The Perception of Teachers Regarding Entropy in University Institutional Management

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Abstract

University Entropy from the Teachers' Perspective Highlights Challenges in Terms of Structure, Communication, or Resource Management Efficiency. The study aims to determine teachers' perception of entropy in university institutional management. The methodology employed was quantitative, descriptive level, cross-sectional, and non-experimental in design. The population consisted of 300 teachers from various public universities in Lima who voluntarily participated. A key characteristic was that the universities had obtained institutional licensing. The entropy instrument has 2 dimensions: management and metamanagement, with 16 items using a dichotomous scale. It was validated by experts and subjected to a pilot test for reliability, obtaining a KR20 of 0.87. The study results revealed that entropy associated with the licensing process is perceived at high and medium levels, reflecting the persistence of fear, anxiety, uncertainty, and controversy regarding potential loss of autonomy. This autonomy is considered crucial in the university setting as it contributes to the development of critical thinking and professional formation of students. It is concluded that there is an urgent need to adopt a more holistic and reflective approach to address the challenges facing the education system in its constant pursuit of excellence and continuous improvement. This implies avoiding the influence of political control and management in the academic sphere, thus allowing for a more conducive environment for the overall growth and development of higher education.

Keywords: Perception, teachers, entropy, management, and national universities

1. Introduction

The inherent complexity of the concept of entropy poses challenges for students and teachers, and ambiguity in its interpretation persists. For a better understanding and application of the concept of entropy, it has been extended to other disciplines such as the social sciences, which are validated through the teaching process (Ferreira et al., 2023).

In general, teachers do not understand or do not know the term entropy. It is likely that the meaning has to be avoided since there is a gap in knowledge and/or understanding in the educational community (Flores-Camacho & Ulloa-Lugo, 2014). The definition of entropy as "the measure of disorder" may offer an apparently intuitive understanding, but in reality, it leads to a simplification that obscures its true meaning (Reyes García, 2023; Subiela et al., 2023). The position arguing that entropy is a measure of the irreversibility of processes influences natural transformation with a constant increase in the universe towards a more chaotic state (Montoya Carvajal et al., 2023). In these terms, entropy has found its application in the educational sector, where it is used to understand the dynamics of learning processes and the organization of educational systems. This extension of the concept reflects its versatility and relevance in various fields of knowledge (Marin Ruiz, 2014).

Universities are experiencing a significant increase in entropy, or disorder, within their structure. There is an argument for the need to propose a new educational model that decolonizes academic and teaching practices as a vital strategy. Therefore, it is emphasized that higher education responds to diverse communities by offering sustainable curriculum programs that promote intercultural education and adopt a decolonial and relevant academic and teaching approach (Castillo Castillo, 2023).

If there is careful planning, it is possible to positively stimulate the teaching staff, mitigate risk, and overcome challenges; however, educators are not aware of the advances in the formalization and clarification of entropy, which prevents them from integrating valuable ideas into their teaching methods (Guanin-Fajardo et al., 2023).

The apprehension and application of the concept of entropy in the administration of university institutions present substantial challenges, both for educators and for the effective development of these entities. In this context, entropy plays a crucial role in addressing the complexity and intrinsic dynamics of academic and operational management. The perception that teachers have about entropy in university administration reflects a scenario marked by complexity and a lack of conceptual clarity. (Arriaga Ornelas, 2017; Cárdenas Messa, 2020). Not only conceptual, but accrediting bodies are also more scrutinizing and punitive, generating resistance among the authorities responsible for implementing corrections. The lack of tact and training of some evaluators provokes negative reactions and widespread complaints in the evaluated universities (UNESCO, 2004).

In the 2010s, higher education in Peru faced challenges such as informal employment for 30% of graduates and low rankings. Law No. 30220, the University Law, enacted in 2014, aimed to improve quality without affecting autonomy. In response, the National Superintendence of Higher University Education (SUNEDU) was created to supervise educational quality (Benavides & Saldarriaga, 2020).

The research is based on the total quality theory. One of the representatives is Kaoru Ishikawa who promoted the participation of all employees in the continuous improvement of quality. He developed the Ishikawa diagram to identify and solve problems. He believed in shared responsibility for quality throughout the organization, from management to rank-and-file workers, encouraging collaboration and teamwork to achieve excellence in products and services (Lozano Cortijo, 1998).

The study establishes theoretical foundations in two aspects: educational management and meta-management. Key aspects for business success. Management deficiencies are attributed to the lack of risk plans, contingency procedures and environmental prevention and correction measures. Delays in the delivery of documents and information are also highlighted. (Ordóñez Parra et al., 2021).

