Experimental Sciences: A Comprehensive Study

Relevancia de la Formación Humanística en las Facultades de Ciencias Experimentales: un estudio integral

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Abstract:
Introduction: The university has evolved to adapt to recent changes, prioritizing specialization at the expense of holistic education. This article examines how this transformation has created a gap between the humanities and scientific disciplines, displacing critical reflection with efficiency. Our objectives are to explore the historical foundations of the university to preserve its essence and to argue the importance of comprehensive education through a concrete case in the Faculty of Experimental Sciences at Universidad Francisco de Vitoria, which integrates humanities subjects and interdisciplinary activities into its programs. **Methodology:** The research conducted has been descriptive, using both quantitative and qualitative experimental methodologies in line with the proposed objectives. The empirical study was conducted with 1690 students, showing that comprehensive and humanistic education improves learning in experimental sciences. **Conclusions:** The results highlight the need for innovative methodologies that foster integral knowledge and the intersection between science and the humanities, emphasizing the importance of future scientists studying

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humanities subjects to develop a broader understanding of reality and recognize the limits of the scientific method.

Keywords: Comprehensive education; experimental sciences; humanities; university; interdisciplinarity; technification; inter/science conversations; dialogue.

Resumen:
Introducción: La universidad ha evolucionado para adaptarse a cambios recientes, priorizando la especialización en detrimento de una educación holística. Este artículo examina cómo esta transformación ha creado una brecha entre las disciplinas humanísticas y científicas, desplazando la reflexión crítica por la eficiencia. Los objetivos que nos proponemos son explorar los fundamentos históricos de la universidad para preservar su esencia y argumentar la importancia de una educación integral a través de un caso concreto, en la Facultad de Ciencias Experimentales de la Universidad Francisco de Vitoria, que integra materias humanísticas y actividades interdisciplinares en sus programas. **Metodología:** La investigación llevada a cabo ha sido de carácter descriptivo, utilizando una metodología experimental cuantitativa y cualitativa acordes con los objetivos propuestos. El estudio empírico se realizo a 1690 estudiantes mostrando que la educación integral y humanística mejora el aprendizaje en ciencias experimentales. **Conclusiones:** Los resultados destacan la necesidad de metodologías innovadoras que fomenteen el conocimiento integral y la intersección entre ciencia y humanidades, subrayando la importancia de que los futuros científicos estudien materias humanísticas para desarrollar una comprensión más amplia de la realidad y reconocer los límites del método científico.

Palabras clave: Educación integral; ciencias experimentales; humanidades; universidad; interdisciplinariedad; tecnificación; conversaciones Inter/Ciencias; dialogo.

1. Introduction

1.1. The University: Technification versus Integral Formation

Over the centuries, the university has evolved to adapt to new changes in society, the economy, and technology. However, in this evolutionary process, a crucial debate has emerged: to what extent has technification overshadowed the essence of the university and its original function of providing an integral formation? The inclination towards specialization, driven by adaptation to the technological era, has led the university to prioritize efficiency over critical reflection, relegating integral education in favor of specific competencies. This focus has created a gap between the humanities and sciences, diminishing the interdisciplinarity that enriched learning.

From a historical perspective, the Western university emerged in the Middle Ages, within cathedral and monastic schools, centered on study, research, and knowledge transmission. The University of Bologna, founded in the 11th century, was primarily dedicated to teaching the liberal arts, a general education that included linguistics, oratory, dialectics, calculus, trigonometry, music theory, and cosmology. This approach sought to form minds capable of thinking critically and understanding the world in its entirety.

Historically, the division between sciences and humanities was not always as marked as it is today. During the Renaissance, figures like Leonardo da Vinci and Galileo Galilei embodied the union between science and art, philosophy and mathematics. This integral approach was largely lost with the progressive specialization that characterized education and research in

the 19th and 20th centuries. However, the complexity of current problems demands synergies between these fields of knowledge.

Over time, the university diversified and specialized, reflecting the growth of human knowledge and the demands of a constantly changing society. The Industrial Revolution and the rapid advancement of science and technology intensified this process of specialization. Ortega y Gasset, in his essay "The Mission of the University," argued that the university had the responsibility to form "complete individuals," capable of understanding and transforming their environment, emphasizing the importance of a humanistic education that developed both intelligence and sensitivity, preparing students to face the ethical and social challenges of their time (Ortega, 1968).

