PIXEL-BIT
e-ISSN: 2171-7966
REVISTA DE MEDIOS Y EDUCACIÓN
MEDIA & EDUCATION JOURNAL

Teacher perceptions on the application of active methodologies in Higher Education: a study in a Peruvian public university

Percepción docente sobre la aplicación de metodologías activas en la Educación Superior: un estudio en una universidad pública peruana

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Received: 2025/02/24; **Revised:** 2025/03/01; **Accepted:** 2025/05/02; **Online First:** 2025/05/07; **Published:** 2025/05/28

ABSTRACT
Various international and national policies aim to unify higher education through an educational model centered on competencies, active learning, and lifelong learning. Within this framework, this study analyzes faculty perceptions regarding the application of active methodologies at the National University of San Agustín in Peru. A non-experimental, descriptive, and cross-sectional study was conducted with 131 faculty members selected by convenience. Data were collected using a five-dimensional Likert-type questionnaire, which analyzes the use of educational technology, the application of active methodologies, faculty perceptions of student acceptance, teacher training needs, and attitudes toward these methodologies. The instrument showed a high internal reliability of Cronbach's alpha of 0.950. The results reflect a positive attitude toward active methodologies, highlighting their contribution to understanding, participation, and student-centered learning. However, their application is limited, being more frequent among women and faculty members in biomedical fields. The need for specific training in the use of artificial intelligence and immersive technologies for effective implementation is evident.

RESUMEN
Diversas políticas internacionales y nacionales buscan la unificación de la educación superior mediante un modelo educativo centrado en competencias, el aprendizaje activo y la formación continua. En este marco, el presente estudio analiza la percepción del profesorado respecto a la aplicación de metodologías activas en la Universidad Nacional San Agustín de Perú. Se realizó un estudio no experimental, descriptivo y transversal con 131 docentes seleccionados por conveniencia. Los datos se recogieron mediante un cuestionario Likert de cinco dimensiones, que analizan el uso de la tecnología educativa, la aplicación de metodologías activas, la percepción docente de la aceptación estudiantil, las necesidades de formación docente y la actitud hacia estas metodologías. El instrumento mostró una alta fiabilidad interna de Alfa de Cronbach de 0.950. Los resultados reflejan una actitud positiva hacia las metodologías activas, destacando su contribución a la comprensión, la participación y el aprendizaje centrado en el estudiante. No obstante, su aplicación es limitada, siendo más frecuente en mujeres y en docentes de áreas biomédicas. Se evidencia la necesidad de formación específica en el uso de inteligencia artificial y tecnologías inmersivas para una implementación efectiva.

KEYWORDS · PALABRAS CLAVES
Active Methodologies; Higher Education; Teacher Perception; Educational Technology; Teacher Training
Metodologías activas; Educación superior; Percepción docente; Tecnología educativa; Formación del profesorado

1. Introduction

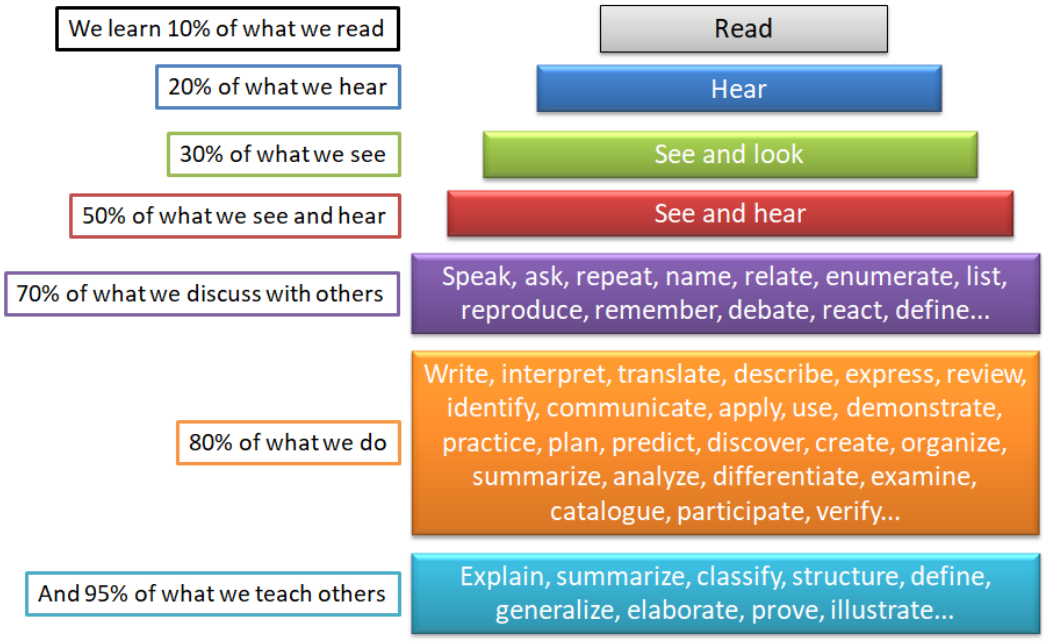
The Bologna Process is an ongoing initiative aimed at harmonising higher education across Europe, with a particular emphasis on promoting lifelong and competence-based learning. The programme is founded on the principles of multidisciplinary models, theory-practice integration and student-centred Active Methodologies (AM). These principles have exerted a significant influence on Latin America through the Tuning Project, which adapted these approaches to the region's educational realities by developing generic and transversal competences in higher education (Beneitore et al., 2007). In the Peruvian case, these trends have been incorporated through policies such as University Law No. 30220, which promotes quality, curricular innovation, and comprehensive training. This reflects a transition towards more relevant educational models that are more in line with contemporary social and professional demands, through the management of AMs centred on university students and managed by teachers who respond to these demands.