The Entropy variable establishes educational management and meta-management as dimensions that support the critical analysis of the research. Likewise, the Educational Management dimension is subdivided into four indicators (a) Controversial (b) Changing (c) Uncertainty and (d) Static.

The Controversial indicator represents ideas about progressive education and democracy in institutions that generate debate and controversy. A frame of reference is John Dewey, who establishes the promotion of a university culture centered on learning, participation, and commitment to educational excellence and the integral development of the university community (Esteves-Fajardo et al., 2021; Ruiz, 2013).

The Changing indicator symbolizes a profound shift within educational systems, emphasizing the appreciation of diverse learning styles over the traditional exam-oriented model (Condori Gutiérrez, 2019). A prominent advocate of this perspective is Ken Robinson, renowned for championing sweeping transformations in the education sector.

The Uncertainty indicator represents the concept of self-organization, setting aside conventional ideas about the educational process. One representative of this approach is Sugata Mitra. (Baloco Navarro et al., 2021; Sánchez Quitián & Vargas Gómez, 2020). The fourth static indicator that underpins the structure of knowledge and learning processes, as proposed by Jerome Bruner, is fundamental for understanding the dynamics of education. Bruner, a prominent cognitive psychologist, emphasizes the importance of knowledge structure and its influence on learning processes (Baloco Navarro et al., 2021).

The second dimension called Meta-Management is represented under the theory of Edgar Morin, since the approach developed is the understanding of complexity in systems and its application in various areas of knowledge including management. (Estrada García, 2020; Ferrada-Sullivan, 2017). Morin also proposes holistic approaches to address organizational challenges in an interconnected and changing world (Macías et al., 2020)

Meta-Management is a management approach that addresses the complexity and dynamics of organizational systems, promoting adaptability, continuous learning and a holistic understanding of the challenges and opportunities faced by organizations in a changing environment (Hidalgo-Flor, 2022). The indicators of Meta-Management are (a) Autonomy, (b) Transformation, (c) Complexity and (d) Restructuring.

Autonomy is the indicator that highlights the ability of teams to make independent decisions, fostering innovation and responsibility. Autonomy remains crucial for the achievement of institutional goals. The University Law, Peruvian case argues that the regulations affect the freedom of teaching and research, as well as the ability to adapt to technological advances. The need to foster critical and innovative thinking in order to generate a transforming impact on society is emphasized (Hidalgo-Flor, 2022; Sánchez Pinedo, 2022; Suyo-Vega et al., 2022).

Transformation refers to the capacity to adapt to changes in the business environment. Higher education in Latin America highlights its massification and the growing influence of privatization in financing. The transformation has changed the perception of the university from being an institution for elites to one focused on training human capital for the labor market and social mobility (Labraña & Brunner, 2022).

Complexity recognizes the diversity of business operations, which require efficient management to optimize resources and minimize risks (Hidalgo-Flor, 2022; Ramírez Ramírez et al., 2021)

Finally, Restructuring involves adjusting the organizational structure and processes to improve efficiency and effectiveness (Cruz Cardona & Quintero, 2022; Esquicha Medina, 2018)

The research focuses on analyzing the perception of teachers from national university institutions regarding the concept of entropy in academic management. This approach is crucial given the increasing complexity of universities, which face diverse challenges, from program diversification to the integration of technological advances. Entropy is presented as an essential conceptual framework for understanding the dynamic nature of knowledge and its evolution in this context. Additionally, it identifies possible deficiencies in the understanding and application of

entropy, offering valuable insights to strengthen university management and effectively adapt to an ever-changing educational environment.

On the other hand, entropy is associated with the field of science, but where there is disorder or imbalance in various aspects. In the case of public universities, obtaining licensure has brought about changes in administrative management, from course planning to the effectiveness of the programs offered. This research characterizes the difficulties faced by institutions in complying with the requirements. (Gallegos, 2017).

Failure to obtain institutional licensing may be the result of several factors, either academic or administrative. Failing to obtain a license can result in penalties or even the closure of the institution, underscoring the importance of seeking and maintaining licensing to ensure the validity and trust in the educational quality offered. However, during the licensing stage, punitive regulations were imposed to close universities and sanction their authorities; by denying institutional licenses, political bias and particular interests become evident (Velásquez Benites et al., 2022).

2. Methodology

This study has a quantitative approach, descriptive level, non-experimental design, and cross-sectional design (Hernández Sampieri et al., 2014).

The population consisted of 300 teachers from various public universities in Lima. The teachers belong to different academic schools. Sampling was non-probabilistic for convenience (Otzen & Manterola, 2017).

The criteria included for the selection of teachers were that they be appointed with more than 1 year of undergraduate or graduate university experience, and that they be actively involved in the licensing process. The instrument was applied for a period of four months. The application was virtual through the Google Docs form, which allowed for the collection of information in real time (Alarco & Álvarez-Andrade, 2012).