Ortega y Gasset identified five main missions for the university: the pursuit of truth as an abstract and universal principle, the development of scientific knowledge, applied technical training, support for cultural, social, and economic development, and the dissemination of university culture. This vision emphasizes the need for an education that integrates both humanities and sciences, promoting a formation that not only transmits specialized knowledge but also fosters critical thinking and ethical sensitivity (Ortega, 1996).

In line with this perspective, Basave defines the university as a grouping of students and professors focused on the exploration and analysis of truth, the coherence of knowledge, the fulfillment of individual vocations, and the training of professionals essential for the good of society (Basave, 1992). This integral formation must encompass not only the specific area of knowledge but also a holistic understanding of the world, providing students with tools for both professional and life purposes.

Similarly, Nova indicates that the university's mission should be oriented towards identifying and developing individual values and skills, promoting integral growth and adequately responding to environmental demands. This includes fostering a living environment that is reflective, critical, sensitive, creative, and responsible (Nova, 2017).

In accordance with this vision, Remolina asserts that the university must review, update, and dynamize its goals to contribute significantly to social and cultural progress. This demands a holistic education that encompasses the academic, human, and ethical formation of students, promoting values such as social responsibility and commitment to truthfulness (Remolina, 2007).

Finally, we highlight the words of Navarrete when he states that the university must play fundamental roles such as education, inclusion, and social integration. These responsibilities are framed within an educational mission that pursues an integral formation of students, promoting their development in all facets: academic, social, and personal (Navarrete, 2013).

Considering these definitions, the traits that define the University would be:

1. It is an institutionalized community of students and teachers.
2. Its purpose is the transmission of knowledge through teaching.
3. Improving and expanding knowledge through study and research.
4. Pursuing the formation of students both in knowledge acquisition habits (study) and in its expansion (research).
5. This formation should not be limited to knowledge training but should also include training in values, both human and university values.
6. Serving society through the formation of people, research, and innovation.

These starting premises also require reflection on teaching or the way of teaching, which must align with the university's mission and objectives. If the university pursues integral formation that educates in knowledge and values, this conception must be translated into educational methods. The value of the university lies in its intellectuality, that is, in the use of reason or intellect to reach the truth, investigate it, perfect it, and transmit it, forming its students in humanistic values, the scientific method, and the habit of developing an authentically critical and open spirit towards their field of study.

The academic, therefore, becomes an authentic "truth-seeking agent," without this categorization requiring – quite the opposite – that intellectuals be on the margins of the "real world"; their position as researchers is not disconnected from their role as citizens, and they must actively engage in the problems and debates of the society they are part of (Badenes, 1959). Because their mission is to turn students into professionals, strongly committed to the issues of their environment, who must become aware not only of their academic formation but also of their formation as authentic citizens called to change society, identify the scourges that afflict it, and lead projects that improve the conditions of the social body. Therefore, one of the important functions of the university is to properly train its students so that they know the world they live in, understand it, and get involved in the processes of social improvement and change.

If the university is to serve global formation, to a human and intellectual preparation of students, this conception must be projected in teaching. Consequently, teaching should be in the three dimensions that make up the university's identity, that is, teaching students from a universal and humanistic perspective (cultured person), to think, to reason, to inquire, to systematize and elevate knowledge to categories (research), to solve and provide practical solutions from the specialized knowledge acquired (professionalism), and ultimately, to foster the critical capacity of students. It is about developing the work capacity, moral sensitivity, and character that every professional so desperately needs (Badenes, 1959).

As technology advances and society changes, the university faces pressure to adapt to the demands of the labor market and the globalized economy. This technification has gained ground, with increasing emphasis on technical and professional training to the detriment of humanistic education. This trend, although it has brought significant advances in fields such as medicine, engineering, and computer science, has also led to a fragmentation of knowledge and a crisis of meaning in the university, eroding its role as a defender of critical thinking and ethical reflection.

In an increasingly interconnected and complex world, social, political, and environmental challenges require multidisciplinary and innovative approaches. Holistic formation, which combines technical knowledge with humanistic wisdom, is more relevant than ever. Therefore, it is essential that the university reevaluates its mission, balancing technification with integral education that includes the humanities, preparing students to face the challenges of the 21st century.