Pedagogical approaches of this nature place the student at the centre of their learning, promoting active participation, critical thinking, and problem solving through meaningful experiences. By this conceptualisation, the primary responsibility of educators is to facilitate students' acquisition of the capacity for autonomous learning, that is, to equip them with the cognitive frameworks necessary to manage information effectively. Muntaner Guasp et al. (2020) observe that competence-centred educational conceptions have been integrated in the European Convergence Process and the OECD model. The OECD is an international organisation that promotes public policies aimed at economic growth, social equity, and the improvement of educational quality. In this context, there is an emerging trend towards learning methodologies that are better suited to the needs of today's society. These methodologies foster problem-solving skills, critical thinking, and student autonomy. They move away from the mere memorisation of content and emphasise the results expressed in generic and specific competencies. At the same time, they redefine teaching and learning activities within a modular and multidisciplinary organisation in a global curriculum. Furthermore, the learning process is regarded as a cooperative endeavour between educators and learners, with continuous assessment being strategically integrated with teaching activities. The European Credit Transfer System (ECTS) is utilised to evaluate student work and ensure transparency between educational systems, while Information and Communication Technologies (ICT) are employed to innovate learning methodologies (Villa Sánchez, 2020). ICT is defined as the set of digital tools and technological resources used to facilitate, enrich, and transform teaching and learning processes, thereby favouring interaction, access to information, and the creation of more dynamic and personalised educational environments. Moreover, the significance of inclusive strategies in addressing diversity in the classroom is emphasised.

The theory of the American psychiatrist William Glasser concludes that certain means of acquiring knowledge are easier to assimilate than others, so that students learn approximately: 10% through reading, 20% through writing, 50% through observing and listening, 70% through discussing, 80% through practising, and 95% through teaching. These findings suggest that the most efficient methods are to be found in active learning.

Figure 1

How we learn



Note: Glasser (1998), taken from Fernández-Mesa et al., (2016)

Active learning, in contrast to the traditional lecture-based approach, has been shown to promote greater emotional and cognitive involvement of students, favouring the meaningful construction of knowledge (Fidalgo-Blanco et al., 2019). Unlike passive learning, in which students merely listen, AMs encourage decision-making and constant participation through practice and interaction (Cabanillas-García et al., 2023). This approach underscores the significance of 'learning by doing' as a process that entails more cognitive actions and enhances knowledge retention. In addition, the extant literature demonstrates that these methodologies are conducive to the development of both transversal and specific competencies, thereby promoting autonomous and reflective learning (Valencia-Quintero et al., 2024). In this sense, meaningful interaction between students and their environment has been shown to foster deeper and more lasting learning (Colomer et al., 2020).

These methodologies are characterised by the creation of practical work scenarios, group work and interaction with peers, learning by discovery, connection with real-world situations, and the active role of the student in the construction of knowledge. It is imperative to furnish students with complex scenarios and challenges to be resolved, employing products that are observable and assessable, thereby cultivating competencies such as autonomy and critical thinking. In this paradigm, the student assumes the role of the active agent of the learning process, while the teacher functions as the guide (Coloma Arguello et al., 2023).

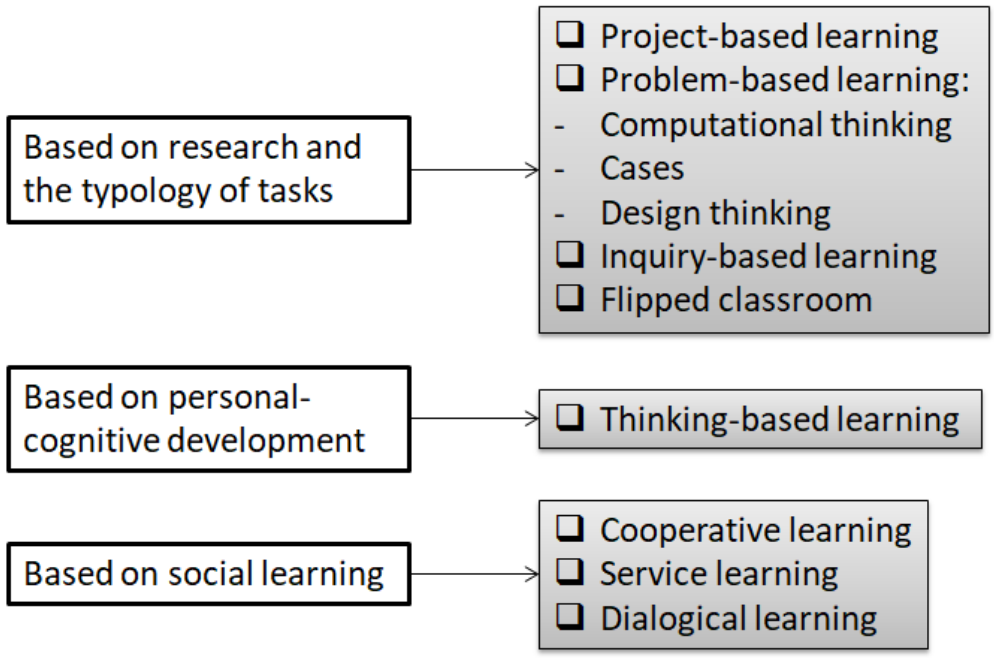
However, one of the problems with AMs is that they are often implemented incorrectly or not at all, thus remaining only theoretical or wishful thinking (Mora Pluas et al., 2024). Robledo et al. (2015) identify, from the student perspective, that limitations in the implementation of AMs include the need for competent tutors and student engagement. Furthermore, they emphasise that reliance on a single methodology may prove

counterproductive, proposing an integration of diverse methods to align with the distinct requirements of each educational context. Santana et al. (2023) highlight the importance of continuous training for teachers in the implementation of these methodologies and highlight that some teachers find it difficult to evaluate their effectiveness due to the context and the particular conditions of each course or subject. They also underline the relevance of institutional support to optimise student learning.

