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Universal Design for Learning and Instruction: Effective Strategies for Inclusive Higher Education

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Abstract: Guaranteeing inclusive, high-quality education for all requires comprehensive changes to the curriculum so that, instead of creating or perpetuating barriers, these barriers are eliminated. Universal Design for Learning (UDL) and Universal Design for Instruction (UDI) emerge as teaching strategies that encourage inclusion in education. This study presents the implementation of both models within the higher education framework, applying them to the Spanish Sign Language and Deaf Communities degree that is studied by a large number of deaf students. For this purpose, a descriptive study is presented with a quantitative methodological approach using a survey as an instrument. Four dimensions were established for designing the curriculum: course materials, teaching strategies, synchronous course management, and asynchronous. After student assessment, the results revealed their high level of satisfaction and the importance these teaching strategies had for their motivation, comprehension, and learning of the relevant competencies. There was also recognition of the importance of blended teaching methods for active learning as a vehicle for increasing student involvement and participation. This study concludes that it is necessary to continue progressing in the practical implementation of teaching models based on Universal Design, which also supports course management.

Keywords: inclusive education; universal design for learning; sign language; higher education

1. Introduction

Ref. [1] defines inclusive education as "the process of addressing and responding to the diversity of needs of all learners through increasing participation in learning, cultures, and communities and reducing exclusion from education and from within education".

This goal implies changing and transforming content and strategies from a universal point of view that includes all students, with the conviction that the education system is responsible for educating everyone. This objective should be achieved by adhering to the principle that each and every student has their own characteristics: interests, skills, and different learning needs. This means that education systems and programs should be designed to consider this broad diversity of needs and characteristics.

Inclusive education is a strategic approach that is designed to help students learn successfully. It advocates shared goals to reduce and remove all learning barriers and encourage more vulnerable students to participate.

The Incheon Declaration states that the end goal of education must be to ensure "inclusive and equitable quality education and promote lifelong learning for all".

Universal Design applied to education is an approach that provides a firm basis for establishing inclusive and safe agreements and promoting and guaranteeing a high-quality, inclusive, and equitable education system for the whole community.

The Universal Design (UD) approach originated in the field of architecture and industrial design in 1970, mainly appearing in the United States, Canada, and Japan. The term was created by Ron Mace, the Universal Design Center (UDC) founder. Ron Mace defined

it as designing services that are usable by all people without the need for later adaptation for specific users [2].

The approach specifically emerged to promote an architecture model with no accessibility barriers that everyone could use, meaning both people with and without a disability. A key concept of UD is the notion of an architectural movement that was flourishing at the time: designing and constructing buildings and public spaces that considered access, communication, and use by everyone. Advances in design were achieved by incorporating principles such as accessibility, clarity, coherence, compression, and flexibility [3].

Similarly, the UD wave discovered that this approach did not only benefit people with disabilities; by applying its principles, many other people also benefitted from its features. Different approaches have been progressively developed to apply UD principles to educational spheres; each approach has been given a different name, but they propose similar objectives [4].

The main approaches and their terms are as follows:

- Universal Design for Learning (UDL).
- Universal Instructional Design (UID).
- Universal Design for Instruction (UDI).
- Universal Design in Education (UDE).

These four principles share a common goal: guaranteeing accessible learning for all students, with or without a disability, with the aim of improving their chances of success. According to [5], UID, UDI, and UDL focus on the processes of teaching and learning, while UDE proposes applying the principles of Universal Design to other spheres that are linked to the education process, such as student services and libraries.

Studies performed using the UID, UDI, and UDE models have focused on university-level education, while, in contrast, the UDL is present at all education levels. In relation to this data, Ref. [2] states that the UDL approach is the one most commonly found in the education community and has become essential content for training future teachers. It is also part of the education framework, used to respond to diverse needs and demands across all education levels.

The reason that UDL is included in classrooms can be extrapolated from the aim of UDL: use different teaching methods to remove barriers that create obstacles to learning, thereby developing the ability to adapt to the needs of each student. This means that the objective is to benefit all students, not just those with different functional capacities [6].