Numerous authors have highlighted in their studies the importance of interdisciplinary dialogue between the sciences and the humanities. Already in the 90s, Klein spoke of the importance of interdisciplinary dialogue, arguing that the humanities can provide conceptual clarity and new directions for scientific research (Klein, 1990).

Later, Slingerland emphasizes the need to promote a scientific framework for the humanities, establishing a common language and shared principles that facilitate interdisciplinary collaboration. This approach not only fosters the generation of new hypotheses and analyses

from diverse perspectives but also helps avoid irreversible errors by integrating results more deeply (Slingerland et al., 2011).

The 2018 report by the National Academies of Sciences, Engineering, and Medicine, titled "The Integration of the Humanities and Arts with Sciences, Engineering, and Medicine in Higher Education," highlights the growing evidence that integrating the arts and humanities with STEMM disciplines (science, technology, engineering, mathematics, and medicine) in higher education can significantly enhance educational outcomes and better prepare students to face real-world challenges (National Academies of Sciences, Engineering, and Medicine, 2018).

In this same line, Burguete emphasizes that the humanities and sciences must be integrated to address the complexity of the human in its entirety. This holistic approach can provide a scientific basis for the humanities, facilitating a common language and shared principles that promote interdisciplinary collaboration (Burguete et al., 2008).

Adding to this vision, Robinson highlights the value of the humanities in interdisciplinary scientific projects, emphasizing how integrating scientific results into humanistic contexts, such as artistic and writing projects, can connect the humanities with complex scientific projects (Robinson et al., 2017).

Winters and Sichani (2022), in their work on digital humanities, accentuate how these can act as a bridge between the humanities and other disciplines, facilitating interdisciplinary collaboration and addressing complex questions that require a combination of skills and diverse perspectives.

In his research on the relationship between interdisciplinary dialogue, Dowd (2019) argues that integrating the sciences and humanities can add significant nuances to scientific data, improving public understanding of scientific topics and helping scientists address ethical and social issues they may not have previously considered.

Finally, VanderWeele (2020), in his work on the importance of dialogue between science and faith, emphasizes how this type of exchange can enhance understanding of the relationship between religion and health, as well as the impact of religious practices on longevity and well-being. This interdisciplinary approach is essential for developing an ethical framework that guides both scientific research and technological applications.

Considering what these authors subscribe to, we can affirm that there are many benefits to integrating the humanities into experimental sciences. Below, we outline some of them:

Development of critical and ethical thinking: Humanistic training fosters the development of critical thinking, an essential skill in any scientific field. By studying philosophy, ethics, bioethics, and the history of science, students learn to question and reflect on the foundations and implications of their work. This approach helps them consider not only the "how" but also the "why" of their research, promoting a more conscious and responsible scientific practice. Humanities help scientists understand the human dimension of their work. Science does not develop in a vacuum; it is deeply influenced by cultural, social, and political contexts. By integrating studies of anthropology, sociology, and ethics, students can appreciate how their research affects and is affected by the society in which they live. This understanding is crucial for addressing issues such as bioethics, equity in access to technology, and the social implications of scientific advances.

Personal and professional enrichment: Training in the humanities enriches both the personal and professional lives of students. Subjects such as anthropology and philosophy offer perspectives that can enhance scientists' ability to communicate effectively, work in multidisciplinary teams, and lead projects with a broader and more comprehensive vision. These skills are increasingly valued in the labor market and are essential for success in an increasingly interconnected and complex world.

Promotion of an interdisciplinary vision: Transdisciplinarity allows science students to experience education that goes beyond traditional disciplinary boundaries. This approach fosters dialogue between different fields of knowledge, which can lead to significant innovations and creative solutions to complex problems. For example, collaboration between biologists and philosophers can offer new perspectives on bioethical issues, while interaction between engineers and sociologists can improve the design and implementation of technologies in diverse communities.

