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Student-Centred Teaching Competencies in Innovative and Traditional Learning Environments

Competencias docentes centradas en el alumnado en entornos de aprendizaje innovadores y tradicionales

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Abstract:

The study aims to analyse the use of student-centred methodologies and teaching professional competencies in Innovative Learning Environments (ILE) versus traditional spaces. The sample consists of 782 teachers who responded to a structured questionnaire covering five areas, evaluating aspects from methodological approaches to use of technology and interest in educational innovation. Using a quantitative approach and analysis with IBM SPSS, differences were explored between teachers working in ILEs and those in traditional settings. The results indicate that 95.26% of teachers use student-centred methodologies, with these practices being more prevalent in ILEs. Significant differences were observed in the planning of learning experiences and in the integration of pedagogical strategies that promote student participation. Additionally, there was a greater use of technology in ILEs, highlighting digital collaboration and content creation. The conclusions suggest that ILEs encourage a more dynamic, student-centred approach to teaching, motivating teachers to use advanced methodologies and digital resources. This reinforces the need to design training programmes that promote professional teaching competencies for working in innovative learning environments, thus helping to adapt the educational system to current challenges.

Keywords: educational environment; methodology; competency-based teaching; digital technology; professional teaching competences; innovative learning environments.

Resumen:

El estudio tiene como objetivo analizar el uso de metodologías centradas en el alumnado y de competencias profesionales docentes en los Entornos Innovadores de Aprendizaje

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(EIA) frente a los espacios tradicionales. La muestra se compone de 782 docentes, quienes respondieron un cuestionario estructurado en cinco áreas que evaluaba aspectos metodológicos, el uso de la tecnología y el interés del profesorado por la innovación educativa. Mediante un enfoque cuantitativo y el análisis con IBM SPSS, se exploraron las diferencias entre docentes que trabajan en EIA y los que lo hacían en entornos tradicionales. Los resultados indican que un 95,26 % del profesorado consultado confirma emplear metodologías centradas en el alumnado, siendo el uso de estas prácticas mayor en los EIA. Se observaron diferencias significativas en la planificación de las experiencias de aprendizaje y en la integración de estrategias pedagógicas que promueven la participación estudiantil. Además, se encontró una mayor utilización de tecnología en los EIA, donde destaca la colaboración digital y la creación de contenido. Las conclusiones sugieren que los EIA favorecen una enseñanza más dinámica y centrada en el estudiante, lo que motiva a los docentes a utilizar metodologías y recursos digitales avanzados. Esto refuerza la necesidad de diseñar programas de formación que impulsen las competencias profesionales docentes para trabajar en entornos de aprendizaje innovadores, contribuyendo así a la adaptación del sistema educativo a los retos actuales.

Palabras clave: entorno educacional; metodología; educación basada en las competencias; tecnología digital; competencias profesionales docentes; entornos innovadores de aprendizaje.

1. Introduction

The research here presented is related to teachers' professional competences. This topic is of great interest to the educational community, as is evident from the fact that various ministries of education and other major institutions are working on defining them.

There are several interrelated factors that are changing the educational context we used to know. Institutions responsible for teacher training must rethink what competences teachers need to develop in order to effectively face these changes. We can summarise these factors in five main ideas. First, with the rise of digital learning tools and online resources, teachers need new competences to be able to integrate these tools and resources effectively (Casillas Martin *et al.*, 2020). This explains the development of digital competence frameworks for teachers and an integral system to train and certify the different levels.

Second, current classrooms are increasingly diverse in terms of ability and learning needs, but also on cultural backgrounds. Therefore, there is a need of a reflection on what competences must teachers develop to be able to provide inclusive and differentiated instruction.

Third, there is a growing recognition of the importance of social-emotional skills in education, requiring teachers to develop competences in emotional intelligence, relationship-building and mental health awareness.

Fourth, international reports point to the importance of students developing 21st-century skills like critical thinking, creativity and adaptability. Here, the teacher's role shifts from rote learning or theoretical work to a more practical, divergent way of looking for solutions or designing projects. This approach fosters students' lifelong learning skills by enabling them to decide what to learn and how to do so.

Fifth, all these factors imply that teachers must not only plan and perform differently, but also assess differently—both their students and themselves. Such an important shift in the teaching experience must be accompanied by training and research to try to minimize the stress caused by a mismatch between teacher competences and the demands of modern classrooms and society.

In this regard, the report *Reimagining our futures together: A new social contract for education* (International Commission on the Futures of Education, 2021) emphasises that teaching must be redefined as a collaborative profession and that education must become a shared societal project and a common good. It calls for teachers to be recognized as key knowledge producers and agents of educational transformation, whose continuous professional development must be linked to broader goals of justice, equity and sustainability. This perspective reinforces the urgency to rethink teacher competences in light of global challenges and future-oriented education.

