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ORIGINAL

Interaction between Research and Innovation in the Ecology of Knowledge in University Organizations: A Correlational Descriptive Study at the National University of Chimborazo, Ecuador

Interacción entre Investigación e Innovación en la Ecología de Saberes en Organizaciones Universitarias: Un Estudio Descriptivo Correlacional en la Universidad Nacional del Chimborazo, Ecuador

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ABSTRACT

Introduction: research and innovation in academic organizations are essential for sustainable development. However, its integration with the ecology of knowledge and the impact on the labor competencies of university professors still represent a challenge, especially in the Ecuadorian context.
Objective: to describe the interaction between research and innovation linked to the ecology of knowledge in the academic organizations of the National University of Chimborazo during the period 2024-A.
Methods: quantitative, descriptive-correlational study. Participatory non-probabilistic sample of 132 teachers from the Faculty of Education. A 15-item questionnaire on knowledge ecology, research-innovation and labor skills was applied.
Results: a strong positive correlation was found between knowledge ecology and labor competencies ($r = 0,723$; $p < 0,01$), while the relationship between research-innovation and labor competencies was weak ($r = 0,025$; $p = 0,772$). The ecology of knowledge explained 52,3 % of the variability in labor competencies.
Conclusions: the ecology of knowledge emerges as a key factor for the development of teaching work competencies at UNACH. Policies and strategies that promote a collaborative and knowledge-sharing environment are required to improve the integration of research, innovation and teaching practice.

Keywords: Education; Research; Innovation; Skills; Ecology of Knowledge.

RESUMEN

Introducción: la investigación y la innovación en organizaciones académicas son esenciales para el desarrollo sostenible. Sin embargo, su integración con la ecología de saberes y el impacto en las competencias laborales del profesorado universitario aún representan un desafío, especialmente en el contexto ecuatoriano.
Objetivo: describir la interacción entre la investigación y la innovación vinculadas a la ecología del conocimiento en las organizaciones académicas de la Universidad Nacional de Chimborazo durante el periodo 2024-A.
Métodos: estudio cuantitativo, descriptivo-correlacional. Muestra no probabilística participativa de 132 docentes de la Facultad de educación. Se aplicó un cuestionario de 15 ítems sobre ecología de saberes, investigación-innovación y competencias laborales.

Resultados: se encontró una fuerte correlación positiva entre la ecología de saberes y las competencias laborales (r = 0,723; p < 0,01), mientras que la relación entre investigación-innovación y competencias laborales fue débil (r = 0,025; p = 0,772). La ecología de saberes explicó el 52,3 % de la variabilidad en las competencias laborales.
Conclusiones: la ecología de saberes emerge como un factor clave para el desarrollo de competencias laborales docentes en la UNACH. Se requieren políticas y estrategias que promuevan un entorno colaborativo y de intercambio de conocimientos para mejorar la integración de la investigación, la innovación y la práctica docente.

Palabras clave: Educación; Investigación; Innovación; Competencias; Ecología de saberes.

INTRODUCTION

Innovation and research in academic organizations have been key drivers of sustainable development worldwide. Countries such as Finland and South Korea have implemented education and research policies that integrate technology and knowledge ecology, achieving impressive results in terms of educational quality and scientific output.[1] These successful models demonstrate that a strong interaction between research and innovation can significantly boost labour skills and human talent in the digital age.

In Latin America, several nations have adopted strategies to strengthen research and innovation in their universities. For example, Brazil and Chile have developed funding and international collaboration programmed that promote the ecology of knowledge. These efforts have led to a considerable improvement in the quality of education and the responsiveness of universities to the challenges of modernization and globalization.[2] The adoption of these models could be an effective way to improve the labour competences of human talent in the region.[3,4,5]

In Ecuador, and particularly at the National University of Chimborazo (UNACH) in Riobamba, the interaction between research and innovation faces several challenges. Limited investment in research, lack of adequate infrastructure and poor continuous training of teaching staff in the Faculty of Education Sciences, Humanities and Technologies (FCEHT) are some of the problems that hinder progress in this area. If these problems persist, the quality of education and the competitiveness of UNACH graduates could be seriously compromised. It is important to implement studies that analyses and propose solutions to this problematic situation to avoid further backwardness and to promote a more dynamic educational environment adapted to the demands of the digital era.[6] Given this situation, the need for research arises:

- How do research and innovation interact within the framework of the ecology of knowledge in the academic organizations of the National University of Chimborazo?

To answer the previous question, the following is proposed:

- Describe the interaction between research and innovation linked to the ecology of knowledge in the academic organizations of the National University of Chimborazo.

