Engagement and scientific production at universities in Peru

Compromiso y producción científica en las universidades de Perú

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ABSTRACT
Teacher commitment has a positive relationship with their satisfaction and positive emotions, which encourages them to conduct research. This benefits universities by increasing their scientific production, thus improving their position in rankings and their reputation in the scientific community. The aim of this study is to analyze the relationship between engagement and scientific production. This basic cross-sectional research has a quantitative and descriptive approach, with a non-experimental hypothetical-deductive design. The sample was made up of 106 teachers from three private universities in Peru. The validation of the instruments was carried out through the judgment of experts majored in Human Resources and University Management. Data were collected through virtual surveys for each study variable, and a descriptive and inferential statistical analysis was performed. The results showed that teachers with a good level of commitment contribute significantly to the increase in research, especially when intrinsic and extrinsic reward systems are applied effectively. Consequently, it was concluded that it is necessary to develop improvement strategies that are based on the situation of the institution to encourage teachers to conduct research.

Key words: engagement, reward system, scientific production.

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RESUMEN
El compromiso de los docentes tiene una relación positiva con su satisfacción y emociones positivas, lo que les anima a realizar investigaciones. Esto beneficia a las universidades al aumentar su producción científica, mejorando así su posición en los rankings y su reputación en la comunidad científica. El objetivo de este estudio es analizar la relación entre el compromiso y la producción científica. Esta investigación transversal básica tiene un enfoque cuantitativo y descriptivo, con un diseño hipotético-deductivo no experimental. La muestra estuvo conformada por 106 docentes de tres universidades privadas del Perú. La validación de los instrumentos se llevó a cabo a través del juicio de expertos con especialización en Recursos Humanos y Gestión Universitaria. Los datos se recolectaron a través de encuestas virtuales para cada variable de estudio, y se realizó un análisis estadístico descriptivo e inferencial. Los resultados mostraron que los docentes con un buen nivel de compromiso contribuyen significativamente al aumento de la investigación, especialmente cuando los sistemas de recompensa intrínsecos y extrínsecos se aplican de manera efectiva. En consecuencia, se concluyó que es necesario desarrollar estrategias de mejora que se basen en la situación de la institución para incentivar a los docentes a realizar investigaciones.

Palabras clave: compromiso, sistema de recompensas, producción científica.

INTRODUCTION

Ranking that evaluates the performance of universities in Research, Innovation and Social Impact places institutions from the United States and China in the top five positions. In Latin America, Brazilian universities hold the first four positions, however the university that ranked fourth at the regional level, placed seven hundred and tenth worldwide. Cayetano Heredia University leads the list in Peru, ranking sixty-first in Latin America and four thousand five hundred and fifty-eight globally. On the other hand, the Technological University of Peru ranked the last places (Scimago, 2023a, 2023b, 2023c).

It is extremely important to enhance the level of engagement at universities in order to boost scientific production. To this end, it is necessary to design strategies adjusted to the specific situation of each institution to encourage teachers to conduct research (Moquillaza, 2019). In Ecuador, public policies were implemented based on the Scimago ranking, which universities took advantage of to increase engagement. These initiatives, in turn, resulted in a significant increase in the number of national publications. In the Peruvian context, CONCYTEC (National Council of Science and Technology) has established tax incentives for private companies that decide to invest in science and technology. This measure, which universities should consider as a strategy, seeks to improve teaching engagement by providing tangible benefits and promoting collaboration between academic and business sectors (Barrutia et al., 2019).

Teacher engagement, according to Falla et al. (2022), is defined as the level of enthusiasm, dedication and commitment to the job, demonstrating interest in both the institution and the impact that adequate engagement can have on the quality of student learning. However, various personal situations, unfavorable working conditions, unmotivated colleagues and the feeling of lack of support due to a low level of engagement can generate stress in teachers and ultimately lead to burnout syndrome, slowing down progress in the number of publications (Chein and Damian, 2021; Kuong et al., 2021). To counteract these challenges, universities, through their academic directors, must provide areas that foster teachers' self-motivation. This involves improving working conditions, clarifying the institutional reward system and providing adequate and timely emotional support. The goal is to increase scientific production, which, in turn, will contribute to improving the institution's position in world rankings (Privalov et al., 2021; Yalçınkaya et al., 2021).