Therefore, teacher training institutions have the responsibility of determining what competences are required and how to foster teachers' acquisition and implementation. This is what makes this research crucial. Through our work we have identified some competences that can be linked to the concept of Innovative Learning Environments (ILE). Similarly, we have tested if they are used more frequently in these environments than in traditional settings to determine whether these ILE could be fostered to develop certain teaching competences.

European Union members have not yet established a list or framework of the teacher's required competences. In 2014, a number of conclusions related to this topic were adopted in a European Council meeting held in Brussels, Belgium. "Improving teacher education programmes and recruitment processes requires the prior identification of the professional competences needed by teachers at different stages of their careers. Professional competence frameworks can be used to raise quality standards, by defining the knowledge, skills and attitudes that teachers, including in the fields of vocational education and training (VET) and adult learning, should possess or acquire" (Council of the European Union, 2014, p. 2). Considering this statement, the Council invited the member states to develop and establish a comprehensive professional competence framework for teachers, "which defines the competences and qualities they require at different stages of their careers or in different teaching situations" (p. 4). Some countries have already started working on their own frameworks, although in most cases they have not yet been published. In Spain, we have found a number of frameworks developed by autonomous communities which have been used to define the constructs of this research.

First of all, the concept of competence must be defined in order to understand the research undertaken. Perrenoud (1999) defined competence as the capacity to act efficiently in a given situation based on knowledge, yet extending well beyond it. Cabero *et al.* (2006) enriched this definition stating that a competence embeds knowledge, performance and attitude. For this research, we refer to teaching competences focused on the role of the teacher performing in the classroom (Hagger & McIntyre, 2006).

Teachers, as we have already stated,must develop several competences in order to deliver high quality teaching; thus, we have chosen the ILE context as the framework for our research. It is unlikely, however, that a single teacher will possess all 21st-century teaching competences, or at least, he or she cannot develop them all to the same high degree (European Commission, 2013). Additionally, we have also taken into account that teachers must not only teach most competences to students, but model them as well.

An Innovative Learning Environment (ILE) is a construct that can be defined as highly flexible spaces, with specifically-designed furniture and ubiquitous technology, used in an innovative way, thus facilitating a student-centred learning experience (Blannin *et al.*, 2020). Under this model, the teacher's methodology shifts from a teacher-centred approach to a more student-centred approach (Byers *et al.*, 2018b; Cleveland, 2016; Granda-Piñán & Rojo-Bofill, 2024; Jorion *et al.*, 2016). Teachers in this context are invited to use several competences or focus on different aspects of the teaching process. To perform this study, we have matched the competences commonly fostered in ILEs with the competences defined as research construct to highlight the common ones.

Following the example of international recommendations, academic literature statements and the different frameworks analysed, we have organised the competences into four areas:

a) Learning and teaching competence

b) Teaching performance

c) Professional commitment

d) Cross-cutting competences

The first area compiles all the competences related to planning, implementing and assessing learning and teaching processes. Planning is related to taking into account students' needs (Hatano & Oura, 2003; Vogt & Rogalla, 2009) and designing the learning experiences according to a competence model of teaching (European Parliament and Council of the European Union, 2006; Council of the European Union, 2018). The implementation refers to the design of situations in which student-centred approaches are used, fostering students' participation (Byers *et al.*, 2018a) and coping with diversity through personalisation (Council of the European Union, 2014; European Commission, 2013; Granda-Piñán *et al.*, 2024; McDiarmid & Clevenger-Bright, 2008). Concerning assessment, there is a highlight on the use of varied instruments and the use of feedforward to help students learn (Council of the European Union, 2014).

The second area refers to the teacher's capacity to implement educational strategies that promote comprehensive student development. This is related to creating a safe, inclusive and stimulating learning environment that promotes the students' social, emotional and moral development, as well as their physical wellbeing (European agency for Development in Special Needs Education, 2012; Granda-Piñán & Rojo-Bofill, 2024; Noriega *et al.*, 2016; Organisation for Economic Co-operation and Development [OECD], 2017; Pericacho, 2023; Scheerens, 2007, Tanner, 2014; Teruel, 2000). This area also includes other aspects linked to the learning process, such as tutoring and student involvement in the organisational structures of the institution. We have decided not to consider these two aspects, however, as they are not specific competences fostered in an ILE, even though they are closely related and indirectly addressed.

The third area refers to the teachers' commitment in terms of participation and involvement in their school, improved educational quality and ongoing professional development. Although we consider these three aspects to be of great importance, we have elected to survey only the first, focusing on collaboration among teachers to design learning situations (OECD, 2009).