METHODS

Research Focus

The research approach used in this study is quantitative. This approach is applied because it allows us to accurately measure the interaction between research and innovation in the context of the knowledge ecology, providing objective and replicable data that are essential for a rigorous and informed analysis.[7]

Type of study

The study is descriptive-correlational in scope.[8] On the one hand, it seeks to describe the interaction between research, innovation and the ecology of knowledge in the academic organisations of the FCEHT. On the other hand, we analyse the relationship between these variables and the development of teachers' labour competences in the context of the digital era. The Pearson correlation coefficient was used to determine the degree of linear relationship between the variables of interest.[9]

Population and Sample

The population consisted of 152 teachers from the FCEHT. The sampling was non-probabilistic and participatory, with the participation of 132 teachers from the faculty.[10] This type of sampling was chosen because it allows for the involvement of those individuals who are willing and available to participate, facilitating the collection of data in a specific context.

Techniques and Instruments

The technique for data collection was the survey.[11] A link to the survey was sent via email to the 152 teachers, with 132 teachers participating via Google Forms. The instrument used was a questionnaire designed to measure three variables: one independent variable and two dependent variables. Each item had 5 Likert scalar response options. The lowest option "Strongly disagree" (1), "Disagree" (2), "Neutral" (3), "Agree" (4), "Strongly agree" (5) (see figure 1).

Universidad Nacional de Chimborazo / Facultad de Ciencias de la Educación Humanas y Tecnologías					
Date: _____/_____/_____					
Carrera de Psicopedagogía Ítems	Options				
	(5)	(4)	(3)	(2)	(1)
Independent Variable: Ecology of Knowledge					
1. The university promotes a collaborative learning environment.					
2. Knowledge from different disciplines is integrated into my teaching.					
3. Resources for interdisciplinary research are adequate.					
4. I participate in knowledge exchange activities with other universities.					
5. The integration of knowledge is fundamental in the training of students.					
Dependent Variables: Research and Innovation					
1. I frequently participate in research projects at the university.					
2. The university fosters innovation in teaching and learning.					
3. Collaboration between teachers in innovation projects is effective.					
4. I receive institutional support to develop innovative projects.					
5. The research I conduct has a significant impact on educational quality.					
Dependent Variables: Teaching Competencies					
1. I frequently attend trainings to improve my work skills.					
2. The training received is relevant and of quality.					
3. I feel prepared to face the challenges of the digital age in my teaching work.					
4. I have a high capacity to use technological tools in teaching.					
5. The university provides me with enough opportunities to develop my work skills.					

Source: Own elaboration.

Figure 1. Research questionnaire applied to teachers of the Faculty of Human Education Sciences and Technologies during the period 2024-A

Descriptive Analysis of the Results

In this study, the Statistical Package for the Social Sciences (SPSS), version 26, was used to perform a descriptive correlational statistical analysis of a questionnaire of 15 items distributed across three variables. The questionnaire was distributed via Google Forms and collected 132 responses from teachers.

Key statistical measures such as means, standard deviations, and frequencies were calculated to provide a detailed understanding of the variability and central trend of the data.[12] The descriptive analysis allowed us to explore in depth the participants' responses in relation to each variable of the questionnaire.[13] The presentation of the results included tables that facilitated the interpretation of patterns and trends in the data.

Reliability of the Data Collection Instrument

The reliability of the questionnaire was assessed using Cronbach's alpha coefficient. A pilot test was applied to 20 teachers. The ecology of knowledge variable obtained a statistical coefficient of 0,709. The research and innovation variable had a coefficient of 0,772. The learning competences variable had a coefficient of 0,835. The value indicates a level of reliability of the data collection instruments.[14]

Ethical aspects

The data obtained in the study were used in compliance with the Declaration of Helsinki.

RESULTS

After the questionnaire had been applied, the tabulation and statistical analysis of the data obtained was developed.[15] The correlation table presented shows the Pearson correlation coefficients between the variables "Ecology of Knowledge", "Teaching Competencies" and "Research and Innovation". This analysis was carried out with a sample of 132 teachers from the FCEHT of the Universidad Nacional de Chimborazo (see table 1).

Table 1. Correlation study of the independent variable Ecology of Knowledge and the dependent variables competencies and research-innovation

Correlations		Ecology of Knowledge	Teaching Competencies	Research and Innovation
Ecology of Knowledge	Pearson correlation	1	0,723**	0,601**
	Sig. (bilateral)	0	0,001	0,001
	N	132	132	132
Teaching Competencies	Pearson correlation	0,723**	1	0,025
	Sig. (bilateral)	0,001	0	0,772
	N	132	132	132
Research and Innovation	Pearson correlation	0,601**	0,025	1
	Sig. (bilateral)	0,001	0,772	0
	N	132	132	132

**. Correlation is significant at the 0,01 level (2-tailed)

According to the research hypothesis system, the null hypothesis exists if the Pearson correlation coefficient is 0.[16] On the other hand, the alternative hypothesis is acquired if the Pearson coefficient is different from zero. To answer the first objective: To describe the interaction between research and innovation linked to the ecology of knowledge in the academic organisations of the National University of Chimborazo.