When classifying AMs, López and Martínez (2017) propose three criteria to categorise methodological processes defined as active, which meet the characteristics described above (Figure 2): Methodologies based on research promote enquiry and critical thinking through the use of scientific strategies guided by the teacher, thus developing research skills and teamwork (Rivadeneira & Silva, 2017). Methodologies focused on personal-cognitive development seek the integral growth of the student, enhancing critical thinking, metacognition and the acquisition of competences for daily and professional life (Ruiz-Morales, 2018). Finally, social learning methodologies are predicated on the promotion of cooperation and collective learning through interaction and service-learning, thereby facilitating the transmission of knowledge among peers (Ojeda-Martínez, 2018).

Figure 2

Classification of AMs



Note: López and Martínez, (2017)

However, as posited by Cabanillas-García (2025), a taxonomy of AMs can be delineated based on technological utilisation, distinguishing between those that employ conventional pedagogical methodologies and those that are augmented by technological instruments. Traditional AMs include strategies such as cooperative learning, flipped classroom or problem-based learning, which promote active student participation without the need for advanced technology (Basilotta Gómez-Pablos & García Barrera, 2023). On the other hand, technology-supported AMs integrate resources such as simulation,

gamification, augmented and virtual reality, and personalised tutoring based on artificial intelligence, which enhance student engagement and motivation, while developing essential digital competences for education in the context of Society 4.0 (Navas Bethancourth & Blancafort-Masriera, 2022). The latter strategies enable the creation of immersive and interactive learning environments, fostering critical thinking, creativity and problem solving, while personalising the educational experience and facilitating the continuous monitoring of students' progress (Mounkoro et al., 2024). Therefore, this classification reflects the evolution of AMs towards a more dynamic and flexible model where emerging technologies complement and expand traditional pedagogical possibilities (Villalobos López, 2024).

The implementation and use of traditional and technology-enhanced AMs are influenced by variables such as gender, age, subject area, and teacher training. Recent literature highlights that female teachers tend to use AMs more frequently, valuing collaboration and teamwork more (Arias-Gago & Rodríguez-García, 2020), while younger teachers are more predisposed to using these strategies due to their familiarity with educational technologies (Becerra-García et al., 2023). Furthermore, a lack of specific, up-to-date training in AMs and emerging technologies remains a significant barrier to effective implementation (Godinho et al., 2022). This underlines the need for continuous training programmes that reinforce the teacher's role as a facilitator in dynamic, technology-rich learning environments, as previously mentioned in the classification of AMs.

The research questions are based on an analysis of the literature on AMs in the context of the Universidad Nacional San Agustín de Arequipa (UNSA): What level of use of AMs do teaching staff declare in their teaching practice? How do teaching staff perceive the acceptance of AMs by students? What training needs have been identified by teachers with regard to the use of AMs? What is the attitude of teachers towards incorporating AMs into the teaching and learning process? Are there significant differences in the level of use, perceived student acceptance, training needs, and attitudes towards AMs according to the gender of the teaching staff? What kind of relationship exists between the level of use, perceived student acceptance, training needs, and attitude towards AMs, and the age of the teachers?

The general research objective was: ‘To analyse the perception of teachers on the application of AMs in the context of higher education at UNSA’. In order to respond to this, the following specific objectives are proposed:

- To assess the level of use, perception of student acceptance, training needs and attitude towards AMs (SO1).
- To establish the differences according to gender and area of knowledge in the variables analysed (SO2).
- To determine the existing relationships between these variables and age and teaching experience (SO3).
- To analyse the relationship between the variables analysed (SO4).

2. Methodology

2.1. Research design

To achieve the research objectives, we conducted a descriptive study using a quantitative methodological approach, as suggested by Acosta Faneite (2023) for research seeking to analyse phenomena through objective data measurement. The non-experimental, cross-sectional, comparative-causal design enabled us to observe and analyse differences and causal relationships between variables at a specific point in time without deliberately manipulating them (Torres Barzabal et al., 2022; López-Padrón et al., 2024). The survey technique was employed for data collection, with a self-administered questionnaire serving as the main instrument. This facilitated the systematic and efficient collection of direct information from participants (Serrano et al., 2023).

2.2. Population and sample

The population of the presented work was the teaching community of UNSA during the academic year 2023/2024. It is a finite population, estimated to be around 1422 teachers based on the latest records. The sample consisted of 131 participants who were recruited through convenience sampling, including those teachers with a contractual relationship with UNSA, who were available and able to complete the research instrument. Informed consent was obtained from each of the participants, who were informed of the objectives and procedures of the study. The principles of voluntariness and confidentiality, governed by UNSA's bioethics protocol, were respected. The study complies with UNSA ethics regulations and is part of the projects of the Institute for Research, Innovation and Development of Educational Sciences, INEDU-UNSA.

Table 1 shows the socio-demographic characteristics of the sample. Of the 131 participants, 48.9% were male and 51.1% were female. The average age of the participants was 55.13 years, with a standard deviation of 10.240. In terms of teaching experience, the average was 18.42 years, with a standard deviation of 11.095. The area of social sciences was predominant with 42.7%, followed by engineering with 34.4%, and biomedicine with 22.9%. Concerning marital status, 64.1% of the participants were married or in a civil union, followed by 28.2% who were single, 5.3% who were divorced and 2.3% who were widowed. Regarding the working day, 44.3% worked mornings, 43.5% worked split shift, 6.9% worked nights, and only 5.3% worked evenings. Finally, regarding the sector of residence, 99.2% of the participants lived in urban areas and only 0.8% in rural areas.