Finally, the fourth area is related to cross-curricular competences, including communication skills, digital proficiency and competence in research and innovation. We have selected the second and third groups, i.e. digital competence and research and innovation, focusing on how teachers use ICT in the classroom, what they ask students to do with these technologies (Council of the European Union, 2014; European Commission, 2013; Mishra & Koehler, 2006), and teachers' interest in new methodologies, resources and pedagogical approaches (Hagger & McIntyre, 2006).

The central hypothesis of this research is that teachers working in ILEs activate a series of competences more often than in traditional settings. If confirmed, it could help authorities and teacher trainers to design both an initial and a lifelong learning plan, and provide teachers with opportunities to design and implement such environments in their schools. The research questions of this study are:

1. Do teachers use student-centred approaches?
2. Which competences do teachers activate when planning a learning experience?
3. Which pedagogical and spatial strategies are employed by teachers in their classrooms?
4. What is the role of digital technology when implementing learning experiences?
5. In which areas do teachers wish to gain deeper knowledge to enhance their future professional practice?

2. Method

2.1. Sample

The questionnaire was administered online by sending a message to teachers and schools explaining the purpose of the research. The sampling method was non-probabilistic, specifically, a convenience sampling. The sample was obtained by disseminating the questionnaire through different channels to various groups of teachers, and participation was voluntary. A total of 786 answers were received, although four responses were excluded during the analysis phase due to a lack of validity. Table 1 shows the characteristics of the study sample.

TABLE 1. Sample. Distribution of background characteristics of respondents (*N* = 782)

Aspects		**Frequency (*n*)**	**Percentage (%)**
Gender	Female	549	70.2
	Male	232	29.7
	Other	1	0.1
Educational stage	Early Childhood Education	64	8.2
	Primary Education	249	31.8
	Compulsory Secondary Education	239	30.6
	Post-compulsory secondary education	85	10.9
	Vocational training	124	15.9
	Other	21	2.7
Innovative Learning Environments	Yes	65	8.3
	No	717	91.7

Source: Prepared by the authors based on data supplied by respondents

The responses were anonymous and were collected during the months of April and May 2024.

2.2. Instrument

To conduct the research, we developed an *ad-hoc* questionnaire aimed at answering the questions posed in the introduction.

First, the research team carried out a review of different documents where teachers' professional competences were a key focus (Table 2).

Table 2. Documents consulted

Document title	**Authorship**
Las competencias profesionales docentes. Modelo competencial de la Red de Formación del Profesorado	Xunta de Galicia (s.f.)
Competencias profesionales docentes. Orientaciones para el profesorado del futuro	Comunidad de Madrid (2022)
Documento para debate. 24 propuestas de reforma para la mejora de la profesión docente	Ministerio de Educación, Formación Profesional y Deportes (2022)
Marco común europeo de competencias profesionales docentes	CAFI, Consellería de Cultura Educación e Ordenación Universitaria, Xunta de Galicia. LFEE Europe. Ugdymo Plėtotės Centras. IPL Instituto Politécnico de Leiria. Junta de Castilla y León. PHW Pädagogische Hochschule Wien (s.f.)
Análisis de percepciones del estudiantado del Máster de Secundaria respecto a las competencias profesionales del docente	José María Sola Reche, José Antonio Marín Marín, Santiago Alonso García y Gerardo Gómez García (2020)
Developing teaching competences with service-learning projects	Andresa Sartor-Harada, Juliana Azevedo-Gomes, Ester Torres-Simón (2022)
Modelo de competencias profesionales del profesorado	Red de Formación del Profesorado de Castilla y León. (2010).
Conclusions on effective teacher education	Council of the European Union (2014)
Supporting teacher competence development for better learning outcomes	European Commission (2013)

Based on the review, four areas were defined with varying levels of detail, from which a proposal of items was developed. These items were structured in five areas within the questionnaire, including an introductory section that gathered demographic information (gender, educational stage...). The questions in this first section had different formats, the most common being short answers or yes/no questions. The other four sections were designed using Likert scales to express the degree of agreement with different statements. The questionnaire was anonymous, although participants could include their email address if they wished to receive the results of the study.

Next, a group of seven experts were asked to evaluate two aspects for each item following Lawshe's guidelines (1975), with modifications by Tristán López (2008): the clarity of the wording and its importance, defined as the degree of significance the item had within the study. To assess the clarity of each item, a Likert-type scaling technique was employed with four response categories ranging from 4 to 1, where: 4 = Very high, 3 = High, 2 = Low, and 1 = Very low. To evaluate importance, experts were provided with three options: 1) Essential, 2) Useful but not essential, and 3) Not important. There was also an open-ended section for observations and alternative wording. Based on the experts' ratings, the Content Validity Ratio (CVR) was calculated for each item to assess its quantitative content validity, following

Lawshe's method. Items with low CVR (< 0.62) were reviewed or eliminated. On a second round of expert validation, all the items received a CVR > 0.62.