1.2. Development of the Interdisciplinary Dialogue Initiative at the Faculty of Experimental Sciences of UFV

The Francisco de Vitoria University (UFV) is committed to the search for truth and the integral formation of its students, emphasizing freedom, pluralism, and academic excellence. Its mission is to train professionals who are leaders in their fields and transform society to make it more just and humane. The Francisco de Vitoria University is firmly rooted in the principles of the School of Salamanca, which became an emblem of the defense of the dignity of the indigenous people of the New World, criticizing the excesses committed by the Spaniards, developing a true law of nations, and defending the right of human beings to identify with a territory, to reside in it, and to be welcomed. These values have been incorporated into the university's ideology, which is strongly committed to society.

Bologna marked a change in academic methodologies and a new teacher-student relationship. This profound transformation of the university required great effort from the university community, demanding a renewal of teaching guides, methodologies, and a rethinking of what is taught and how it is taught.

This opportunity has been seized at Francisco de Vitoria University to emphasize the need for transdisciplinarity and the transcendence of teaching. By transdisciplinarity, we understand the necessary dialogue between experimental sciences and speculative sciences. Meanwhile, the transcendence of teaching requires students to understand the necessity of knowledge for their own lives, the interconnection between knowledge and purposes (Perea, 2006).

This orientation towards integral formation contrasts with the predominant technical specialization in the current university environment. The Faculty of Experimental Sciences aspires to train scientists who are also humanists, promoting an education that is not limited to specific knowledge but offers a broad view of reality.

Students of experimental sciences must recognize the limitations of the scientific method and understand that there are questions their method cannot answer and that they must address other approaches to reality that are essential for their life and profession. Interdisciplinary dialogue encourages students to ask questions that transcend their method and actively engage in the search for answers.

At the Faculty of Experimental Sciences – biotechnology, biomedicine, pharmacy, genetics, and biomedical engineering – students are trained to reflect on the ultimate goals of their professions and their integration into their professional and social environment. It is not about providing them with a dogmatic catechism to follow but about training them and making them reflect on existential questions and the big questions that will accompany them throughout their lives, so they graduate as great scientists but also with an integral humanistic education that equips them for an improved and more complete view of reality.

For this reason, the curriculum of the subjects of the Faculty of Experimental Sciences at Francisco de Vitoria University is infused with humanistic subjects, strategically distributed so that students receive intense humanistic training throughout all the courses of their degree. Thus, once they complete their degree, all students will have taken the following subjects: Foundations of Scientific Thought, Introduction to University Studies, History and Philosophy of Science, Anthropology, Education for Social Responsibility, Ethics and Bioethics, and Introduction to Theology. By the end of their studies, they will have received over a thousand hours of humanistic training. As Álvarez points out, the sciences of meaning traverse the curriculum in a conscious, planned, and organized way (Álvarez, 2016).

Additionally, extracurricular activities are carried out to help students develop a fruitful dialogue between sciences and humanities. Every year since 2017, the "Inter/Science Conversations" have been held, an activity designed to bring together science and humanities teachers and students from both areas of knowledge. The aim of these conversations has been to establish a dialogue, guided by experts, on frontier topics in the biotechnological and biomedical fields, which, being frontier, emerge from both factual and experimental sciences and humanities. Through this initiative, questions have been raised, spaces for meeting and coexistence of different approaches, paradigms, models, and research methodologies have been organized. Argumentation corners have been created, and communities of educators have been established.

These meetings allow a large part of the Faculty of Experimental Sciences to benefit from these interdisciplinary dialogues. The aim was to foster continuous dialogue between science and philosophy, with the goal of seeking comprehensive answers to complex questions. The debates and discussions facilitated a deeper understanding of the interconnections between different fields of knowledge, enriching both the academic approach and the personal perspective of the participants. Students, being active participants in this process, developed a more holistic view of their formation, learning to value both the scientific and humanistic aspects of their education.

We seek to expand the horizons of scientific rationality to place the human being at the center and beneficiary of scientific efforts. Both students and teachers are called to participate in productive dialogues with other scientific disciplines, reaching conclusions and answers that transcend their own methods.

Each of the interdisciplinary meetings focused on a specific topic, addressing fundamental questions from different scientific and humanistic perspectives. The first degree where these conversations were held was in biotechnology. This ambitious project involved 440 biotechnology students from the faculty. The work was carried out over a period of three years, starting in January 2017 and ending in 2020. The four conversations that took place followed the same work protocol.