Table 1

Socio-demographic characteristics of the sample

Variable	Mean ± SD/Frequency (percentage)
Gender	
Male	64 (48.9%)
Female	67 (51.1%)
Age	55.13 ± 10.240
Teaching experience (years)	18.42 ± 11.095

Variable	Mean ± SD/Frequency (percentage)
Area of knowledge	
Engineering area	45 (34.4%)
Biomedical area	30 (22.9%)
Social sciences area	56 (42.7%)
Marital status	
Single	37 (28.2%)
Married, in civil partnership or cohabitation	84 (64.1%)
Divorced	7 (5.3%)
Widowed	3 (2.3%)
Working day	
Morning	58 (44.3%)
Afternoon	7 (5.3%)
Split shift	57 (43.5%)
Evening	9 (6.9%)

Prepared by the authors. SD = Standard Deviation

2.3. Research instrument

The research team comprised five researchers from various disciplines, including education, psychology, social sciences, language and literature. They contributed to the development and validation of the questionnaire from an interdisciplinary perspective, building upon previous studies such as those by Ibáñez-López et al. (2022). The questionnaire was digitised using Google Forms to improve distribution and accessibility. INEDU-UNSA was asked to help disseminate the questionnaire among teaching staff in three subject areas.

The questionnaire has five dimensions and an internal reliability of 0.950, as measured by Cronbach's alpha statistic. Table 2 shows the number of items, the scale and the reliability of each dimension and of the questionnaire as a whole. The first dimension analyses various components related to educational technology, including its implementation in the classroom, teaching innovation, new methodologies, and the perception of one's digital competence. The other four dimensions delve into different evaluation components of AMs:

- Use of AMs (UAM): This involves the frequency, variety and manner with which teachers incorporate student-centred teaching strategies, such as cooperative learning, project-based learning or flipped learning. The aim is to foster more participatory and meaningful teaching.
- Teacher perception of the degree to which students accept AMs (AcAM): This refers to how teachers interpret and value students' willingness, interest and receptiveness towards the implementation of AMs, taking into account their level of involvement, attitude and commitment during the development process.
- Teacher training needs (TAM): This refers to teachers' perceived gaps in the knowledge, skills and pedagogical tools needed to plan, implement and evaluate AMs effectively in the classroom, and their interest in further training in this area.

- Attitude towards AMs (AtAM): This comprises teachers' beliefs, evaluations and predisposition towards the usefulness, relevance and applicability of AMs in their teaching practice, as well as their level of motivation and openness to methodological change.

Table 2

Socio-demographic characteristics of the sample

Dimension	No. of items	Scale	Cronbach's alpha
Educational technology	4	1-10	0.713
Use of AMs (UAM)	12	1-5	0.908
Teacher perception of the degree to which students accept AMs (AcAM)	12	1-5	0.919
Teacher training needs (TAM)	12	1-5	0.920
Attitude towards AMs (AtAM)	8	1-5	0.933
Complete questionnaire	48		0.950

Prepared by the authors

2.4. Data analysis

Descriptive and inferential statistical analyses were carried out using version 25 of IBM SPSS (Cabanillas-García et al., 2023; Vásquez Peñafiel et al., 2023). The following types of analysis were performed: (a) univariate to describe the general characteristics of the sample and the dimensions and items that comprise them; (b) bivariate to identify significant differences between the studied dimensions in relation to teachers' gender and area of knowledge using the non-parametric Mann–Whitney U test for two groups and the Kruskal–Wallis H test for more than two groups; and (c) correlational to assess relationships between the studied dimensions and their link with age and teaching experience. Bivariate analyses were performed at a 95% confidence level with a 5% margin of error, while correlations were performed at a 99% confidence level with a 1% margin of error.

3. Analysis and results

3.1. Descriptive data analysis

Firstly, Figure 3 shows the average values of items analysing different aspects related to educational technology. All the values are higher than 7.5, demonstrating the value that UNSA teachers place on educational technology. The two most important considerations are the introduction of educational technology to their field of expertise (M = 8.95; SD = 1.595) and the application of new methodologies to improve learning (M = 8.68; SD = 1.458). However, despite their self-perceived adequate technological competence (M = 7.68, SD = 1.495), this consideration is lower than the other three.

Figure 3

Average values of the items of the educational technology dimension

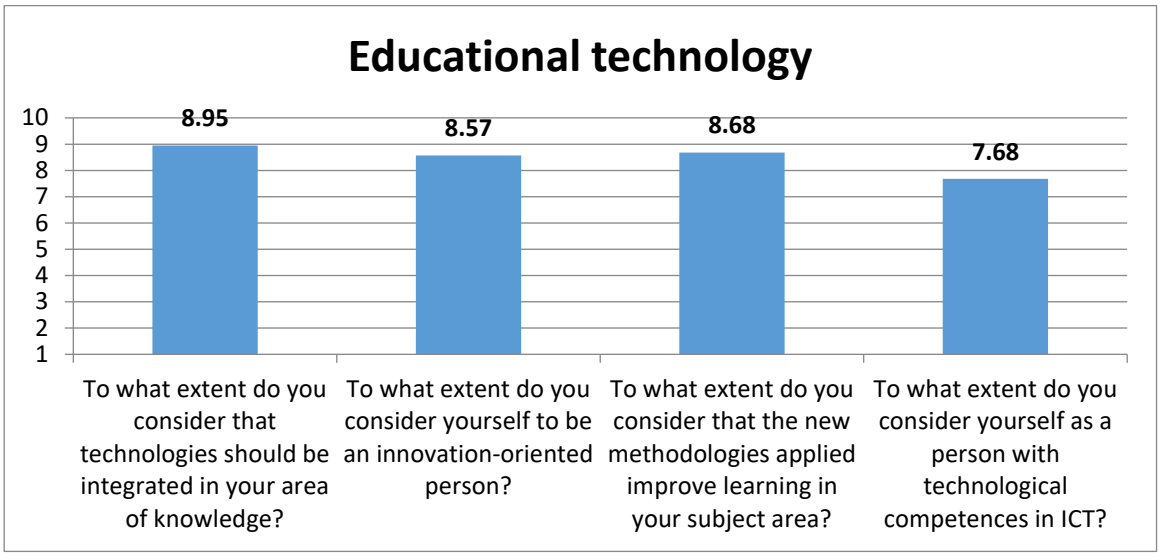


Figure 4 shows the average values of the dimensions under study. All dimensions show scores above the central value, but the dimension with the highest average score is TAM (M = 4.23; SD = 0.76), as teachers need to acquire specific skills and knowledge on how to implement these methodologies effectively in the classroom. The dimension with the lowest average score is UAM (M = 2.81; SD = 0.91), which implies that UNSA teachers do not make extensive use of AM in their classes.