Martinez et al. (2020) conducted a study that examined personal resources, such as self-efficacy, self-esteem, and optimism, as significant factors in predicting engagement. Studies by Vera et al. (2017) indicated that self-evaluation, which includes self-esteem, self-efficacy, checkpoints, and emotional stability, has a positive relationship with engagement. In addition, self-efficacy shows both short- and long-term positive impact on engagement (Bedoya et al., 2017). Lastly, Pedraza (2020) showed that there is a positive relationship among responsibility, positive emotions, organizational culture levels and engagement.

The recent research of Guadalupe et al. (2021) has revealed that extroversion and awareness have an influence on engagement through specific work factors. In a different study, Calizaya et al. (2020) identified the direct and indirect impact of positive psychological capital on employee engagement. Likewise, Colín (2019) found that front- line staff with high psychological capital show greater dedication to their work, which translates into improved results.

In the Peruvian context, universities require that teachers and new staff publish in high impact journals indexed in international databases such as Web of Science, Scopus and Scielo. Currently having a specific number of scientific publications or holding the title of Renacyt Researcher recognized by CONCYTEC is a requirement to apply for a teaching position. However, the situation in many universities in Peru reflects the lack of adequate training, updated work environments and equipment, as well as remuneration and compensation for publishing that does not balance the workload with the time dedicated to scientific production. This approach, which considers teachers as mere "writing machines", neglects fundamental aspects such as emotional support, enough rest for collaborators, generating reactive attitudes and low levels of engagement among teachers.

The justification for this study is based on the importance of scientific production at university level, considering its vital role in the progress and development of society. Universities, as centers of higher education, play a fundamental role as promoters of the creation of knowledge and new ideas, contributing significantly to the advancement of science and technology. In this context, the main objective of this research is to determine the relationship between engagement and scientific production at universities in Peru.

Theoretical basis

The concept of engagement, proposed by Kahn in 1990, is defined as the use of organizational members to achieve business objectives, personal self-fulfillment and emotional stability of individuals. Over time, various researchers have expanded and enriched this definition. Huan et al. (2022), Khan (1990) and Sun and Bunchapattanasakda (2019) have added the Cognitive, Emotional and Psychic Theory of Engagement. Rameshkumar (2020) highlighted the importance of including emotions and behavior in the conceptualization of engagement. On the other hand, Kosaka and Sato (2020) have described it as a combination of commitment, loyalty and productivity, while Chanana and Sangeeta (2021) propose a different approach that includes cognition, emotion and behavior. Borst et al. (2020) emphasize employee engagement at work in cognitive, physiological and emotional terms. In turn, Huan et al. (2022) express that engagement is a term that encompasses different types of engagements, such as trait, behavioral and psychological. Additionally, Koprivitsa (2020) defines it as energy, participation and effectiveness, considering it as the opposite of burnout and stress. Despite these varied definitions,

engagement is conditioned by the individual's work and personal factors, as well as by the reward they may receive for performing their job efficiently.

The job demands-resources model (JD- R model) states that job and personal factors, both independently and jointly, have the ability to predict employee engagement. Specifically, when high levels of job demands are required, these factors have a more positive impact on employee engagement. In this sense, Vargas and Estrada (2020) claim that job resources can mitigate the impact of job demands, facilitate the achievement of professional goals and stimulate growth, learning and personal development. Albertcht et al. (2021) support this idea by stating that available job factors are the main predictors of engagement. A study conducted by Bakker and De Vries (2021) shows that certain job factors, such as financial profitability, team atmosphere and participation in decision making, have a positive influence on employee engagement.

In addition, cross-cultural theory is used to explain the differences in personal factors that influence engagement. Engaged employees, according to Carolina (2019), Hughes et al. (2018) and Pidduck et al. (2020), are characterized by optimism, self-efficacy, good self-esteem, resilience and a positive attitude to face challenges. These personal resources enable committed employees to effectively control and influence their work environment. Teekens et al. (2021) supports this approach by finding that resilience is an individual resource that promotes engagement.