Each expert was selected based on their knowledge and experience in the field. All participants are in-service teachers with specific training in Future Classroom Lab or Innovative Learning Environments, also serving as teacher trainers in these areas. Among the participants are three PhD holders and four university professors.

Comments and suggestions were gathered and a total of 12 questions were improved; one question was eliminated and one was added. The final result was a questionnaire comprising five sections and a total of 40 items administered electronically through an online platform.

2.3. Procedure

The study was carried out between October 2023 and June 2024 as an exploratory and descriptive study with a non-experimental design. A quantitative methodology was used for data analysis, relying on the responses collected from the *ad-hoc* questionnaire described above.

This questionnaire was administered online. Responses were sent via email, primarily from public teacher training centres in Valencia, Spain. However, the link to the questionnaire was shared on social media platforms created for teachers (like specific groups on social networks), not limited to Valencia.

The questionnaire header indicated its anonymous nature of it in the header, as well as the consent acceptance of the use of the data obtained for research purposes.

2.4. Data analysis

The data obtained was analysed using the IBM SPSS 29 statistical package. Measures of central tendency and dispersion were employed to analyse the responses made by the sample to different items on the scale. Subsequently, after checking for normal distribution and homogeneity of variances, a non-parametric test was selected for the independent variables: Mann-Whitney U test.

3. Results

Results are organized according to the study questions.

3.1. Do teachers use student-centred approaches?

First, we addressed the question of whether teachers use a series of student-centred methodologies. In this regard, we found that 95.26% of participants use them (n = 745), while 4.73% do not (n = 37). Those who do not are distributed across all educational stages, and all expressed that they do not work in an innovative learning space (ILS). Another related finding is that all individuals who work in this type of space use at least one type of student-centred methodology.

Usin g the Mann-Whitney U test to compare teachers working in an innovative learning space with those who work in a traditional one, we found statistically significant differences (p > .05) in all methodologies but one (Problem-based learning). This means that teachers using an ILS in their teaching are more likely to answer "yes" when being asked about using a student-centred methodology than those who work in a traditional setting.

3.2. Which competences do teachers activate when planning a learning experience?

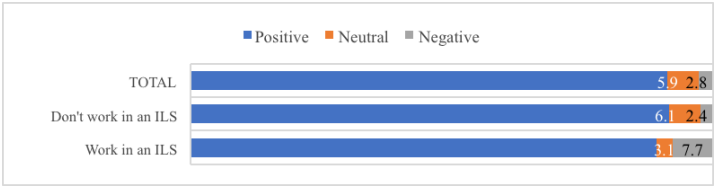
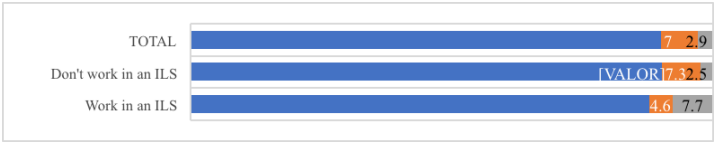
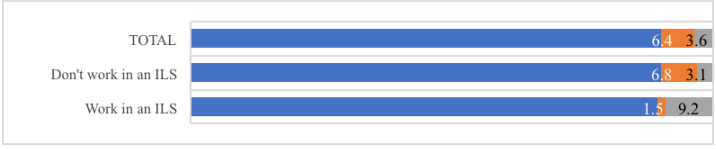
The second part of the test was related to different aspects that teachers may consider when planning the learning experience. As was previously explained, all items in this section were identified as aspects that teachers should take into account when planning their lessons, as well as the method they will use. The purpose of this section was to analyse whether

teachers working in an ILS take these aspects into account more than those teaching in a traditional environment.

Of the sample, 333 teachers rated all items as 4 or 5 on the Likert scale, representing 42.58% of the total. Of the 65 teachers who reported using an ILE, 35 rated all items as 4 or 5, accounting for 53.84% of that group.

Comparing means using the Mann-Whitney U test revealed no significant differences, which means that a higher or lower rating was not conditioned by whether or not the respondent used an ILS. We then examined the frequencies, for which we grouped answers into three new categories: Negative (completely disagree, disagree), Neutral (neither disagree nor agree) and Positive (agree, completely agree).