However, as [7] indicates, paradoxically, inclusive education is frequently mentioned and known by education professionals. Nevertheless, the concept of Universal Design applied to education is rarely incorporated into education design processes in Spain. Therefore, in order to achieve higher levels of inclusion, it is essential to strengthen teacher training mechanisms in this area [8].

Consequently, the objective is to make learning accessible to all students, eliminating any difficulties that arise during the learning process. To achieve this, it is essential to design a curriculum that takes into account classroom diversity so that every student has the same opportunity to progress.

UDL was originally developed at the Center for Applied Special Technology. According to [9], UDL is an approach that focuses on teaching, learning, curriculum development, and assessment. It is based on researching brain processes and ITC with the aim of responding to individual differences in learning.

Therefore, UDL is applied as a teaching approach that aims to eliminate barriers using a flexible, adjustable model that includes all students, boosting their skill development [6].

It also questions the fact that most curricula do not respond to all students equally. As a result, some students do not achieve their learning objectives because they are unattainable [9].

As a result, the UDL research team developed a sphere of use for UDL in the classroom, backed by a theoretical basis that applies the latest advances in neuroscience to learning, educational research, technology, and digital media.

CAST researchers established that, in the complex network of neuronal connections that brain areas use to communicate, three types of brain sub-networks are used in the learning process and specialize in specific information processing or performance tasks.

Ref. [10] proposes that these learning brain networks give meaning to the what, how, and why of learning. These are:

- Recognition networks.
- Strategic networks.
- Affective networks

According to [11], the recognition network is related to giving meaning to received information: "What of learning?" The strategic network oversees planning, carrying out, and monitoring mental and motor tasks ("The How of Education"), and the affective network is related to motivation and involvement in learning ("The Why of Learning").

Identifying these brain networks and the interpersonal variability in how each works established the basis for designing the UDL framework, and a principle was developed for each network. Three key principles based on neuroscientific research guide UDL and the guidelines [11]. These principles are:

- Principle 1: Provide multiple forms of engagement (the why of learning). Motivation is an essential part of the learning process. No two students are alike in terms of motivation, so it is important to provide different sources of motivation.
- Principle 2: Provide multiple forms of action (the how of learning). Each student has their own skills for expressing what they know. There is no one way of acting and expressing knowledge; therefore, different action and representation methods should be used.
- Principle 3: Provide multiple forms of representation (the what of learning). Each student interprets and understands information differently. There is no one way of presenting information that is suited to everyone; therefore, different ways of interpreting information should be offered.

As UDL was developed, other approaches were created to respond to needs as they arose, such as Universal Instructional Design (UID), first named by [12]. Ref. [13] later defined it as an approach applied to the education context for the education of adults; it aimed to design, implement, and assess content and students' performance.

The Universal Design for Instruction (UDI) emerged later. It is a relatively recent concept in education aimed at universities. It is defined as the model that develops instructional methods so that all students with diverse learning needs have equitable access to teaching.

The term was developed at the University of Connecticut (in the United States) at the Center on Postsecondary Education and Disability and the Center for Students with Disabilities. These centers worked on a project that established the foundations of UDI [14].

The defining characteristic differentiating it from other concepts, such as UDL, is that Universal Design for Instruction focuses exclusively on university-level education. UDI applied to university teaching does not solely refer to accessibility for persons with disabilities. It is a truly universal approach because it considers the future needs of all students when designing content and teaching.

This process is used to identify and eliminate barriers in teaching while maintaining academic rigor and boosting students' learning, irrespective of their knowledge and preferences, reducing the need for special adaptation to a minimum.

Ref. [15] proposes the concept of UDI based on the seven principles of Universal Design (Appendix A, Figure A1) but also includes two new principles focused more specifically on education. These two principles are:

1. Learning communities. Teaching processes should promote interaction and communication among students and between students and teachers.
2. Welcoming and inclusive teaching environment. Teaching should be designed to be welcoming and inclusive. Students should have high expectations for their progress.

Although research into developing Universal Design in education has increased in recent years, it is still fairly rare in the university context. Ref. [16] states that, although research is based on a UD model, the level of detail of how it is applied is often limited and, generally speaking, does not provide a standard format for describing how UD is used in research. Therefore, Ref. [17], in collaboration with CAST, created guidelines to unify its development, implementation, and transfer.