For the correlation between Ecology of Knowledge and Teaching Competencies: Pearson's correlation coefficient is 0,723**. The results indicate a high positive correlation between the ecology of knowledge and teaching competencies. The statistical significance is 0,001. This is less than 0,01. The correlation is statistically significant at the 1 % level. According to the correlation between Ecology of Knowledge and Research and Innovation: Pearson's correlation coefficient was 0,601**. There is a moderate positive correlation between the ecology of knowledge and research and innovation. The statistical significance is 0,001, indicating that this correlation is also statistically significant at the 1 % level.[5]

To analyse the role of the job competences of teachers at the Faculty of Educational Sciences, Humanities and Technologies (FCEHT) during the period 2024-A, the data obtained from the applied questionnaire were evaluated. The focus was on measuring how these competences relate to research and innovation in the context of the ecology of knowledge. The descriptive analysis of the teachers' job competences showed a significant positive trend. The mean of the responses to the items related to job competences was 4,2 on a scale of 1 to 5, indicating a high level of agreement among teachers about their competence in the areas assessed. The standard deviation of 0,65 suggests a moderate variability in responses, implying that most teachers perceive their competences consistently.[17]

The correlation between job competences and the variables research and innovation and ecology of knowledge is presented in the correlation table. The Pearson correlation coefficient between job competences and research and innovation was 0,025, indicating a very weak and non-significant relationship ($p = 0,772$).

On the other hand, the correlation between job competences and knowledge ecology was more significant. With a coefficient of 0,723** ($p < 0,01$), a strong positive correlation was found between these two variables.

DISCUSSION

The results obtained in this study provide a detailed view of the interaction between the ecology of knowledge, research and innovation, and the work competencies of teachers at the National University of Chimborazo (UNACH). Specifically, a strong positive correlation was found between knowledge ecology and job competencies, while the relationship between research and innovation and job competencies was very weak. The strong correlation between knowledge ecology and labour competences ($r = 0,723$) highlights the importance of a collaborative academic environment and knowledge sharing. These findings are consistent with existing literature emphasising the importance of communities of practice and collaborative learning in teachers' professional development.[20,22,25]

An environment where teachers share knowledge and experiences not only enhances their individual

competences, but also strengthens the collective capacity of the institution to face educational and technological challenges.[21]

In contrast, the weak correlation between research and innovation and job competences (r = 0,025) suggests that these activities are not sufficiently integrated into daily teaching practice. This finding is consistent with previous studies that have pointed to structural and cultural barriers that prevent research and innovation from directly translating into improvements in teaching.[22] In many cases, research can be seen as a separate task from teaching, which limits its impact on the development of pedagogical competences. One possible explanation for this weak correlation could be the lack of incentives and resources dedicated to integrating research into teaching practice; for innovation to have a significant impact on education, it must be supported by institutional policies that promote collaboration and the use of research results in the classroom.[23] However, in the context of UNACH, it seems that these elements are not sufficiently developed.

Moreover, the implementation of strategies based on the ecology of knowledge can be an effective way to overcome these barriers. Creating dedicated space and time for teacher collaboration, as well as recognising and rewarding these activities, can foster an environment where research and innovation are more effectively integrated into teaching.[24] Comparing these findings with other research in similar contexts, we find that universities in countries such as Finland and South Korea have successfully integrated research and innovation into teaching practice through robust educational policies and adequate funding.[18] These countries have demonstrated that when provided with an adequate supportive environment, research activities can contribute significantly to the development of teachers' job competencies.

CONCLUSION

The results of the present study underline the importance of the ecology of knowledge in the development of teachers' work competences at UNACH. Although research and innovation are fundamental, their integration into daily teaching practice remains a challenge. Policies and strategies that promote a collaborative environment could be key to improving this integration and, ultimately, teachers' professional development. Regarding the objective, it was possible to describe the interaction between research, innovation and the ecology of knowledge of the teaching staff of the FCEHT at UNACH.[17] The findings indicate that the ecology of knowledge has a strong relationship with the development of teachers' job competences, while research and innovation have a weaker association.[22]

A limitation of this study is that it focused on a single faculty at UNACH, so the results may not be generalisable to the whole university. Future research could broaden the scope to other faculties or even to other universities in Ecuador, to obtain a more comprehensive view of the phenomenon. It is also recommended to deepen the qualitative analysis of teachers' perceptions and experiences of the integration of the ecology of knowledge, research and innovation in their pedagogical practices. This would allow for a more holistic understanding of the factors that facilitate or hinder the development of work competences in the university context.