TABLE 3. Number of responses and percentage for question 2

Item	Percentages according to place of work
b1: I identify the students' needs	
b2: I consider the development of competences as the primary objective	
b3: I design student work based on student-centred methodologies	
b4: I take into account adaptations to address student diversity	
b5: I select various assessment tools	

b6: I establish different stages of assessment	
b7: I include opportunities for constructive feedback for students	
b8: I collaborate with colleagues in planning learning situations	

Source: Prepared by the authors based on data supplied by respondents

Figures from Table 3 reveal that more than 80% of teachers working in ILS answer positively to all items but the last one, related to collaboration with other teachers when planning learning situations, which is the aspect with the least number of positive answers for each group of teachers. However, we can observe the same trend in teachers working in traditional settings, with even higher percentages in some of the items.

The items with the greatest number of positive answers are b1, related to identifying students' needs; b4, taking into student diversity to create adaptations to address differences; and b5, selecting a range of assessment tools to evaluate students.

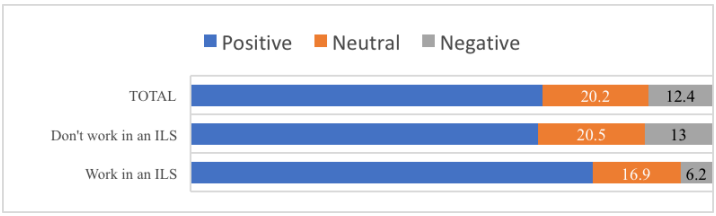
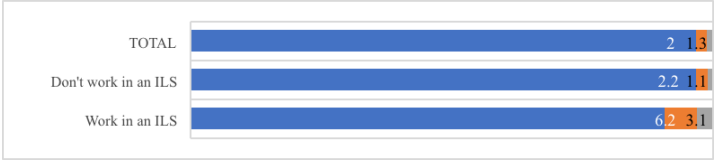
3.3. Which pedagogical and spatial strategies are employed by teachers in their classrooms?

The third section of the test explores strategies teachers can use in their classrooms on a daily basis. Extracting the teachers who answered positively to all the items of this section (n = 346, 44.24%), it can be observed that among the 65 who work in an ILS, 38 fall into this group, i.e., 58.46% of the total.

Comparing the answers between teachers who use an ILS and those who do not, the Mann-Whitney U test reveals significant differences in four of the items: c2 "I encourage student participation in decision-making regarding the learning process" (p = .023, U = 20283.000, Z = -2.272);"c5, "I foster respect for the classroom environment (furniture, resources, etc.)" (p = .042, U = 22355.500, Z = -2.037);"c7, "I support reaching agreements between teachers and students" (p = .050, U = 21330.000, Z = -1.961); and c11, "I allow students to use the space according to their needs" (p = 0.48, U = 20808.500, Z = 1.981). For these items, teachers using an ILS responded more positively than those who do not, except for item c5, to which they responded more negatively (mean ranges: teachers using ILS = 376.92, teachers not using ILS=392.82).

Table 4. Number of responses and percentage for question 3

TABLE 4. Number of responses and percentage for question 3

Item	Percentages according to place of work
c1: I reach a consensus with the students on classroom norms	
c2: I encourage student participation in decision-making regarding the learning process	
c3: I promote self-respect	
c4: I foster respect for others	
c5: I foster respect for the classroom environment (furniture, resources, etc.)	
c6: I promote dialogue within the classroom	
c7: I support reaching agreements between teachers and students	

c8: I ensure the environment has appropriate lighting	
c9: I ensure the ambient noise level is suitable	
c10: I adapt the space to meet the needs of the students	
c11: I allow students to use the space according to their needs	

Source: Prepared by the authors based on data supplied by respondents

From Table 4, it can be inferred that teachers working in an ILS have a higher tendency to reach a consensus with the students on classroom norms (c1), encourage student participation in decision-making regarding the learning process (c2), support reaching agreements between teachers and students (c7), ensure the ambient noise level is suitable (c9), adapt the space to meet the needs of the students (c10) and allow students to use the space according to their needs (c11). However, teachers working in more traditional settings expressed more often that they promote self-respect (c3), foster respect for others (c4), foster respect for the classroom environment (c4), promote dialogue within the classroom (c6) and ensure the environment has appropriate lighting (c8). Only items 2, 5, 7 and 11 registered significant differences.

3.4. What is the role of digital technology in the implementation of learning experiences?

The fourth section of the questionnaire focused on how teachers use technology in the classroom. 228 teachers expressed that they use technology for all the items explored, representing 29.15% of the sample. Among them, 37 work in an ILS, which is 56.92% of the teachers using ILS. Only 17 teachers (2.17%) expressed that they do not use technology for any of the aspects assessed, nine of whom work in early childhood education.

The Mann-Whitney U test shows significant differences in five of the items, as can be seen in Table 5.