This current study was based on earlier studies [18,19] that structured the curriculum around course materials, methodological strategies, and synchronous and asynchronous teaching. These aspects were used to organize planning in education because their structure fits into planning for higher education.

The partial results are included below; they are part of broader research in which curriculum planning was designed and based on the principles of Universal Design for Learning (UDL) and Universal Design for Instruction (UDI), framed within the four aspects described above.

2. Materials and Methods

2.1. Objectives

The main objective was to assess the use of teaching strategies based on UDL/UDI applied to the subject "Spanish Sign Language Interpretation Techniques." Two specific objectives were set:

Check whether students positively assess or prefer inclusive teaching strategies as didactic strategies to enhance learning and achieve the subject competencies.

Assess whether the teaching strategies in line with UDL/UDI that were implemented in the subject curriculum contributed to learner motivation.

A descriptive study was designed with a quantitative methodological approach to achieve these objectives, and the tool used was a questionnaire.

2.2. Population and Sample

The sample was comprised of 108 participants who were all studying for the Sign Language and Deaf Communities degree and had taken the subject "Application of Sign Language Interpretation Techniques I, II, III, and IV." In terms of gender, the participants were: ninety-eight females, seven males, two non-binary, and one who preferred not to answer. A total of 38 of the participants were studying at the Alcorcón campus and 76 at the Madrid-Quintana campus. A total of 72% of the sample were aged between 20 and 26, and the participants were spread across each year of study as follows: 39 in the 1st year, 3 in the 2nd year, 31 in the 3rd year, and 35 in the 4th year. With regard to student variability and the classroom environment, it should be noted that students with specific educational support needs, with or without a disability, were present in every year of study. This information was obtained from the ACAUNES report [20] from the disability and educational needs support unit (DSU) at the university. In the case of special educational needs (related to a disability), they all corresponded to deaf students, whereas the specific need for educational support unrelated to a disability referred to students with ADHD and dyslexia. In terms of Spanish sign language knowledge, the classroom was populated by students with prior higher education qualifications in sign language interpretation, deaf students whose mother tongue is sign language, and students with no prior knowledge of Spanish sign language.

2.3. Tool

The questionnaire administered [21] is aligned with the components included in the subject's design, development, and implementation. It was created by adapting theoretical and practical approaches taken from the following tools and prior studies: Inclusive Teaching Strategies Inventory (ITSI, [22]). Studies conducted by [16,18,19,23,24] and the material presented by [25] offer guidance on applying Universal Design for Instruction to university education. It includes five items corresponding to sociodemographic and

degree data: campus, year, degree, age, and gender. The questionnaire had 30 items, and 18 corresponded to Materials: study program, multimodal content, Supplementary Materials, assessment, practical activities, and physical support. Seven items were related to Teaching Strategies, three to Synchronous Teaching, and two to Asynchronous Teaching. There were four questions on evaluating the experience and three on Spanish sign language. These items were organized on a Likert scale (from 1 "totally disagree" to 5 "completely agree"). Finally, there were four questions about learning preferences with multiple-choice answers.

2.4. Data Gathering and Processing Procedure

Prior studies were performed related to using virtual learning spaces to encourage the use of ICT and link it to the following UDL principles: "Provide multiple forms of representation" and "Provide multiple forms of action and expression." The blended learning method was also studied to encourage motivation, special attention to diversity [26], and self-regulated learning [27]. Finally, the use of Spanish sign language as the working language; both studies were related to the UDL principle "Provide multiple forms of involvement" to be used in the subject "Application of Spanish sign language interpretation techniques I, II, III, and IV".

Using virtual learning spaces was highly valued by students, and they proposed greater use of these spaces throughout their academic careers [28]. Students valued blended learning using virtual spaces as accessible and inclusive [29]. Finally, an analysis of the use of sign language as the working language for the subject, which was already taught in a blended way, showed that it was warmly welcomed by students, with a very positive score for being highly inclusive [30].