The reward system constitutes a part of the brain responsible for indicating a person if situations are positive and, when repeated, generate greater satisfaction. According to Sutikno (2019), the aversion system indicates to the brain those situations that should be avoided because they generate anger, depression, listlessness, among others. Salameh and Zamil (2020) define reward as a benefit granted by employers in the form of money, benefits or promotions, generating job satisfaction. Kebels (2022) found in his study that an organization that provides recognition to its employees, along with training and other benefits, manages to develop their commitment to the company. Similarly, Ntanos et al. (2020) revealed that an effective reward system is directly related to employee motivation and satisfaction, showing that this strategy can have positive effects on the organization.

Intrinsic rewards, derived from the activity performed, can improve mood and contribute to the well-being of others (Bozzo, 2019). Araujo et al. (2021) point out that intrinsic rewards at work, such as reputation empowerment, autonomy and trust, are fundamental to maximize employee commitment, motivation and participation. Pinho et al. (2018) claim that these rewards also enhance organizational support and employee satisfaction, influencing positively affective commitment and work engagement. In contrast, extrinsic rewards are external to the job and include tangible benefits such as bonuses, job security, private offices, promotions, social climate, salary increase, vacation pay and paid leave (Araujo et al., 2021). Employees who prefer extrinsic rewards tend to show higher performance and contribute to the achievement of organizational goals when they receive tangible rewards (Abad, 2019). Since these rewards generate reciprocal results, upon receiving them, employees are satisfied, which enhances their performance and benefits the organization (De Souza and Alves, 2021).

Montalván et al. (2020) emphasize that scientific production is the form in which knowledge is expressed, not necessarily associated with the academic field. Mohabad et al. (2020) and Carvajal and Rodríguez (2019) claim that it is the result of intellectual work, characterized by being published and unpublished, in order to contribute to the development of science. Lopera et al. (2021) point out that scientific production includes tangible materials susceptible of being quantified, such as books, articles, patents and their variants in printed and digital media (Alcalá and Parra, 2021).

Human capital theory suggests that educational level, experience and individual skills are determinants, as educated and trained researchers are likely to conduct research (Montalván et al., 2020). Social capital theory highlights the importance of social networks, interactions and collaborations with other scientists, both nationally and internationally. These connections facilitate the exchange of knowledge, experiences, resources and opportunities (Falla et al., 2022). In this regard, life-cycle theory suggests that scientific productivity undergoes variations throughout a researcher's career, following an upward and positive trend according to the professional development achieved (Carvajal and Rodriguez, 2019).

METHODOLOGY

This research is characterized by its quantitative and descriptive approach, adopting a basic non-experimental design with a hypothetico-deductive method and a cross- sectional design. The research begins with an exhaustive review of specialized literature, selected from journals indexed in the Scopus database, with the aim of identifying articles that have contributed to the development, analysis and support of the variables under study: engagement and scientific production.

A questionnaire made up of 23 items was designed to gather information, using a Likert type scale with five response alternatives (from 1 to 5). This instrument was structured with the purpose of measuring the relationship between the different elements that comprise it, based on indicators and dimensions formulated in the framework of the research.

The questionnaire was submitted for validation by experts, who carried out the content validation and suggested improvements to refine it. Afterwards, an electronic form was created with the final version of the questionnaire using the

Google Forms platform, which was shared with a total of 106 teachers belonging to three private universities in Peru, covering undergraduate and graduate academic levels.

Data collected were organized in an Excel matrix and exported to the SPSS- V26 program to get scores corresponding to each dimension and variable. Descriptive and inferential analyses were performed in order to contrast the hypotheses proposed and make decisions based on the values obtained. The analyses were carried out to implement new strategies for improvement in relation to the measurement of engagement in scientific production.

RESULTS AND DISCUSSION

Levels of engagement and scientific production

Table 1. Level of engagement and level of scientific production

			Scientific production			
			Under	Medium	High	Total
Engagement	Under	f	1	0	1	2
		%	0.96	0	0.96	1.92
	Medium	f	26	1	8	35
		%	25.00	0.96	7.69	33.65
	High	f	33	7	27	67
		%	31.73	6.73	25.96	64.42
Total		f	60	8	36	104
		%	57.69	7.69	34.62	100.00

Note. f = Frequency. % = percentage.