Figure 4

Average values of the dimensions

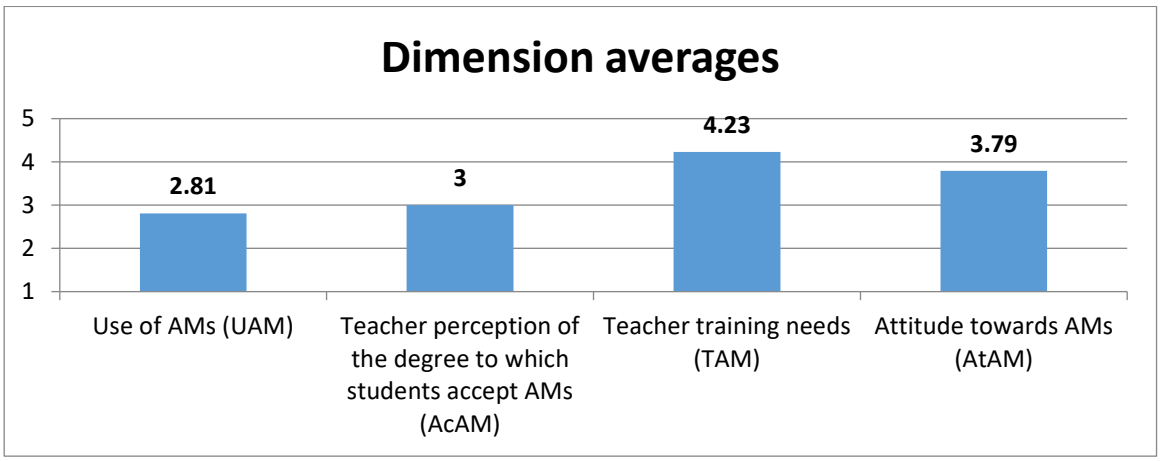


Figure 5 shows the individual averages for each of the AMs analysed in each dimension. With regard to usage, the most used by UNSA teachers are problem-based learning (M = 3.70; SD = 1.30) and competence-based learning (M = 3.64; SD = 1.25), while the least used are Design Thinking (M = 2.09; SD = 1.26) and the implementation of augmented and virtual reality technologies (M = 2.30; SD = 1.30). From the teachers' perspective, the AMs

that have a better acceptance by the students coincide with the most used ones: problem-based learning (M = 3.76; SD = 1.25) and competence-based learning (M = 3.60; SD = 1.25). The AMs that teachers feel they need and in which they demand more training are artificial intelligence (M = 4.49; SD = 0.91) and the implementation of augmented and virtual reality technologies (M = 4.46; SD = 0.88). On the other hand, those that teachers consider to need less training are flipped classroom (M = 3.94; SD = 1.21) and gamification (M = 4.02; SD = 0.91).

Figure 5

Average values of the items of the dimensions: Use of AMs, Teacher perception of the degree of acceptance of AMs by students and Teacher training needs.