As has been described in the population and sample section above, the Sign Language and Deaf Communities degree, and specifically the "Application of Spanish Sign Language Interpretation Techniques I, II, III, and IV," has a large number of deaf students, alongside others with specific educational support needs unrelated to a disability, such as ADHD and dyslexia. Therefore, if following the guidelines for making Universal Design for Learning effective, it is important to consider learner variability. It is always essential to think about any possible difficulties or different ways of learning or working that this may require. The curriculum is being designed along these lines to make accessing education easier for all, preventing any possible limitations at a planning and course management level.

As a result, and based on the results of the prior research, which demonstrated the positive acceptance of blended or mixed, bilingual, and multimodal learning spaces, researchers proposed planning the curriculum for the subject by ensuring that Universal Design for Learning (UDL) and Universal Design for Instruction (UDI) featured in the materials, strategies, and synchronous and asynchronous teaching aspects. A further study was performed that was revised by two experts in Universal Design, two in accessibility, and one in sign language. This study defined the components that should feature in each of the four aspects planned for the curriculum. These components were designed to ensure that each was framed within UDL and UDI principles and was also in line with inclusive teaching processes in accordance with competence-based teaching and the quality standards required by the university context.

Following the guidelines for designing instruction systems by [31], after analyzing, designing, developing, and implementing the subject, the assessment was performed by providing students with a questionnaire to evaluate whether or not the objectives had been achieved.

The data analysis shows the continuous variables' mean, typical deviation, and median. Kruskall–Wallis non-parametric testing was used (three or more independent samples) to compare between years. The frequencies and percentages of the categorical variables are shown. The Pearson Chi^2 test was used to compare years.

The *level of significance* used in the analyses was 5% ($\alpha = 0.05$). The *p*-value was used to confirm that the results were not random.

3. Results

The results of the aspects used in the course structure are found below: Materials, course strategies, and synchronous and asynchronous management.

Table 1 shows high scores for all the items. The median of each item was 5, except for 34, which was 4. The lowest deviation was in item 3 with 0.67, reflecting students' high level of comprehension about the usefulness of different activities and their appropriate choice to develop the skills they were working towards, increasing their commitment to the content. However, item 5 had a deviation of 0.94, indicating that, although it had significant results, speaking to the teacher freely is a resource they did not all use equally.

Table 1. Results—Materials: Study program.

Materials: Study Program	N	M	SD	25th pctl.	Me	75th pctl.
1. The teacher defined and explained the objectives, competencies, and content when they introduced the subject at the start of the course.	108	4.50	0.70	4.00	5.00	5.00
2. Once the objectives had been explained, I understood that they were necessary to achieve the subject competencies.	108	4.45	0.74	4.00	5.00	5.00
3. I understood that each type of subject activity was oriented toward developing a specific skill/s or competence/s related to SSL interpretation.	108	4.56	0.67	4.00	5.00	5.00
4. The teacher explained the assessment criteria at the start of the course and before each assessment test.	108	4.50	0.88	4.00	5.00	5.00
5. I felt I could speak freely with the teacher about issues related to a disability, educational need, or personal situation.	108	4.35	0.94	4.00	5.00	5.00
34. The teacher explained how the subject worked in the VC, describing the sections and schedules that would be followed.	108	4.30	0.79	4.00	4.00	5.00
35. The teacher was available to respond to my learning needs.	108	4.41	0.80	4.00	5.00	5.00

With regard to the multimodal materials provided by the teacher that are directly related to the UDL principle of multiple forms of representation, a high score was noted for the availability of electronic materials and the variety of ways of accessing materials. Table 2 shows item 11 had a mean of 4.46, showing students' comprehension of tasks and the reason that these tasks were designed

Table 2. Results—Materials: Multimodal Content.

Materials: Multimodal Content	N	M	SD	25th pctl.	Me	75th pctl.
6. The subject teacher provided and presented the content in formats that were accessed in different ways: text, video, orally, video in SSL, etc.	108	4.60	0.80	4.00	5.00	5.00
7. The content was available electronically.	108	4.74	0.55	5.00	5.00	5.00
11. The teacher provided varied activities in different formats, letting me practice different skills to learn SSL interpretation techniques.	108	4.46	0.81	4.00	5.00	5.00

Tables 3 and 4 also show high scores regarding the acceptance of the items. Particular note should be taken of the scores for items 12, 15, and 17 in Table 3 and 29 in Table 4. The data show that teachers should bear this information in mind, given the importance

students place on continuous feedback, rubrics, and personalized comments as tools for reflecting on the learning process, their situation, and their evolution during it. This aspect and the preference for conducting continuous tasks instead of a final assessment test highlight the need to use these types of activities. These are related to the UDL principles of multiple forms of engagement and multiple forms of action and expression.