First Meeting:
Physics and Philosophy: the first interdisciplinary meeting focused on the dialogue between physics and philosophy. This exchange was facilitated by teachers specialized in both areas, with the aim of exploring how these disciplines address the epistemological question. The discussion focused on the existence of reality and the human capacity to know it. The historical need to explain the reality of the cosmos and the world was highlighted, as well as the different narratives that humans have constructed to understand it, emphasizing that these narratives, being partial, do not exhaust the understanding of the real.

Second Meeting:

Genetics and Anthropology: in the second meeting, the dialogue moved to the intersection between genetics and anthropology. Participants, teachers of genetics and anthropology, debated the mystery of the human being and its complexity, and how these sciences can address it. The debate on anthropology permeated the entire discussion, exploring how science and anthropology coexist and seek to provide complementary answers about human existence. Many questions were raised about whether genetics can fully explain human behavior, highlighting the need for a holistic view.

Third Meeting:

Science, Technology, and Ethics: the third interdisciplinary debate addressed science, technology, and the ethical issues related to their application. This dialogue was led by professors of bioethics and bioreactors. The conversation focused on the power of science and technology and the ethical responsibilities and limits in their application. Topics such as the legitimacy of scientific practice and the differences between moral certainties and scientific evidence were discussed, concluding that both are essential for the progress of knowledge.

Fourth Meeting:

Philosophy, Theology, and Experimental Sciences: the fourth and final meeting brought together teachers of philosophy, theology, and experimental sciences to reflect on the importance of dialogue between these disciplines. It was discussed that the lack of knowledge of respective methodologies is the main cause of misunderstandings between them. It was concluded that there can be no contradiction between philosophy, science, and theology. Problems arise when methods overlap and each discipline invades the other's domain.

These topics and interdisciplinary dialogue methodologies were later replicated in the Biomedicine degree, where the four Inter/Science conversations were developed between 2020 and 2023. The implementation of these conversations in another academic program underscores the importance and positive impact of this approach on student formation, promoting a more holistic and integrated understanding of knowledge. These conversations had a much greater impact than the first, with more than 1000 students participating.

Finally, at the end of 2023, an interdisciplinary conversation was held where the speakers were students from the Faculty of Experimental Sciences and the Humanities degree. More than 250 students attended this Conversation. This dialogue focused on several fundamental topics, providing a platform for mutual exploration and understanding between disciplines. Students debated the need to integrate scientific and humanistic knowledge to address the complex challenges of today's world. It was explored how interdisciplinary collaboration can enrich both scientific and humanistic understanding, providing a more holistic and complete view of reality. A central theme was the consideration of ethical implications in scientific practice.

Participants discussed the importance of ethics in scientific research and how the humanities can offer ethical guidance for the development and application of technology and science. Finally, students reflected on the challenges and opportunities presented by interdisciplinarity. Institutional and cultural barriers to collaboration between disciplines were discussed, as well as strategies to overcome these obstacles and foster a more integrated and collaborative academic environment.

The creation of this community of scientists and humanists committed to truth has allowed the faculty to advance towards more integral and balanced education, where collaboration and the exchange of ideas are fundamental elements. This interdisciplinary approach has not only improved the quality of teaching and learning but also strengthened the ties between different areas of knowledge, promoting greater cohesion and understanding within the university.

2. Methodology

During the last six academic years, 9 Inter/Science Conversations have been held with the participation of a total of 1690 students from the Faculty of Experimental Sciences and Humanities, although students from the entire Faculty attended, the degrees with the most presence were biotechnology and biomedicine.

In the empirical study conducted, the research was descriptive, using both quantitative and qualitative experimental methodologies appropriate to the object of study. Information collection and data analysis techniques were used directly through surveys. This data collection technique is widely used in social science research, as noted by Alvira, as it facilitates the understanding of the environment (Alvira, 2004).

To delve into the topic, the research was structured in several phases. Initially, the specific objectives to be achieved were defined. Subsequently, a questionnaire was designed to measure the variables of interest. Surveys were applied to a representative sample of students, ensuring the validity and reliability of the data obtained.

The analysis of the collected data allowed the identification of significant patterns and trends, providing a detailed view of the influence of the Inter/Science Conversations on student learning. The results indicated a positive correlation between participation in these activities and the achievement of the proposed educational objectives.