TABLE 5. Mann-Whitney test for responses to question 4

Item	Mean ranges		U	Z	p
	Works in ILS	Doesn't work in ILS			
d1	402.20	390.53	22607.000	-.751	.453
d2	426.96	388.29	20997.500	-1.850	.064
d3	480.32	383.45	17529.500	-3.758	<.001
d4	494.16	382.19	16629.500	-4.139	<.001
d5	473.28	384.09	17986.500	-3.529	<.001
d6	430.71	387.95	20754.000	-1.992	.046
d7	421.25	388.80	21369.000	-1.544	.123
d8	448.24	386.36	19614.500	-2.496	.013

Note: d1= I present information to the students; d2= I encourage students to search for information; d3= Students collaborate with their peers (shared documents, chats, shared whiteboards, etc.); d4= Students design their own learning process (roles, phases, etc.); d5= Students create digital content; d6= Communication between students and myself; d7= Students submit or present completed work; d8= I share the evaluation process and results with the students.

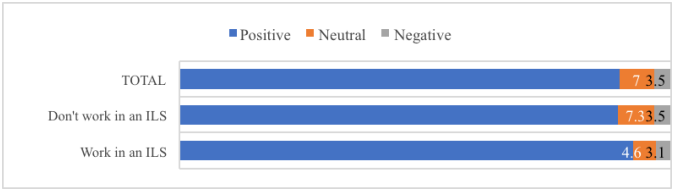
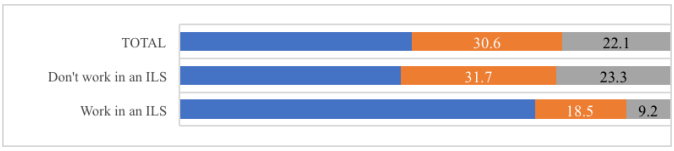
Source: Prepared by the authors based on data supplied by respondents

From these data, it can be seen that teachers who work in an ILS responded more positively to the following questions:

- use of technology for peer collaboration
- students design their own learning process
- students create digital content
- communication between students and the teacher
- sharing the evaluation process and results with the students.

No significant differences were observed for the items related to the use of technology to present pupils with information, for pupils to search for information, or to present or submit completed work.

TABLE 6. Number of responses and percentage for question 4

Item	Percentages according to place of work
d1: I present information to the students	
d2: I encourage students to search for information	
d3: Students collaborate with their peers (shared documents, chats, shared whiteboards, etc.)	
d4: Students design their own learning process (roles, phases, etc.)	
d5: Students create digital content	
d6: Communication between students and myself	
d7: Students submit or present completed work	
d8: I share the evaluation process and results with the students	

Source: Prepared by the authors based on data supplied by respondents

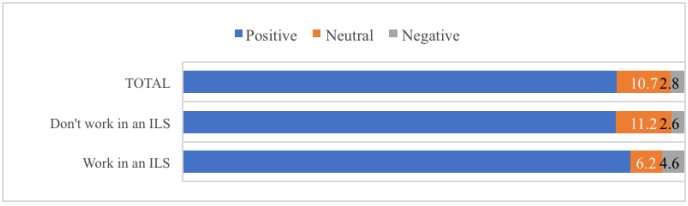
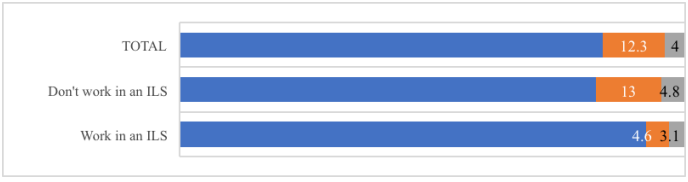
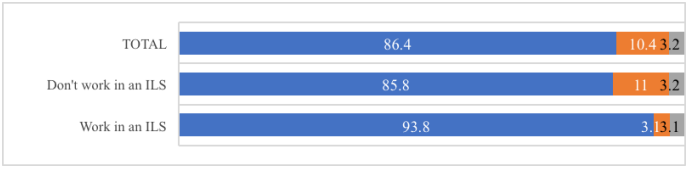
Observing the frequencies compiled in Table 6, it is significant to note that the number of positive answers is higher among the teachers who work in an ILS for all items.

3.5. In which areas do teachers wish to gain deeper knowledge to enhance their future professional practice?

The fifth and final section explored teachers' interests in looking for new strategies for methodologies, spaces or use of technology. A total of 63.04% of the sample stated that they were interested in all six aspects included in this section.