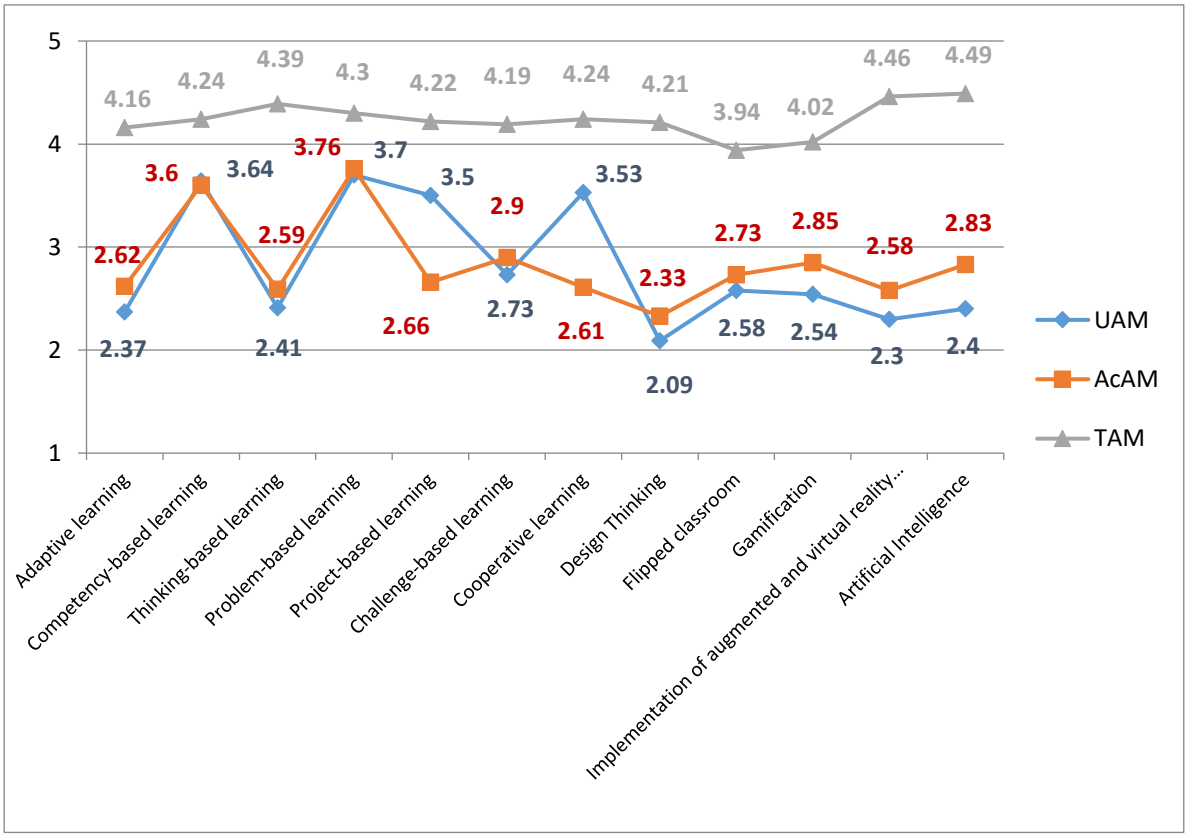
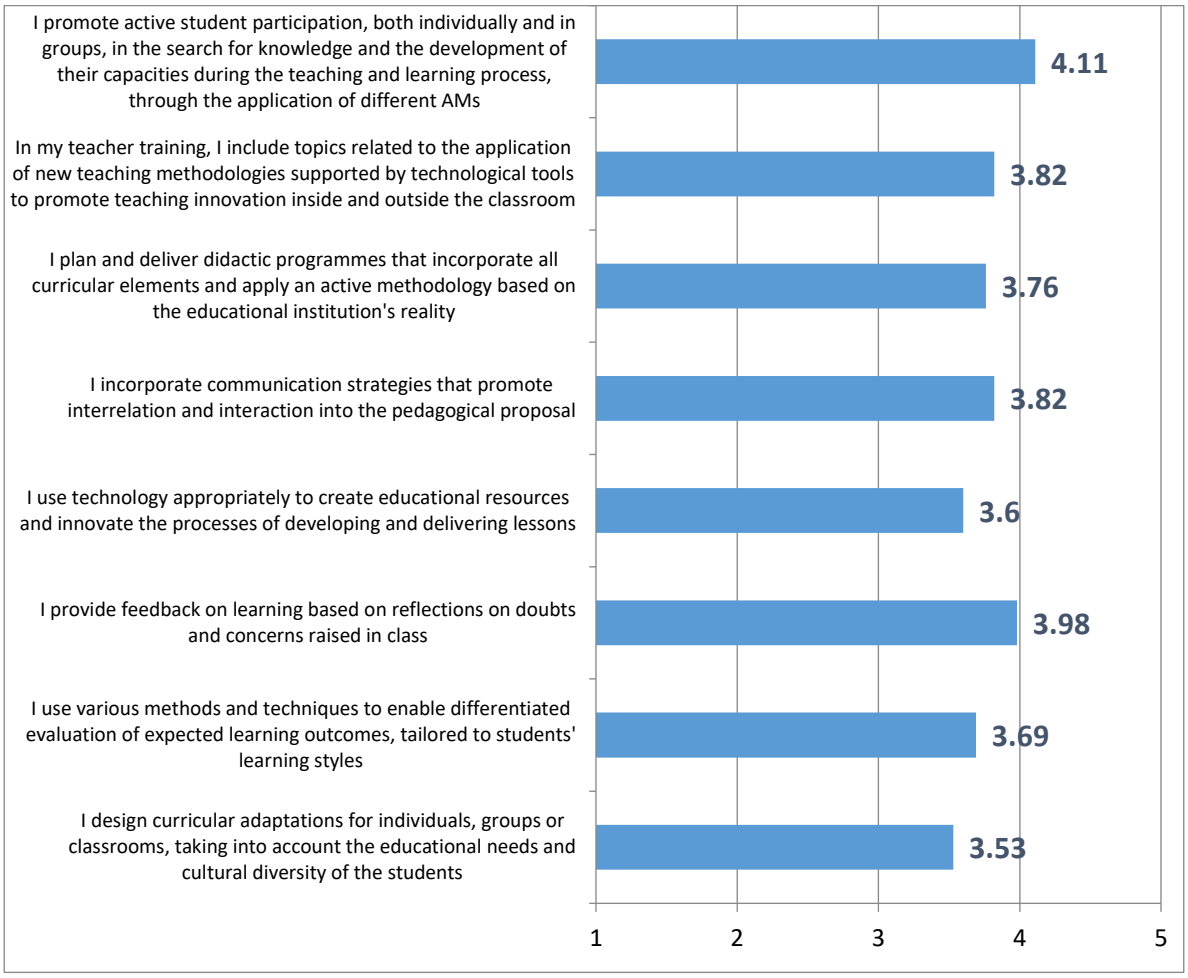


Figure 6 shows the average values of the items linked to the attitude towards AMs. The highest score corresponds to the teacher's promotion of student participation, both in groups and individually, in the search for knowledge through the application of the different AMs (M = 4.11; SD = 0.92) and the provision of feedback based on the reflection of doubts and concerns raised in class (M = 3.98; SD = 1.08).

Figure 6

Mean values of the items of the dimension Attitude towards AMs



3.2. Inferential data analysis

Table 3 shows the results of the gender-based analysis. It has been found that women are more likely to believe that ICT should be applied in their field of expertise ($p = 0.007$), and that their students are more accepting of the use of AMs ($p = 0.023$) and have a more positive attitude towards AMs ($p = 0.018$).

Table 4 analyses the differences according to the teachers' area of knowledge. Statistically significant differences were found in self-perceived digital competence ($p = 0.046$): teachers in the engineering field considered themselves to have greater digital competence than those in the social sciences, who considered themselves to have poorer digital competence. Differences were also found in the use of AMs ($p = 0.029$), with teachers specialising in biomedical sciences making more intensive use of this type of methodology.