The questionnaire applied on entropy has two (2) dimensions: management and meta-management, totaling 16 items with a dichotomous scale. The instrument was validated by the judgment of 10 national expert researchers, obtaining 0.87 according to the KR20 (Merino Soto, 2010). It was also subjected to a pilot test for reliability, with a rating of 0.92, considered highly reliable (Chaves-Barboza & Rodríguez-Miranda, 2018).

The ethical principles of research, such as autonomy, beneficence, nonmaleficence and justice, were followed throughout the research process. Autonomy is when the research subject can stop answering and not answer the entire form; no intervention was made to manipulate his/her response. Likewise, beneficence was observed when the participant received information indicating that the data collection was solely for research purposes. At no time was personal data requested, and total anonymity was maintained. Likewise, it was informed that the information will not be used to harm or comment on their answers (Espinoza Freire & Calva Nagua, 2020).

Likewise, authorization for the execution of the study was requested, and informed consent was obtained from each teacher included in the research (Suárez-Obando, 2016).

To obtain the results, descriptive quantitative analysis was conducted using the Excel program. These results were grouped according to the objectives outlined (Carrillo et al., 2007).

3. Results

The results are grouped according to variables and dimensions. In each case, the high, medium, and low levels are described with their respective percentages (Table 1, 2).

Table 1: Level of perception of teachers about entropy in national university institutions

Dimensions	High		Medium		Low	
	N	%	N	%	N	%
D1 Educational Management	140	46	80	27	80	27
I1 Controversial	126	42	69	23	105	35
I2 Changing	135	45	90	30	75	25
I3 Uncertainty	144	48	60	20	96	32
I4 Static	153	51	105	35	42	14
D2 Meta-management	132	44	103	34	65	22
I1 Autonomy	114	38	126	42	60	20
I2 Transformation	132	44	87	29	81	27
I3 Complexity	150	50	84	28	66	22
I4 Restructuring	132	44	114	38	54	18

Table 1 describes that teachers from public institutions perceive a high level regarding the entropy variable, with over 40%, and in its dimensions in educational management, it is noteworthy that it is controversial (42%), changing (45%), generating uncertainty (48%), and static (51%). Regarding the Meta-management dimension, a medium and low level is identified (62%) for autonomy, (56%) for transformation, complexity (50%), and restructuring (56%), prevalent risks for the licensing process of universities.

Table 2: Teachers' perception of the educational management of university institutions by items

Entropy	Yes	No	Sometimes
Educational management			
Controversial			
1 The established norms for the licensing process allow planning according to existing resources	45%	25%	30%
2 The experience of implementing the regulations improved university management processes	39%	21%	40%
Changing			
3 The contextualization of licensing regulations modified the established processes in university management.	47%	32%	21%
4 The implementation of licensing regulations organized the processes of university management.	43%	28%	29%
Uncertainty			
5 The requirement for compliance with institutional licensing regulations brought uncertainty about the authorization of operation.	61%	23%	16%
6 The university educational community considers that those responsible had difficulties in developing the means of verification for licensing.	35%	17%	48%
Static			
7 The university educational community showed resistance to the implementation of licensing indicators.	56%	29%	15%
8 The university educational community participated in the development and compliance of licensing indicators.	47%	40%	13%
Meta-management			
Autonomy			
9 The licensing management process ensures university autonomy.	29%	45%	26%
10 The university educational community considers that autonomy is guaranteed through compliance with quality indicators.	47%	40%	13%
Transformation			
11 The university educational community perceives significant changes in the improvement of educational services after licensing.	37%	28%	35%
12 Teachers perceive that the licensing process had direct implications on their professional development.	52%	30%	18%
Complexity			
13 University management of various academic programs, with their own demands, faces the challenge of incorporating new pedagogical approaches.	61%	27%	22%
14 The university educational community faces challenges in integrating technology and innovative methodologies.	49%	30%	21%
Restructuring			
15 University management of the various academic programs had human and financial resources for better service.	46%	35%	19%
16 University management implemented new technologies and/or methodologies to promote research in teaching.	43%	40%	17%

University educational management reflects a complex dynamic between established regulations and their practical application. The perception of professors is diverse: while almost half of the respondents recognize the adequacy of regulations for planning (45%), a similar proportion considers that the implementation of regulations has not substantially improved university management

processes (39%). This suggests the existence of challenges in the adaptation and application of current regulations, which could affect the efficiency and effectiveness of university management.

On the other hand, the dimension of meta-management reveals a divided perception regarding the guarantee of university autonomy through the licensing process. While a considerable percentage of professors perceive direct benefits in their professional development (52%), there is uncertainty as to whether the licensing process really ensures university autonomy (45%). This dichotomy raises questions about the real scope of regulations in the exercise of academic and administrative autonomy of universities.