When using the Mann-Whittney U test to compare means, we obtained significant differences for items e5 (New approaches to redesigning educational spaces, p = .007, U = 19658.500, Z = -2.690) and e6 (New ways of utilizing educational spaces, p = 0.18, U = 20177.500, Z = -2.372), with teachers who work in an ILS showing a higher interest in these aspects (Table 7).

TABLE 7. Number of responses and percentage for question 5

Item	Percentages according to place of work
e1: New active methodologies or strategies	
e2: New ways of using educational technology/ digital tools with students	
e3: New ways of using educational technology to create resources	
e4: New ways of using educational technology to accommodate all types of students	
e5: New approaches to redesigning educational spaces	

e6: New ways of utilizing educational spaces	

Source: Prepared by the authors based on data supplied by respondents

Once more, there are proportionally more positive answers among the teachers who work in an ILS for all of the items explored.

4. Discussion

Through the research presented here, we have been able to compare the answers of 65 teachers who work in an ILS to those of 717 who do not. Participants responded to various questions concerning the use of student-centred methodologies, planning considerations, daily classroom strategies and use of technology. Additionally, we have also gathered information about their interest in the three aspects identified as the core of ILEs.

From the results presented above, we can first identify a strong trend toward the adoption of student-centred methodologies, as the majority of the teachers surveyed (95.26%) reported the use of at least one of these methodologies. This is a highly significant finding, as it reflects a widespread acceptance of pedagogical approaches that position students at the centre as active agents with responsibility in their learning process, taking part in more dynamic and participatory learning practices.

Among the teachers who reported not using these methodologies (4.73%), it is revealing that they are distributed across all educational stages, making it impossible to attribute their lack of use by the specific characteristics of the stage in which they teach. It is also significant that all of these respondents expressed that they do not work in an ILS.

When analysing the information provided by teachers working in an ILS, it is noteworthy that all of them employ some form of student-centred methodology. This suggests a potential correlation between the educational space and the willingness to implement these methodologies. This correlation can be interpreted in both directions: teachers working in these spaces utilize more student-centred methodologies, or teachers who employ such methodologies create and work in such spaces. Therefore, these findings could reinforce the idea of educational setting influencing pedagogical practices (Byers *et al.*, 2014), more concretely encouraging the flexibility and freedom to incorporate a variety of pedagogical practices, enabling student-centred learning (Charteris & Smardon, 2019).

When comparing the responses of both groups, statistically significant differences were found in almost all methodologies, with the exception of problem-based learning. This indicates that teachers in ILSs tend to use these methodologies more frequently than those in traditional settings. Problem-based learning may be an exception due to its applicability in various contexts, regardless of the type of space.

The second section of our research studied various planning aspects fostered by ILEs. A positive trend was noted, but no significant differences were found between the group of teachers using an ILE and those who do not. In general, teachers surveyed answered positively to all aspects, and it is interesting to note that the items with a higher number of positive responses were related to student diversity and the strategies used to cope with it (taking into account their needs, creating adaptations when needed and using a range of assessment tools). This suggests a general professional awareness of the importance of inclusive practices, as well as a prioritization of inclusive practices in planning. The results align with broader educational trends that emphasize the importance of developing teaching competence to provide equity and

personalized learning (European Agency for Development in Special Needs Education, 2012; United Nations, n.d.). Previous studies have highlighted the positive effect of ILEs in successfully implementing an inclusive educational environment, as inclusive education is most effective in a learning context in which each student is the centre of their own learning, autonomy is encouraged and socialisation is facilitated (Harris *et al*., 2013; Thomas, 2013).

When exploring some aspects to be considered during the development of the classes in the third section, we found significant differences in some of them. Teachers working in an ILS showed a greater propensity toward encouraging student involvement in decision-making regarding their own learning process, fostering teacher-student agreements and allowing students to use the space to fit their needs. These three aspects are an example of how to provide a student-centred experience, which is one of the basic features of the work that must be developed in an ILS. Therefore, these findings reveal that working in such spaces indeed fosters or permits student-centred learning. It was also reported that there was less encouragement of respect for the classroom space, which can be interpreted by the fact that innovative spaces are intentionally designed to be more interactive, flexible, changeable and manageable than traditional ones. In conclusion, these findings highlight a relationship between innovative spaces and student-centred strategies. This relationship has already been described in previous studies using other research methods (e.g. Mahat *et al*., 2018).

Regarding the use of technology, an aspect explored in our fourth section, 29.15% of teachers use it for all of the aspects explored, with 56.92% of ILS teachers consistently doing so. Having found significant differences between both groups, the results suggest a deeper integration of technology into innovative spaces, where it is used not only for presenting information, searching for it and submitting the final product, but also for providing students with opportunities to create digital content, facilitating peer collaboration and encouraging two-way communication between teachers and students, including the former sharing the evaluation process and results with the latter. These findings support the important role of educational technology in such environments (Gonzalez-Mohino *et al*., 2023; Granda-Piñán *et al*., 2024; Rivera-Vargas *et al*., 2024).