Table 3

Results of differences according to gender

Dimension	Men (n = 64)	Women (n = 67)	U	p-value
	Average			
Introduction of ICT in their area	8.91	**8.99**	1992.500	0.446
Innovation-oriented person	**8.70**	8.45	2033.500	0.598
Application of ICT in their area	8.33	**9.01**	1580.000	**0.007**
Digital competence	7.55	**7.81**	1986.000	0.456
UAM	2.69	**2.94**	1829.000	0.147
AcAM	2.80	**3.20**	1651.000	**0.023**
TAM	4.10	**4.37**	1777.000	0.088
AtAM	3.58	**3.97**	1633.000	**0.018**

Prepared by the authors

Table 4

Results of the differences according to the area of knowledge

Dimension	Engineering area (n = 45)	Biomedical area (n = 30)	Social sciences area (n = 56)	Chi-square	p-value
		Average			
Introduction of ICT in their area	8.93	**8.97**	8.95	0.401	0.919
Innovation-oriented person	8.29	**8.87**	8.64	4.246	0.120
Application of ICT in their area	8.62	**8.93**	8.59	2.043	0.360
Digital competence	**8.07**	7.80	7.30	6.153	**0.046**
UAM	2.68	**3.17**	2.74	7.113	**0.029**
AcAM	2.88	**3.36**	2.90	5.810	0.055
TAM	4.22	4.19	**4.28**	0.983	0.612
AtAM	3.64	**4.04**	3.77	4.649	0.098

Prepared by the authors

Table 5 shows the relationship between age and experience with each of the analysed dimensions. As can be seen, there is no relationship between age and any of the analysed variables, showing that age is not a determining factor in the use of AMs, their popularity among students, demand for teacher training or attitude. The same is true for 'experience', where no significant relationship was found either.

Table 5

Results of the correlations between the dimensions under study and age and experience

Dimension	Data analysis	Age	Experience
Introduction of ICT in their area	p-value	0.770	0.624
	r	0.226	0.043
Innovation-oriented person	p-value	0.698	0.298
	r	-0.034	0.092
Application of ICT in their area	p-value	0.330	0.282
	r	-0.086	-0.095
Digital competence	p-value	0.108	0.482
	r	-0.141	0.062
UAM	p-value	0.318	0.194
	r	-0.088	0.114
AcAM	p-value	0.070	0.957
	r	-0.159	-0.005
TAM	p-value	0.299	0.484
	r	-0.091	-0.062
AtAM	p-value	0.168	0.792
	r	-0.121	0.023

Prepared by the authors. r = Correlation coefficient.

Finally, Table 6 shows the relationships between the dimensions of the AMs analysed. Positive and significant relationships were established with student acceptance (p = 0.000) and teaching attitude (p = 0.000). This is of particular relevance, as increased use of AMs by teachers entails a more positive attitude towards these practices, which in turn promotes a greater perception of student acceptance. This creates a more participatory and dynamic learning environment, encouraging student engagement and active learning. In turn, a more positive teacher attitude towards AMs leads to greater perceived student acceptance (p = 0.006), motivating and encouraging teachers to train specifically in this area (p = 0.000).

Table 6

Correlations between the dimensions under study

Dimension (n = 131)		UAM	AcAM	TAM	AtAM
UAM	p-value		**0.000**	0.390	**0.000**
	r		**0.811****	0.076	**0.628****
AcAM	p-value	**0.000**		0.097	**0.000**
	r	**0.811****		0.146	**0.704****
TAM	p-value	0.390	0.097		**0.006**
	r	0.076	0.146		**0.237****
AtAM	p-value	**0.000**	**0.000**	**0.006**	
	r	**0.628****	**0.704****	**0.237****	

Prepared by the authors. r = Correlation coefficient; **Correlation is significant at the 0.01 level (bilateral)

4. Discussion and conclusions

In response to SO1: 'To evaluate the level of use, perception of student acceptance, training needs and attitude towards AMs', the data obtained show a high recognition by UNSA teaching staff of the importance of educational technology, with prominent scores in the need to introduce new methodologies in their areas of knowledge and in their ability to improve learning. However, their self-perception of technological competence is below these evaluations, suggesting that although there is a favourable predisposition, the digital competence of teaching staff could still be strengthened, as identified in previous studies (Cabanillas-García et al., 2019; 2020).

Regarding the level of AM use, the results show that its application is still limited, with problem-based and competence-based learning strategies standing out as the most widely implemented. This trend aligns with teachers' perceptions of student acceptance of these methodologies, with students valuing them as the most effective. However, the limited use of more innovative methodologies, such as Design Thinking and emerging technologies like augmented and virtual reality, reflects uneven adoption of AMs, which continues to focus predominantly on traditional approaches. This limitation seems to be directly related to the lack of specific training, as can be seen in the results regarding teacher training needs, where artificial intelligence and immersive technologies stand out as priority areas for updating.

These findings reinforce previous studies (Rivadeneira & Silva, 2017; Navas Bethancourth & Blancafort-Masriera, 2022), which indicate that the use of AMs is mostly concentrated in traditional strategies oriented towards research, enquiry, social learning and personal cognitive development, while methodologies enhanced by advanced technologies such as artificial intelligence or augmented reality continue to be applied sporadically and marginally, mainly due to the lack of training and the perception of complexity in their implementation (Cabanillas-García, 2025). As for the attitude towards AMs, teachers express a positive disposition, especially in aspects related to the promotion of student participation and reflective feedback, which shows a favourable pedagogical orientation

towards the implementation of these methodologies. However, their use has not yet become widespread, as their implementation is often deficient, erroneous or, in many cases, does not even materialise, and they end up being relegated to the theoretical plane or converted into mere purposes without real execution (Mora Pluas et al., 2024).