REFERENCES

1. Striepe M, Thomson S, Sefcik L. Understanding Academic Integrity Education: Case Studies from Two Australian Universities. J Acad Ethics. 2023;21(1):1-17.

2. Gibbs P. Transdisciplinarity as subversion: in space and place. Qual High Educ. 2023;29(3):374-89.

3. Grudistova E, Tkhorenko D, Slinkov A, Slinkova O, Tretyakova L. The issue of emotional intelligence in the context of vocational guidance of students. Rev Line Política E Gest Educ. 2022;1-10.

4. Labrea VV, Makiuchi M de F, Chalub-Martins L, Zaneti ICBB, Kornijezuk N. The ecology of knowledge and reinventing university extension education. Young People Educ Sustain Dev. 2023;303-8.

5. Bozhenkova NA, Semke TI. The Concept of Educative Teaching of Russian as a Foreign Language in Modern Social Conditions: Tradition or Transformation? Proc Southwest State Univ Ser Linguist Pedagogy. 2023;13(3):10-21.

6. Lubell M, Matous P, Klerkx L, Barahona C. The population ecology of sustainable agriculture knowledge networks: insights from California. Ecol Soc. 2023;28(2):1-13.

7. Mendoza D, Barreiro LMA, Chica TKM, Medranda EMA, Chávez SAR. Resilience in vulnerable university groups: An analysis of social work intervention strategies from the perspective of social inclusion. Educ Sci J. 12 de enero de 2024;26(1):82-102.

8. Navarro M, Cejas CMM, Mendoza MVD, Marieta AHS, Silvana VÁG. Virtual platforms and the perception of university students in Ecuadorian higher education during the Covid-19 pandemic. RISTI - Rev Iber Sist E Tecnol Inf. 2021;2021(E43):647-63.

9. Vrapi A, Mendoza Velazco DJ, Chernyavska N, Kravtsov Y, Kondratiuk V. Teaching in Cooperative Groups in the Function of Inclusive Education. Youth Voice Journal. 2023;II:46-58.

10. Hernández R, Mendoza C. Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta. McGraw Hill. México; 2018.

11. Bruner J. The Process of Education, Revised Edition. Harvard University Press; 1963.

12. Sordi JD. Design Science Research Methodology. Design Science Research Methodology. Springer International Publishing; 2021.

13. Sarwono J. Quantitative, Qualitative and Mixed Method Research Methodology. Vol. 1, Research Gate. Research Gate; 2022.

14. Mendoza D, Cejas M, Rivas G, Varguillas C. Anxiety as a prevailing factor of performance of university mathematics students during the covid-19 pandemic. Obraz Nauka. 2021;23(2):94-113.

15. Samoilenko S, Osei K. Quantitative Methodologies using Multi-Methods. Routledge; 2021.

16. Vogt W, Burke J. The SAGE Dictionary of Statistics & Methodology: A Nontechnical Guide for the Social Sciences. SAGE Publications; 2023.

17. Cabero-Almenara J, De-La-Portilla-De-Juan F, Barroso-Osuna J, Palacios-Rodríguez A. Technology-Enhanced Learning in Health Sciences: Improving the Motivation and Performance of Medical Students with Immersive Reality. Appl Sci Switz. 2023;13(14):1-14.

18. Schildermans H. Resisting the Ecology of Knowledges, Reclaiming an Ecology of Study: Some Notes on Decolonization in Higher Education. Philos Theory High Educ. 2024;5(3):565-80.

19. Álvarez MCC, Mendoza MP, León P del RR, Pérez CDZ, Gómez HOE, Guillén JYM. Internationalization of the curriculum: Connectivism approach supported by relational leadership. A case study. Salud Cienc Tecnol - Ser Conf. 2024;3:1-11.

20. Becerra IJ, Reyes RC, Marín AA, Vargas LDA. ICT-mediated teaching models in university teaching: a systematic review. Educ E Pesqui. 2023;49:undefined-undefined.

21. Leblanc P, Occelli P, Etienne J, Rode G, Colin C. Assessing the implementation of community-based learning in public health: a mixed methods approach. BMC Med Educ. 2022;22(1):1-10.

22. Prieto M, Valdivia G, Perreault T. Aporias of North/South political ecologies. Prog Environ Geogr. 2023;2(3):166-78.

23. Ahmad T, Jabran K, Cheema ZA, Bajwa AA, Farooq M. A global perspective of education in weed science. Weed Sci. 2023;71(6):536-48.

24. Gutiérrez-Pequeño JM, Anguita-Martínez R, Pradena-García YP. Social Media Labs in the Social Education Degree: Exploring Digital Competences of University Students. Educ Sci. 2023;13(1):1-19.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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