The fifth and last section was related to the teachers' interest in exploring new strategies, both methodological and technological. A high interest was expressed, with 63.04% of the surveyed teachers showing interest in all areas examined. These results are consistent with previous studies that gathered teachers' training interests (Lozano *et al*., 2024). This high level of engagement suggests that teachers are generally open to innovation and eager to improve their practices, both in terms of pedagogical approaches and the integration of technology into the learning process. Results revealed a stronger interest, with proportionally more positive answers, among the teachers who work in an ILS for all the items explored. Significant differences were also found in the two points related to the redesign and utilization of educational spaces, in which they showed more interest than traditional teachers. This suggests that these environments can have an impact on fostering an innovative mindset or that they are a result of the latter. The significant differences found in areas related to the redesign and utilization of educational spaces suggest that teachers in ILS are more attuned to the importance of adapting physical learning spaces to enhance learning. This could be due to the flexibility and opportunities for experimentation that these spaces offer, which likely make teachers more conscious of their potential, or due to the teachers' previous concern about how space educates and fosters learning, which makes them work or create such spaces. What seems clear is that teachers working in ILSs recognize the critical role the learning space plays in student engagement and outcomes. This suggests that innovative spaces not only support more dynamic teaching methods, but also encourage teachers to continuously rethink and improve their physical teaching environments to better support learning experiences.

From all that has been mentioned, it can be stated that innovative learning spaces seem to foster, or at least facilitate, the use of student-centred approaches and their integration with technology. This confirms our previous hypothesis, always taking into account that some modern pedagogical principles are present in both innovative and traditional settings.

Nevertheless, some limitations of this study should be acknowledged. First, the use of a non-probabilistic convenience sampling method, based on voluntary participation, may

introduce self-selection bias and limit the transferability of the findings to the wider population of teachers. Second, although significant differences have been found between the groups compared, the cross-sectional and descriptive nature of the research does not allow for causal inferences. Future studies using probabilistic samples, mixed methods or longitudinal designs could provide deeper insights into the relationship between innovative learning spaces and teaching competences.

In conclusion, this study has contributed to understanding how teachers working in Innovative Learning Spaces tend to apply more student-centred methodologies, integrate digital tools more extensively, and show a greater awareness of the potential of the learning environment. These findings reinforce the idea that the educational setting can act as a catalyst for pedagogical change.

However, while our results suggest a strong association between ILEs and innovative practices, they must be interpreted in light of other sources of research. For example, some studies (Byers *et al*., 2014; Cleveland, 2016) have also found that spatial design can foster active pedagogies, although they caution that without specific training, the mere existence of flexible spaces does not automatically lead to innovative teaching. Therefore, our results may reflect a favourable alignment of space and teacher mindset, rather than the effect of the physical environment alone. Coherently, some educational systems, including for example Singapore, are investing in learning spaces with the intention of promoting diverse pedagogical approaches and student-centred learning (Fan & Popkewitz, 2020). Further cross-national studies are needed to clarify how cultural and systemic factors mediate the impact of ILEs on teaching practices.

Based on the results, it would be advisable to incorporate these insights into both initial and ongoing teacher education programmes. For example, teacher training curricula could include practical modules focused on the design and use of flexible learning spaces, as well as training in co-teaching models and active methodologies. Institutions could also redesign practicum experiences to take place in innovative environments, allowing future teachers to experience and reflect on student-centred practices in context. Furthermore, continuous professional development initiatives should provide structured opportunities for teachers to redesign their classrooms and share innovative strategies within professional learning communities. This last idea is fully aligned with the ones stated by the International Commission of the Futures of Education (2021) concerning how teachers should develop their competences. These actions would help educational institutions not only to promote innovative learning environments, but also to consolidate the professional competences needed to make the most of them.

Finally, this research opens the door to further investigation. Future studies should explore the causal relationship between space and pedagogy through longitudinal or experimental designs. It would also be relevant to examine how specific components of ILEs (such as furniture flexibility, technological infrastructure or co-teaching) contribute independently to teacher practice. Additionally, qualitative approaches could help uncover the underlying beliefs and motivations behind teachers' decisions to innovate, offering a more nuanced understanding of the interaction between space, mindset and professional development.

Author Contributions

Amelia-R. GRANDA-PIÑÁN. Conceptualization, methodology, project administration, data curation, formal analysis, investigation, writing – original draft.

Moisés MORENO-RANDO. Conceptualization, methodology, project administration, writing – review & editing.

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IA statement

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