4. Discussion and Conclusion

In the educational and social context, there is a responsibility to address and adapt to changes and social dynamics. The perspective of entropy emerges as a phenomenon that influences various human dimensions. In the university setting, a comprehensive analysis of entropy in various spheres is required to manage solutions that benefit both the university community and academic institutions.

It should be noted that entropy represents the disorder and uncertainty of a system that encompasses management processes related to educational quality, including standards, norms, and procedures that must be addressed promptly. Rabanal, (2017) It indicates that open systems evolve in multiple scenarios. In the context of public university education, a static system is observed, which is poorly adaptable to changes, generating constant uncertainty and resistance to change in the educational environment. Likewise, the licensing process represents a challenge for university organizations that seek to constantly improve the quality of their educational services. It serves as a driver for changes and improvements in all aspects of the institution (Cárdenas Messa, 2020). So, entropy is fundamental for the necessary transformations in education, adapting to a dynamic reality, examining education as a system with low entropy, organized and not very adaptable to the changing contemporary reality.Villarruel-Fuentes et al., (2022).

They express that entropy emerges as a new perspective in educational formation, grounded in epistemic and theoretical-conceptual frameworks that are oriented from the complexity of systems. Professional practices are the pinnacle of any disciplinary training, reflecting how one understands and intervenes in social reality. In Peru, a law is promulgated (*Ley Universitaria Ley N°30220*, 2014) which established the obligation for universities to obtain their Institutional License. This process involved complying with Basic Quality Conditions(Minedu, 2017) Within an established schedule, with the aim of regulating and ensuring quality standards in the country's higher education institutions. To fully understand the process, it is essential to analyze the perceptions of teachers from the perspective of entropy. This approach shed light on the behavior of the phenomenon in question.

The findings revealed a marked perceptual inclination towards "Entropy," with 45% of high perceptions and 31% of medium perceptions. Likewise, it was observed that associated dimensions, such as Controversial, Changing, Uncertainty, Static, Autonomy, Transformation, and Complexity, maintain significant levels of high and medium perception.These the data match with Reátegui Marín, (2022). The one who found that the overall perception within the university was one of disorganization and lack of clarity in internal communication, along with low staff commitment. Despite these difficulties, the institutional licensing process was legitimized. However, a negative predisposition towards participation in this process was observed due to the lack of clarity in internal communication.

The legitimization of licensing is crucial for improving organization and streamlining university procedures. This means that higher education institutions must undergo continuous and systematic evaluation to reflect on their management and service, which involves self-assessment to ensure the fulfillment of mission and objectives, implement an efficient information system, and link results with institutional improvement. Evaluation for licensing demonstrates a commitment to quality and academic excellence, being essential for effective decision-making.

University evaluation has evolved from external certifications to internal evaluations, such as self-assessment. With proper leadership, universities improve their educational and research quality. In Latin America, especially in Peru, a culture of quality measurement in high-responsibility programs has been promoted, reflecting a commitment to academic excellence and adaptation to current challenges (Yamada & Castro, 2020).

Licensing, as part of the Quality assurance policy, is mandatory and aims to ensure basic quality conditions. Additionally, it encourages the revaluation of the faculty, proper selection of students, and improvement of infrastructure to meet professional training standards (Ahumada Bastidas, 2021).

In the case of the "Autonomy" dimension, it emerges with significant presence, primarily distributed across medium and low levels. This phenomenon not only underscores the preeminence of autonomy as a prominent component in the perception of entropy but also signals its potentially risky role for the university licensing process. The predominant factor is autonomy (Velásquez Benites et al., 2022).

The university licensing process in Peru can be considered part of a reformist policy that hinders university freedoms. Despite budgetary constraints, higher education institutions have shown leadership and creativity in their national development. Likewise, entropy and its dimensions reveal high and medium levels from the perspective of teachers, generating controversy around licensing requirements, perceived as imposing and subject to political control. This fact highlights the importance of approaching autonomy from a deeper scientific understanding, considering it not only as a characteristic of academic management, but also as a critical factor that influences the overall perception of complexity and disorder in the context of university licensing.

In this sense, the implementation of management strategies is proposed that not only mitigate the potential risks associated with autonomy but also foster its positive contribution to the integral development of quality educational policies in educational institutions. This perspective emphasizes the urgent need for a more holistic and reflective approach to address the challenges facing the educational system in its constant pursuit of excellence and continuous improvement.

The limitations they face include the implementation of effective management strategies such as budgetary and human resources constraints, which hinder their application and effectiveness. Without disregarding the resistance to adopting new practices and policies, especially if they perceive them as threatening their autonomy and control.

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