To evaluate the learning process derived from this experience, two methodological tools were implemented: one quantitative and one qualitative. Both tools involve the participation of all students involved in the activity. The quantitative evaluation, developed by the Vice Dean of Integral Formation of the Faculty of Experimental Sciences, measures learning in relation to the objectives set in the Inter/Science Conversations. A questionnaire was designed, validated by a group of experts, and later a study of the validity and reliability of the measuring instrument was conducted. The items explored included whether these conversations had achieved the goal of broadening the horizons of scientific rationality and whether a fruitful dialogue between science and philosophy had been generated. We were interested in measuring whether a community of teachers had been created and if students considered the dialogue between science and humanities necessary for their academic formation.

Table 1.

Questionnaire for students

Questions	1				5
1. I believe that the conversations have served to create spaces for reflection, seeking answers through interdisciplinary dialogue.	○	○	○	○	○
2. Listening to professors present their reflections on frontier topics between disciplines from different areas has been beneficial to me.	○	○	○	○	○
3. A dialogue between the sciences and the humanities has been generated.	○	○	○	○	○
4. I think the dialogue between science and humanities is necessary for my academic formation.	○	○	○	○	○
5. I value that the University organizes this type of meetings between professors from different fields of knowledge.	○	○	○	○	○
6. It would be enriching and positive to have more activities like this.	○	○	○	○	○
7. From a general consideration, evaluate the Inter-Science conversations activity globally.	○	○	○	○	○

Fuente: Own elaboration (2024)

Qualitative Questions

1. Briefly explain what you would highlight the most about this activity.
2. Tell us what improvements you can think of for this activity, as well as any constructive comments you consider.

On the other hand, the qualitative evaluation consisted of two open-ended questions, asking students to identify the positive aspects and areas for improvement of the activity. This process fosters deep reflection by the student, integrating what they have learned both in the classroom and in the Conversations, and promoting a critical self-assessment of their own learning (Aramburuzabala et al., 2018).

In conclusion, the methodology used not only validated the impact of the Inter/Science Conversations but also highlighted the importance of an integrative approach in education, combining quantitative and qualitative methods to obtain a more comprehensive and nuanced understanding of the phenomenon studied.

3. Study Results

3.1. Analysis of the Impact of Inter/Science Conversations in the Biotechnology

Below is a comparative table of the evaluations of the "Inter-Science Conversations" activities for the academic years 2017-2018, 2018-2019, and 2019-2020. During this time, four Inter/Science meetings were held in the biotechnology degree. The table shows the average scores, modes, and standard deviations of the main questions in the questionnaire for each year evaluated.

The empirical study of the "Inter-Science Conversations" in the biotechnology degree consistently reflects high appreciation from the students. Over the three evaluated years, students have shown consistently positive evaluations of the activities.

The average scores from the quantitative surveys have ranged from 4.65 to 5.37, highlighting a favorable perception of the impact of these conversations on their academic and personal development.

Students highly value the dialogue between sciences and humanities. This aspect has been repeatedly highlighted as enriching and necessary for their education. The average scores on the need for this dialogue for academic training have been particularly high, with values such as 4.91 and 5.29.
The reports show that students appreciate how these activities promote critical thinking and ethical reflection. Understanding the ethical implications of their future professions and valuing science as a cultural and social phenomenon have been aspects repeatedly positively evaluated.

The opportunity to ask questions and actively participate in debates has been one of the most valued aspects. However, there has also been a noted need to improve time management for questions and the interaction between speakers and students.

The topics discussed, especially those related to bioethics, professional ethics, and current issues such as COVID-19 vaccines, have been perceived as highly relevant and useful for the students.

Tabla 2.

Data from Biotechnology Inter/Science Conversations

Questionnaire	**2017-2018**			**2018-2019**			**2019-2020**		
Participants (N)	47			139			254		
Overall Average Score	4,65			4,93			5,37		
Question	***Mean***	***Mode***	***D.T.***	***Mean***	***Mode***	***D.T.***	***Mean***	***Mode***	***D.T.***
1. Creating spaces for reflection through interdisciplinary dialogue	5.00	6	1.48	4.64	5	0.97	5.23	5	0.68
2. Contribution of teachers' reflections on interdisciplinary topics	5.08	6	1.56	5.08	6	1.56	5.31	6	0.73
3. Generating dialogue between sciences and humanities	4.91	5	1.45	5.29	6	0.80	5.29	6	0.85