Table 3. Results—Materials: Assessment and Practical Activities.

Materials: Assessment and Practical Activities	N	M	SD	25th pctl.	Me	75th pctl.
12. Receiving continuous feedback on each task lets me reflect on my skills, be aware of what I accomplish best, and learn where I should improve.	108	4.73	0.66	5.00	5.00	5.00
13. Receiving "live" feedback (in the classroom/synchronous video class) lets me check my work and discuss it with classmates.	108	4.50	0.79	4.00	5.00	5.00
14. I can turn to the teacher's feedback comments when I need to because they are sent in different formats (written, audio, video, etc.).	108	4.44	0.87	4.00	5.00	5.00
15. I prefer to accomplish continuous and progressive tasks that let me set goals and increase my motivation.	108	4.46	0.79	4.00	5.00	5.00
16. I prefer to accomplish more continuous practical activities that give me information about my progress than one final assessment test.	108	4.61	0.77	4.00	5.00	5.00
17. Assessment rubrics and personalized comments by video (oral and/or in SSL) are useful for finding out about my learning situation and progress in the subject.	108	4.78	0.66	5.00	5.00	5.00

Table 4. Results—Materials: Supplementary and Physical Format.

Materials: Supplementary and Physical Format	N	M	SD	25th pctl.	Me	75th pctl.
38. It makes learning easier to be able to access content and information in different formats (text, video, audio, subtitles, etc.).	108	4.58	0.64	4.00	5.00	5.00
29. I can accomplish tasks at my pace and study anywhere because I can access the virtual classroom from different devices (tablet, mobile, computer, etc.).	108	4.36	1.00	4.00	5.00	5.00

For a broader view of the results of the Materials aspect, Table 5 shows the items that stood out earlier and compares them by academic year. The scores from the second year were not included because the sample was too small.

There was no significant difference for any items (p-value K–W > 0.05) according to the academic year. The scores (from 1 to 5) were generally very high, and the median of all the items was 5, i.e., at least half of the scores were 5. The means ranged between 4.39 and 4.78, with a deviation between 0.66 and 0.99 (indicating little dispersion). This means that there was very high acceptance of each item. However, differences were noted between the item scores. They can be ordered from highest to lowest: 17, 12, 3, 15, 11, 5, and 29, which had the greatest dispersion (0.99), suggesting possible difficulties accessing the virtual learning environment using different formats. If the <4, 4, and 5 scores are grouped together and the Pearson Chi^2 test is applied, there is little difference between academic years here either (p-values > 0.05).

Table 5. Results—Materials: all aspects.