As shown in Table 1, in regard to the levels of engagement and scientific production, 64.42% of the teachers surveyed reported a high level of engagement, 33.65% reported a medium level, and only 1.92% reported a low level. Regarding scientific production, 57.69% reported a low level, which includes the production of patents and others. On the other hand, 34.62% indicated a high level, focused on the publication of scientific articles in indexed journals such as Scopus, Scielo, Latindex, among others. Likewise, 7.69% mentioned a medium level in the publication of books or book chapters and conference papers.

These results coincide with Moquillaza (2019), who suggests the need to improve engagement to increase scientific production, proposing strategies that are based on the reality of the institution and motivate teachers to conduct research. Similarly, Falla et al. (2022) point out that the level of engagement is reflected in enthusiasm, dedication and commitment to work, aspects that, when properly developed, have a positive impact on the quality of work and translate into high levels of scientific production.

Table 2. Levels of the dimensions of engagement

Levels of the dimensions of engagement	Under		Medium		High		Total	
	f	%	f	%	f	%	f	%
Organizational culture	43	41.3	0	0	61	58.7	104	100
Labor factors	42	40.4	0	0	62	59.0	104	100
Personal factors	0	0	21	20.2	83	79.8	104	100
Reward system	9	8.7	45	43.3	50	48.1	104	100

Note. f = Frequency. % = percentage.

Table 2 shows the frequencies and percentages of the levels of the dimensions of engagement. Regarding organizational culture, 58.7% of teachers indicated a high level, suggesting a relationship or predisposition towards research and scientific production. On the other hand, 41.3% stated a low level, showing the need for efforts to improve engagement levels. This result is in line with the statement of Pedraza (2020) who highlighted that organizational culture, responsibility, positive emotions and commitment are key requirements to improve engagement.

In the dimension of work factors, 59% stated a high level, coinciding with the studies of Bakker and De Vries (2021), who showed that certain work factors such as financial profitability, organizational climate and decision making have a positive impact on employee commitment. 40.4% indicated a low level, suggesting that there is still low commitment on the part of

teachers. This finding supports the claim of Albertcht et al. (2021), who stated that work factors are the main predictors of commitment.

In the personal factors dimension, 79.8% indicated a high level, evidencing energy and involvement to improve their knowledge and research capacity. This result is consistent with cross-cultural theory, which explains that personal factors, such as optimism, self-esteem, and resilience influence the ability of dedicated employees to positively influence their work environment (Carolina, 2019; Hughes et al., 2018; Pidduck et al., 2020). 20.2% expressed a medium level.

In the reward system, 48.1% indicated a high level, 43.3% a medium level and 8.7% a low level. These results suggest the need to improve employee benefits, supporting the idea of Salameh and Zamil (2020), who stated that reward is a benefit that generates job satisfaction. To improve these results, Ntanos et al. (2020) recommended that an effective reward system should be directly related to the levels of motivation and personal satisfaction. This implies implementing strategies that generate positive effects, leading to effective results where engagement levels reach the expectations of the organizations.

Table 3. Types of scientific production of teachers

Scientific production	f	%
Scientific articles	36	34.62
Book or book chapter	7	6.73
Patents	1	0.96
Other (conference papers, congresses, thesis advisories)	60	57.69
Total	104	100

Note. f = Frequency. % = percentage.

Regarding the types of scientific production, 34.62% corresponds to the publication of scientific articles in indexed journals such as Scopus, Web of Science, Scielo, Latindex, among others. In addition, 6.73% corresponds to the publication of books or book chapters, while 0.96% is attributed to utility patents. A significant percentage is related to other types of scientific production, such as conference papers, participation in congresses and research thesis advising.

The results obtained indicate a low percentage of teachers dedicated to scientific production, being the writing of scientific articles the main activity. It is crucial to improve this indicator, since the evaluation of the researcher is made through research results, which contribute to their qualification within the scientific community, as pointed out by Esteban et al. (2021). This result also finds support in the life-cycle theory, which suggests that scientific productivity varies according to a researcher's career, presenting an upward and positive trend as a function of their professional development (Carvajal and Rodriguez, 2019). It is essential that teachers maintain production levels in various types of scientific products, such as the creation of patents, writing of book chapters and publication in scientific articles with Q1 and Q2 indexing, in order to ensure a solid professional development in the scientific community.

Inferential results

A significance level of p = 0.05 was established and Kendall's Tau b test statistic was used to test the research hypotheses since transformations in three categories were used for both variables (low, medium and high).