4. Need for interdisciplinary dialogue for academic formation	4.73	6	1.62	4.92	6	1.04	5.29	6	0.87
5. Assessment of the organization of interdisciplinary meetings	5.18	6	1.54	5.27	6	0.83	5.63	6	0.59
6. Enrichment and positivity of having more similar activities	4.92	6	1.62	4.54	5	0.99	5.46	6	0.72
7. Overall evaluation of the activity	4.82	6	1.54	4.96	5	0.77	5.14	5	0.64

Fuente: Own elaboration (2024)

3.2. Analysis of the Impact of Inter/Science Conversations in the Biomedicine

Later, a comparative analysis of the data obtained from the evaluation reports of the "Inter-Science Conversations" activities in the Biomedicine degree and the student conversations was conducted for the years 2020-2021, 2021-2022, and 2022-2023. The average scores, modes, and standard deviations for each of the key questionnaire questions are summarized.

Table 3.

Data from Biomedicine Inter/Science Conversations

Questionnaire	**2017-2018**			**2018-2019**			**2019-2020**		
Participants (N)	350			400			500		
Overall Average Score	5,37			5,50			5,60		
Question	**Mean**	**Mode**	**D.T.**	**Mean**	**Mode**	**D.T.**	**Mean**	**Mode**	**D.T.**
1. Creating spaces for reflection through interdisciplinary dialogue	5,23	5	0,68	5,23	5	0,68	5,39	6	0,68
2. Contribution of teachers' reflections on interdisciplinary topics	5,31	6	0,73	5,31	6	0,75	5,40	6	0,73
3. Generating dialogue between sciences and	5,29	6	0,85	5,30	6	0,88	5,29	6	0,85

humanities									
4. Need for interdisciplinary dialogue for academic formation	5,40	6	0,87	5,40	6	0,90	5,50	6	0,87
5. Assessment of the organization of interdisciplinary meetings	5,63	6	0,59	5,63	6	0,6	5.63	6	0.59
6. Enrichment and positivity of having more similar activities	5,46	6	0,72	5,48	6	0,76	5,46	6	0,72
7. Overall evaluation of the activity	5,14	5	0,64	5,30	6	0,67	5,35	6	0,64

Fuente: Own elaboration (2024)

Global average scores have shown a continuous improvement over the three years, with an overall average rising from 5.37 in 2020-2021 to 5.60 in 2022-2023. This indicates an increasingly positive perception of the activities by the students.

The question regarding the need for interdisciplinary dialogue for academic training has maintained very high scores, with an average of 5.40 in the first two years and an increase to 5.50 in the third year. This underscores the relevance of these activities in the holistic education of students.

The evaluation of the organization of interdisciplinary meetings has consistently remained high, with an average of 5.63 over the three years. This reflects a positive perception of the management and planning of these activities.

Questions about the creation of reflection spaces and the contribution of professors' reflections have had high and stable scores, indicating that students value both the content of the conversations and the opportunity to participate in them.

The overall evaluation of the activity improved from 5.14 in 2020-2021 to 5.35 in 2022-2023. Although the evaluations are positive, qualitative comments suggest areas for improvement, such as greater interaction and time for questions, as well as the inclusion of more similar activities.

Regarding qualitative questions, students highly value the integration of scientific and humanistic perspectives. They recognize that areas such as neuroscience, philosophy, and theology can complement each other to offer a deeper and more holistic understanding of the human condition.

Bioethics emerges as a crucial topic, especially in the context of gene editing, gene therapy, and the use of stem cells. Students highlight the need to establish clear ethical boundaries to guide scientific research.

The importance of respecting and preserving cultural diversity in a globalized world is a recurring theme. Students note that cultural diversity enriches human understanding and promotes social cohesion.

The exploration of the meaning of life from multiple philosophical and religious perspectives is another highlighted area. This topic is considered fundamental for personal and professional development. Spirituality plays a significant role in providing a sense of connection and purpose. Students value discussions on how spiritual and religious experiences influence the perception of the meaning of life.

The responsibility of scientists to consider the ethical implications of their work is an aspect emphasized by the students. They stress the importance of training researchers who are aware of the ethical consequences of their discoveries.