Course Materials		N	1st	3rd	4th	*p* Value K-W
3. I understood that each type of subject activity was oriented toward developing a specific skill/s or competence/s related to SSL interpretation.	N	105	39	31	35	0.444
	$\overline{x}$	4.56	4.67	4.42	4.57	
	SD	0.68	0.58	0.85	0.61	
	Me	5.00	5.00	5.00	5.00	
5. I felt I could speak freely with the teacher about issues related to a disability, educational need, or personal situation.	N	105	39	31	35	0.170
	$\overline{x}$	4.39	4.56	4.19	4.37	
	SD	0.89	0.82	1.01	0.84	
	Me	5.00	5.00	4.00	5.00	
11. The teacher provided varied activities in different formats, letting me practice different skills to learn SSL interpretation techniques.	N	105	39	31	35	0.097
	$\overline{x}$	4.48	4.62	4.19	4.57	
	SD	0.82	0.78	1.05	0.56	
	Me	5.00	5.00	4.00	5.00	
12. Receiving continuous feedback on each task lets me reflect on my skills, be aware of what I accomplish best, and learn where I should improve.	N	105	39	31	35	0.771
	$\overline{x}$	4.74	4.69	4.68	4.86	
	SD	0.67	0.80	0.75	0.36	
	Me	5.00	5.00	5.00	5.00	
15. I prefer to accomplish continuous and progressive tasks that let me set goals and increase my motivation.	N	105	39	31	35	0.170
	$\overline{x}$	4.49	4.54	4.26	4.63	
	SD	0.79	0.72	0.93	0.69	
	Me	5.00	5.00	5.00	5.00	
17. Assessment rubrics and personalized comments by video (oral and/or in SSL) are useful for finding out about my learning situation and progress in the subject.	N	105	39	31	35	0.332
	$\overline{x}$	4.78	4.74	4.68	4.91	
	SD	0.66	0.75	0.79	0.37	
	Me	5.00	5.00	5.00	5.00	
29. I can accomplish tasks at my pace and study anywhere because I can access the virtual classroom from different devices (tablet, mobile, computer, etc.).	N	105	39	31	35	0.297
	$\overline{x}$	4.39	4.28	4.29	4.60	
	SD	0.99	1.02	1.13	0.77	
	Me	5.00	5.00	5.00	5.00	

With regard to the Learning Strategies aspect shown in Table 6, there were only significant differences by academic year for item 32 (*p*-value 0.036 < 0.05). The teacher discussing the content for the next class in advance was more beneficial to 4th-year students than 1st-year students. The scores were generally very high, and the median of all items was 5 (except for 30, which was 4), i.e., at least half of the scores were 5. The means ranged between 4.2 and 4.6, with a deviation between 0.60 and 0.98 (indicating little dispersion). This means that there was also very high acceptance of each item.

However, differences were observed in the items' scores, which could be ordered from highest to lowest: 31, 33, 32, 8, 39, 24, and 30. This highlights the importance of specific teaching strategies for boosting engagement and motivation, such as summarizing at the beginning and end of class, using varied and different types of activities, and discussing content in advance.

Table 7 shows the importance of establishing work teams to learn from others and generate learning communities and confirms that virtual learning spaces and human resources are accessible.

On the other hand, Table 8 shows the importance of explaining the activities clearly in the virtual classroom. However, a greater dispersion is perceived in the responses regarding the promotion of participation through discussion forums and dialogical activities.

Table 6. Results—Teaching Strategies: Tasks and Activities.

Teaching Strategies: Tasks and Activities		N	1st	3rd	4th	*p* Value K-W
8. Supporting materials and/or SSL glossaries reinforce comprehension of the main content of each topic.	N	105	39	31	35	0.1447
	$\bar{x}$	4.40	4.46	4.13	4.57	
	SD	0.85	0.82	1.02	0.65	
	Me	5.00	5.00	4.00	5.00	
24. In this subject, I feel respected, can express my opinions, and can explore new ideas.	N	105	39	31	35	0.189
	$\bar{x}$	4.39	4.54	4.06	4.51	
	SD	0.81	0.60	1.12	0.61	
	Me	5.00	5.00	4.00	5.00	
30. I feel that, in this subject, you are not penalized for showing initiative and learning from your mistakes in your daily activities.	N	105	39	31	35	0.801
	$\bar{x}$	4.21	4.31	4.16	4.14	
	SD	0.98	0.89	1.04	1.03	
	Me	5.00	5.00	4.00	4.00	
31. When the teacher summarizes the content that has been covered in each session, it helps my comprehension and learning of the subject.	N	105	39	31	35	0.320
	$\bar{x}$	4.62	4.59	4.58	4.69	
	SD	0.68	0.55	0.76	0.76	
	Me	5.00	5.00	5.00	5.00	
32. When the teacher discusses in advance the content that will be covered in the next class, it helps my comprehension and learning of the subject.	N	105	39	31	35	0.036
	$\bar{x}$	4.46	4.28	4.35	4.74	
	SD	0.77	0.86	0.88	0.44	
	Me	5.00	4.00	5.00	5.00	
33. The teacher provided practical activities to generalize and experiment with what had been learned.	N	105	39	31	35	0.252
	$\bar{x}$	4.57	4.64	4.39	4.66	
	SD	0.60	0.49	0.76	0.54	
	Me	5.00	5.00	5.00	5.00	
39. I think it is good for my learning and personal reflection to be able to share a space where you can think individually, share with your team, and later, share with the entire group.	N	105	39	31	35	0.288
	$\bar{x}$	4.38	4.46	4.23	4.43	
	SD	0.74	0.76	0.76	0.70	
	Me	5.00	5.00	4.00	5.00	

Table 7. Results—Synchronous Teaching.