The following study hypotheses were proposed:

General hypothesis

H0: Engagement is not related to scientific production

Hi: Engagement is related to scientific production at universities in Peru.

Table 4. Correlations between the levels of engagement and scientific production

			Engagement	Scientific production
Kendall's Tau_b	Engagement	Correlation coefficient	1,000	,195*
		Sig. (bilateral)	.	,039
		N	104	104
	Scientific production	Correlation coefficient	,195*	1,000

	Sig. (bilateral)	,039	.
	N	104	104

*. The correlation is significant at the 0.05 level (bilateral).

As shown in table 4, results show a positive and significant correlation between the variables, evidenced by a Spearman's rho coefficient of 0.195. This value indicates a low correlation, but the significance obtained was 0.039, which is less than the established significance level of 0.05. Consequently, the null hypothesis is rejected while the research hypothesis is accepted, with a confidence level of 95%.

Table 5. Correlations between the dimensions of engagement and scientific production

	Kendall's Tau b	Scientific production
Organizational culture	Correlation coefficient	0.108
	Sig. (bilateral)	0.258
	N	104
Labor factors	Correlation coefficient	,190*
	Sig. (bilateral)	0.047
	N	104
Personal factors	Correlation coefficient	,211*
	Sig. (bilateral)	0.028
	N	104
Reward system	Correlation coefficient	0.120
	Sig. (bilateral)	0.194
	N	104

According to the results of the dimension contrasts, it is observed that there is only a positive and significant correlation between work factors and scientific production (correlation coefficient = 0.190 and Sig. = 0.047 < 0.05), as well as between personal factors and scientific production (correlation coefficient = 0.211 and Sig. = 0.028 < 0.05). In contrast, no correlation was found between organizational culture, reward system and scientific production, since the significances in both cases were greater than 0.05.

These results suggest that it is necessary to address and improve both the organizational culture and the reward system to generate greater motivation and initiative on the part of teachers in the field of research. Kebels (2022) and Pinho et al. (2018) highlighted in their studies that an organization that offers recognition to its collaborators, along with providing training and other benefits, manages to develop their commitment to the company, improving organizational support and employee satisfaction.

CONCLUSIONS

Faculty researchers play a crucial role in the generation of new scientific knowledge at various conceptual levels, as well as in the development and design of innovative methods and processes. Both public and private sectors of higher education have implemented specific policies aimed at attracting these researchers. Events have been organized to encourage academics to focus on research and innovation to address both local and national challenges. Despite these efforts, it remains evident that the government's financial investment in research is limited.

As centers of academic and scientific excellence, universities play a fundamental role in the generation of new knowledge. The scientific output of these institutions not only contributes to expanding the boundaries of human knowledge, but also drives innovation, problem solving, and economic and social development. In addition, publications in Scopus and high impact journals provide opportunities to share and disseminate high quality research internationally.

In Peru, scientific production has increased significantly in the last decade, with a representative number of research professors recognized by RENACYT. However, according to the study conducted, it is observed that, despite some progress, the scientific production indicator is still relatively low. The highest percentage, 34.62%, corresponds to the publication of scientific articles in indexed journals such as Scopus, Web of Science, Scielo, Lantidex, among others. Likewise, 6.73% corresponds to publications of books or book chapters, 0.96% to patents, and a significant 57.69% to other types of scientific production, such as conferences, congresses and research thesis advising.

These results show the need for a continuous effort to improve and strengthen the production of the different types of scientific products mentioned, since the percentages still do not reach highly representative levels.

Consequently, it is concluded that government institutions and the university community should focus their efforts on improving the reward system in an effective manner, establishing a direct relationship with the levels of motivation and personal satisfaction. This implies the implementation of strategies that generate positive effects and lead to effective results, allowing engagement levels to be as expected. In this way, the presence and influence of universities in the world scientific community will be strengthened, promoting excellence in academic research.

AUTHORSHIP CONTRIBUTION

1. Javier Valentino, Palomino – Flores: Conceptualization; Data curation; Formal analysis; Methodology; Project management; Resources; Software and Drafting - original draft.
2. Giuliana del Pilar, Saravia – Ramos: Acquisition of funds; Research; Supervision; Validation; Visualization and Drafting - proofreading and editing.

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