In response to SO2: 'To establish the differences according to gender and area of knowledge in the variables analysed', the results show that both gender and subject area significantly influence the implementation of active methodologies (AMs) by university teaching staff. Notable gender-related differences were identified: women showed a greater predisposition towards integrating ICT, perceived better acceptance of active methodologies by students, and had a more favourable attitude towards their use in the classroom. These findings are consistent with previous research, such as that of Arias-Gago and Rodríguez-García (2020), which indicated a greater affinity among female teachers for student-centred pedagogical approaches.

This difference can be interpreted in various ways. Firstly, it could be related to greater pedagogical sensitivity or an orientation towards more inclusive and collaborative practices among women, which are commonly associated with active methodologies. Alternatively, it may reflect a more open attitude towards innovation and methodological change, contrasting with certain traditional teaching patterns still evident in some male teachers. Nevertheless, these results also prompt us to consider the importance of overcoming gender stereotypes in teacher training and fostering institutional environments that encourage the adoption of AMs across all subjects and regardless of gender. In this sense, university policies should consider more equitable training initiatives that recognise these differences and promote awareness, support and continuous training to ensure all teaching staff have the necessary tools, attitudes and competencies to effectively and sustainably implement AMs.

Engineering teachers perceive themselves as more digitally competent than social studies teachers, while social studies teachers perceive themselves as less digitally competent, which reinforces the need to provide training and resources in this area. Furthermore, biomedical teachers are the most frequent users of AMs. These findings highlight the need to consider these differences when designing specific training and support programmes for the implementation of AMs in education, since a lack of training clearly hinders implementation (Godinho et al., 2022).

Concerning SO3: 'To determine the existing relationships between these variables and age and teaching experience', the data reveal that age and teaching experience do not influence the use of AMs, the teacher's perception of their acceptance by students, the demand for teacher training or their attitude towards these methodologies. This justifies an educational proposal based on the use of AMs by novice and veteran teachers alike. These results contrast with studies that suggest younger teachers predominantly use AMs (Becerra-García et al., 2023) or that ageing limits their implementation (Toledo Sandoval & García Vélez, 2022).

Finally, in response to SO4: 'To analyse the relationship between the variables analysed', the obtained results support previous studies that highlight the positive relationship between the use of AMs and the teaching staff's attitude and student acceptance from the teaching staff's perspective. Studies such as those by Rodríguez García (2021) and Crisol Moya et al. (2020) demonstrate that greater teacher engagement with AMs enhances student perception and fosters more participatory educational environments. This reinforces the necessity of promoting teacher training and the technological infrastructure required for the effective and sustainable implementation of AMs.

This study has several limitations that should be considered when interpreting the results. Firstly, the cross-sectional design only allows correlations to be observed at a given point in time, without enabling causal relationships to be established. Additionally, the cross-sectional approach prevents the routine use of AMs from being used in more depth; therefore, mixed methodologies could be incorporated in future research to enrich the analysis. Convenience sampling restricts the generalisability of the findings but helps contextualise the current situation of the Peruvian university in question and its environment. For future research, it is advisable to complement this approach with methodological triangulation techniques, such as qualitative interviews or focus groups. Alternatively, external validation processes could be incorporated to reinforce the robustness of the findings and broaden the understanding of the phenomenon. On the other hand, while the application of a self-administered digital questionnaire facilitated data collection, it may have excluded teachers with limited digital competence or technological access.

To strengthen institutional training policies in Peruvian universities, teacher training programmes in AMs must be prioritised, integrating innovative approaches such as artificial intelligence and immersive technologies to complement and enrich traditional teaching strategies. This training should be oriented towards a practical and contextualised application that promotes the effective use of AMs in university classrooms. Institutions must also foster an organisational culture that values pedagogical innovation by recognising good practices, disseminating successful experiences and supporting implementation. This should take advantage of the teaching staff's positive perception of students' receptiveness to innovation. Finally, the training offered must be flexible and sensitive to the characteristics of teaching staff, adapting to the particularities of disciplines and preventing factors such as age or study field from acting as barriers to innovation. This approach must be accompanied by sustained institutional commitment, including strengthening technological infrastructure and continuous pedagogical support.

Potential lines of research generated from this study include analysing the relationship between institutional technological infrastructure and the effectiveness of AMs by comparing universities with different levels of resources. Additionally, qualitative studies investigating the experiences and challenges of teaching staff when implementing AMs, as well as student perceptions of their adaptability and effectiveness, would be useful. Investigating the impact of continuous teacher training in educational technologies and innovative methodologies on teaching quality and teacher satisfaction is also suggested.

Author contributions
Conceptualization, (E.P.G.C.; A.H.M.), Data creation, (J.L.C.G.; M.C.S.G.); Formal analysis, (J.L.C.G.; M.C.S.G.); Investigation, (J.L.C.G.; M.C.S.G.); Methodology, (J.L.C.G.; M.C.S.G.); Project management, (E.P.G.C.; A.H.M.); Supervision (J.L.C.G.; M.C.S.G); Validation, (J.L.C.G.; M.C.S.G); Writing the original draft (J.L.C.G; M.C.S.G.; E.P.G.C; A.H.M.). Redaction, revision and edition (J.L.C.G; M.C.S.G.; E.P.G.C; A.H.M.).

Funding
This research has not received external funding

Data Availability Statement
The data set used in this study is available at reasonable request to the corresponding author

Ethics approval
Not applicable

Consent for publication
The author has consented to the publication of the results obtained by means of the corresponding consent forms.

Conflicts of interest
The author declares that they have no conflict of interest

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How to cite:

Cabanillas-García, L., Sánchez-Gómez, M. C., Guillén-Chávez, E., & Hurtado-Mazeyra, A. (2025). Teacher perceptions on the application of active methodologies in Higher Education: a study in a Peruvian public university [Percepción docente sobre la aplicación de metodologías activas en la Educación Superior: un estudio en una universidad pública peruana]. *Pixel-Bit, Revista de Medios y Educación*, 73, Art.10. https://doi.org/10.12795/pixelbit.114719