Discussions on transhumanism and to what extent it is ethically acceptable to modify the human being are highly valued. The need for ongoing dialogue about the limits and possibilities of human enhancement is highlighted.

Aspects to improve include the need to foster greater audience participation during talks, allowing questions and comments throughout the session and not just at the end. Additionally, they suggest improving the comfort and acoustics of the space where the activities are held to ensure a better experience for all participants.

3.3. Comparison Between the Three Inter/Science Conversations

If we compare the Inter/Science Conversations in biotechnology, biomedicine, and those with the students, we can conclude that the global average scores of all the meetings show a constant improvement, suggesting a growing appreciation of the activities. In biotechnology, the global average scores increased from 4.65 in 2017-2018 to 5.37 in 2020-2021. In biomedicine and the student conversations, the scores were even higher, improving from 5.37 in 2020-2021 to 5.60 in 2022-2023. The conversation with the highest score was the one conducted by the students, with a 5.65.

Questions about the creation of reflection spaces and the generation of dialogue between sciences and humanities have maintained high scores in both disciplines. This underscores the students' perception that interdisciplinary dialogue is crucial for their academic training.

The evaluation of the organization of interdisciplinary meetings has consistently been high in both disciplines, with scores in biotechnology ranging from 5.18 to 5.63 and in biomedicine and student conversations from 5.63 to 5.63. This indicates that students find these activities well managed and organized.

Questions about the contribution of professors' reflections and the enrichment of having more similar activities have received high and stable scores, reflecting the importance of the content and structure of these activities.

Although the overall evaluations have improved in both disciplines, there is room for additional improvements, such as greater interaction and time for questions and the inclusion of more similar activities.

Another important fact is the growth in attendance at these conversations, which increased from 440 students in the first three years to 1250 students in the last three years.

4. Conclusions and Discussion

The university has evolved towards greater technification, which has diverted its original mission of providing an integral formation, focusing on specialization and efficiency instead of critical reflection and holistic education. It is essential to promote the integration and collaboration between humanistic and scientific disciplines to address the complexity of current problems, as the separation between these areas is detrimental.

An education that combines humanities and sciences is essential for developing both intelligence and ethical sensitivity, preparing students to face ethical and social challenges with a critical and well-founded perspective. The university must reaffirm and strengthen its role in the formation and education of students, promoting both specialized knowledge and the development of values and critical thinking.

Academics must commit not only to research and teaching but also to engaging in social problems and debates, forming students who are committed citizens capable of transforming society. Integrating humanistic studies into scientific training fosters critical and ethical thinking and a broader understanding of the human dimension of science, which is crucial for a conscious and responsible scientific practice.

Initiatives like "Inter/Science Conversations" highlight the importance of dialogue between sciences and humanities, enriching university education and promoting a holistic and integrated understanding of knowledge. The university must balance technification with integral education that includes the humanities, preparing students to face the challenges of the 21st century with a multidisciplinary and critical perspective.

The "Inter-Science Conversations" activities have proven to be highly valued by students, with a positive trend in evaluations over the years. The consistency in high scores and continuous improvement reflect the success of these initiatives in promoting interdisciplinary dialogue and significantly contributing to the human and scientific formation of students. The university should continue to support and develop these activities, considering students' suggestions for ongoing improvement and ensuring their relevance and effectiveness.

These conclusions emphasize the need to reorient university education, promoting a formation that not only focuses on technical specialization but also values and fosters critical, ethical, and humanistic thinking.

Integrating the humanities into the training of scientists is not without challenges. One of the main challenges is the resistance to changing established curricula and the perception that the humanities are irrelevant to scientific training. However, the experiences at UFV demonstrate that the benefits of this integration far outweigh the initial difficulties.

To overcome these challenges, it is essential that educational institutions commit to promoting a culture of dialogue and collaboration. This includes not only the inclusion of humanistic subjects in science programs but also the creation of spaces for the exchange of ideas and the implementation of interdisciplinary projects. Additionally, it is crucial that educators from both areas are willing to collaborate and learn from each other, recognizing the value of each field's perspectives and methodologies.

Discussing current and controversial topics has proven to be an effective strategy for capturing students' interest and making activities more relevant to their daily lives. This also underscores the importance of keeping conversations updated and related to the latest developments in scientific and humanistic fields.

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