Synchronous: Classroom Management and Tutorials	N	M	SD	25th pctl.	Me	75th pctl.
21. Synchronous or asynchronous teamwork means I can learn from the strengths of others.	108	4.23	0.96	4.00	4.00	5.00
26. It was easy for me to access the virtual spaces (Virtual Classroom/Teams/Blackboard Collaborate).	108	4.36	0.86	4.00	5.00	5.00
36. The teacher responded to my doubts and queries in less than 48 h.	108	4.10	0.87	4.00	4.00	5.00

Table 8. Results—Asynchronous Teaching.

Asynchronous: Classroom Management	N	M	SD	25th pctl.	Me	75th pctl.
27. Instructions for preparing for or conducting tasks were clearly explained in the virtual classroom.	108	4.27	0.83	4.00	4.00	5.00
37. The SSL discussion forums and dialogic activities encouraged participation from all students.	108	3.63	1.20	3.00	4.00	5.00

Tables 9–11 show a preference for receiving feedback and working on and learning theoretic content. The results show that the visual or visual–gestural channel stands out for receiving feedback from the teacher. Furthermore, students preferred to combine teamwork

and individual work. Finally, to learn theoretical content, they preferred face-to-face teaching, followed by electronically written texts that could be printed.

Table 9. Results—Feedback Preferences.

Feedback Preferences	N	M	SD	25th pctl.	Me	75th pctl.
With a rubric.	108	3.93	1.10	3.00	4.00	5.00
With an oral and/or SSL video.	108	4.81	0.60	5.00	5.00	5.00
With an audio file.	108	3.37	1.21	3.00	3.00	4.00

Table 10. Results—Work Preferences.

Work Preferences	N	$\bar{x}$	SD	25th pctl.	Me	75th pctl.
Individually and at my own pace because I think I learn more.	108	3.51	1.08	3.00	4.00	4.00
In a team because I think it enriches me to learn other ways of working.	108	3.81	0.99	3.00	4.00	5.00
Combining both ways.	108	4.49	0.70	4.00	5.00	5.00

Table 11. Results—Learning Theoretical Content.

Preferences for Learning Theoretical Content	N	M	SD	25th pctl.	Me	75th pctl.
In written, electronic texts that are accessed on a computer.	108	3.96	1.07	3.50	4.00	5.00
In written electronic texts that can be printed.	108	4.18	0.98	4.00	4.00	5.00
Watching videos of recorded classes.	108	3.94	1.07	3.00	4.00	5.00
Watching videos of recorded classes with subtitles.	108	3.71	1.00	3.00	4.00	4.50
Watching videos of recorded classes in SSL.	108	3.64	1.12	3.00	4.00	5.00
Watching videos of recorded classes in SSL with subtitles.	108	3.87	1.00	3.00	4.00	5.00
Listening to videos of recorded classes.	108	3.26	1.29	2.50	3.00	4.00
Explained by the teacher face-to-face.	108	4.57	0.70	4.00	5.00	5.00

4. Discussion

This study highlights that teaching a subject that considers Universal Design elements applied to education aspects means investing time into designing the subject and greater planning than usual [19]. However, the research also achieved one of the toughest objectives, which was translating universal design principles into education practice in higher education. This is not usual practice, and authors such as [14,32] discuss the need for studies supporting inclusive methodologies.

The results reveal high student scores and their preference for inclusive teaching strategies. Of particular note are the high levels of comprehension of both objectives and the skills and competencies that are developed by each activity in the Materials: Study Program aspect. This means that actions that emphasize goals and objectives, alongside appropriate guidance towards establishing these goals, improve students' engagement and confirm that the UDL principles of action and expression were implemented correctly. These results coincide with those obtained in the work of [19,33] on student preferences, highlighting the importance of making the objectives and expected results explicit when proposing academic tasks to students.

Another relevant aspect that should be considered is students' feelings about creating welcoming learning environments that encourage a learning community because they felt they could talk to their teacher about any personal matters or issues related to their learning needs. This leads to students being more involved in the subject, which aligns with the UDL principle of multiple forms of engagement and motivation. Studies such as [34], which addressed the principle of exclusive involvement, reveal it as a fundamental principle and link it to the application of the other two UDL principles, as it strengthens students' sense of belonging and reduces the level of academic dropout.

The results obtained support both the authors' expectations and previous research, indicating that building relationships between students and teachers is a key component of effective instruction and that students want to be known as individuals by the course instructor [35,36]. Ref. [37] noted that students report higher levels of participation in courses where the instructor creates a connection with students, and student learning is enhanced through these relationships [38].

Furthermore, considering that 95.4% gave a positive score to the idea that offering a diversity of formats when presenting content helped their learning, we believe it is necessary to commit to applying the principle of representation across all subjects because it aids and increases comprehension options. The results support studies such as [39,40], in which students highlight the value to their learning of the teacher providing different ways of accessing content. On the other hand, coinciding with [33,41], the preference for learning key contents of the subject is with written and electronic texts in printed versions, highlighting, in our case, the teacher's explanation in a synchronous or face-to-face manner. In addition, the results reveal that students also share preferences for learning content through video tutorials and written information (subtitles).

The aspect that stands out the most with 81.7% of "completely agree" answers related to the UDL principle of action and expression and connected to evaluation is students' preference for receiving continuous feedback. This allows them to reflect on the skills they have acquired and be aware of aspects that they accomplish well and need to improve. Continuing with the results, they reflect a preference for immediate feedback, supporting the studies of [34,40]. Along the same lines, works such as [42,43] consider the importance given to feedback in improving student engagement and learning with the course. On the other hand, the results reflect the students' preferences for continuous and progressive tasks, which support the results of the previous findings [19]. These methodological strategies increase motivation and allow information on learning progress to be obtained rather than from a single final test. This also shows a preference for formative assessment, which promotes the principle of action and expression as a resource to improve learning, in line with previous studies such as [40].

It should be underscored that simple actions such as summarizing at the beginning and end of a class, discussing content in advance, and providing practical activities for experimenting with what has been learned are highly valued by students. These actions show that actions that generate greater engagement are key to motivation. In addition, strategies such as providing Supplementary Materials in different formats to strengthen comprehension and anticipating content to help comprehension and learning were acknowledged and given positive scores by students. Additionally, creating work teams to learn from the strengths of others and the teacher clearly explaining task instructions, both orally and in writing, were acknowledged and given positive scores by students. This shows that offering different media for representation, as well as for action and expression of learning, promotes learner engagement [34]. In this sense, students feel greater choice and mastery of the learning process [40,44].

Finally, using discussion forums to encourage participation only received 56.9% of "agree" and "completely agree", suggesting that these kinds of activities should be reconsidered and the reason for these results should be examined. The study [39] confirms that the use of UDL increases the positive perception of e-learning resources and helps learners who are not used to this format of activities.

However, although the sample was not very large, it was large enough to assess that applying inclusive strategies based on Universal Design applied to education boosts students' involvement and encourages and aids learning while also making students responsible for their learning process in a welcoming and enabling environment.

We believe that accessible and inclusive designs should be increasingly applied to curriculum planning if we want to consider the huge diversity of students in university classrooms. Although incorporating Universal Design elements and strategies takes time and effort, especially the first time they are implemented, we can state that, in the medium

term, it is an investment that improves degree management and helps everyday classroom life be handled with greater peace of mind. Even though they were designed to eliminate difficulties and increase all students' participation and achievements, they also mean classes can be managed by focusing on the essential aspects of the teaching and learning process. As a result, more time and quality can be spent on more personalized attention in the classroom and on the teacher–student relationship that is often pushed into the background. As [45] states, participating in academic life generates feelings of psychological well-being that increase students' commitment to their studies and prepare them for future political, social, and work responsibilities [46].

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