Article

Variability of Higher Education Students' Learning Styles Depending on Gender, Course, Degree and Institutional Context

Pilar Alonso-Martín [1,*,†] **, Rocío Cruz-Díaz** [2,*,†] **, Carmen Granado-Alcón** [1,*,†] **, Rocío Lago-Urbano** [1,*,†] **and Concha Martínez-García** [1,*,†]

1   Department of Social, Developmental and Educational Psychology, University of Huelva, Avda. de las Fuerzas Armadas s/n., 21007 Huelva, Spain
2   Department of Education and Social Psychology, Universidad Pablo de Olavide, Ctra. Utrera, Km 1, ES-41003 Seville, Spain
*   Correspondence: pilar.alonso@dpsi.uhu.es (P.A.-M.); mrcrudia@upo.es (R.C.-D.); granado@dpsi.uhu.es (C.G.-A.); rocio.lago@dpee.uhu.es (R.L.-U.); concha.martinez@dpsi.uhu.es (C.M.-G.)
†   All authors contributed equally to this work and all are correspondence.

Abstract: In higher education it is important to consider learning styles of students to facilitate the teaching–learning process. The aims guiding the research were to describe the learning styles predominating among students in the field of the social sciences, to analyse the results with respect to gender, year of study, degree course and institution, and to perform correlation analysis between these variables. The data analyses were carried out with non-parametric statistics with a confidence level of 95%. The sample was composed of 636 students at the Universities of Huelva (UHU), Cádiz (UCA), and Pablo de Olavide of Seville (UPO), who completed the Honey–Alonso Learning Styles Questionnaire and reported sociodemographic and educational data. The results showed a significant preference for the Reflector style. Significant correlations were found in most variables highlighting that the courses showed an inverse correlation with the learning styles, the Activist, Theorist, and Pragmatist styles being less preferred as they progressed in the career. It is worth noting the significant direct correlation between Reflector, Theorist, and Pragmatist styles, but the Activist style inversely correlates with all three. As a complementary contribution, a proposal for intervention in classrooms with a sustainable perspective is offered. It is important to attend to the evolution in the preference of the learning styles that students acquire as they advance in higher education courses in order to facilitate a more optimal and sustainable teaching–learning process.

Keywords: education change; higher education; degree; learning style; lifelong learning; sustainability; educational paradigm

1. Introduction

The current model of education within the European Higher Education Area (EEES) sets up a format of the teaching–learning process based on competences acquisition. This model requires the organisation of new formative proposals in which the essential keys change so as not to focus the emphasis on the teacher and her formal teaching to the students and their learning. These changes are orientated to competences acquisition in which the main purpose focuses on developing a more practical higher education orientated to instruct "sustainable citizens" able to think, make critical reflections, act for societal transformation, and show social cohesion. It is an attempt to solve the distance between knowledge and action [1].

This new format of teaching focused on Education for Sustainability (ES). In this sense and from the last decades to present [2–5], some researchers have established that ES must have among its priorities encouraging critical reflection and promoting a systemic way of thinking, and showed that it is innovative, constructive, and suitable culturally to

let the students be a part of a sustainable social transformation. Following this idea [6], they supported this premise of ES by setting up among its objectives the fact that people must change their way of thinking and work, redirecting education and promoting knowledge, skills, and values development, toward to a social transformation and creation of a sustainable future.

In this process of educational change underlies the interaction among different contextual dimensions such as pedagogy, learning environment, and personal or individual dimensions, like the necessary acquisition competences to reach ES.

In this regard, Education for Sustainability is not only to provide conceptual content, but also to help the person to understand what happens (to know), to feel a part of society (to know how to be), and to know how to be a part of the process development (to how to do). This means that teachers have to build new learning environments with participative and interactive methodologies promoting abilities to learn how to learn (reflexive, critical, and hypothetical thinking) and to know how to do in order to deal with social, environmental, and cultural problems in the 21stcentury.

In the field of Higher Education, this educative approach means to design a training focused on students cut off from traditional teaching. In this sense, and from the dimensions underlying the established purpose for Education for Sustainability by UNESCO [6], from the contextual dimension, it would need methodological tools promoting ES in all educative settings (to how to do), but mainly teachers would need to access an important aspect of the individual dimension. Teachers at the university should know the way the students approach new learning and specifically the preference of learning style defining knowledge access (to know). To go deeper in this individual dimension, there are a lot of unanswered questions around learning styles and their association with gender, academic achievement, etc., and although there is a growing research interest, results are not conclusive.

Therefore, the main purpose of this study is to explore students' learning styles preferences in the branches of social sciences, as well as to reflect on a didactic proposal based on these preferences. Addressing the way students prefer to learn and relating this to variables of gender, field of study, and academic year can help to identify the educational contextual factors necessary to form "sustainable citizens" who are able to collaborate, speak, and act to promote positive changes in society [6].

2. Literature Review

One of the principle challenges in education today is that of meeting the needs of a diversity of students and their individual and cognitive characteristics. The educational system needs to adapt its teaching procedures, allowing an individualised approach to complex information and of deployment of strategies that make autonomous learning processes possible [7]. In Higher Education, this is a topic which has recently generated great interest [8,9] and is dealt with in depth by the European Learning Style Information Network (ELSIN), with the aim of advancing understanding of the theory and application of the concepts "cognitive styles" and "learning styles" [10]. These new approaches argue that the traditional model of transmission of knowledge from lecturer to student should give way to other methodologies [11] in which the students are active, regulating and constructing their own learning in a trajectory where the final objective is to turn them into "sustainable citizens" [12]. The debate centres on finding out the preferences of the university student population with respect to the learning process so as to be able to adapt methodology and resources to the students' learning profiles.

In recent decades, in a globalised world in which education must be understood throughout the life of the individual, various investigations on the question of how university students learn have suggested that this be studied within the framework of learning styles according to their needs [13]. Learning styles have been defined in various ways in past and present studies [14–17]. An influential study [18] defines learning style as the form and/or preference in which the individual student assimilates, processes, and retains new information. In a recent review of the concept [19], the authors incorporate this definition

and summarise the different concepts underlying the distinct approaches. They argue that the way in which someone learns in a specific context [20] is closely bound up with the way in which each person processes, encodes, stores, and transforms the information [21] and is related to the way each person likes to learn [22], their behaviour in learning situations [23], and the different strategies they bring into play during the learning process.

Bringing some order to these ideas, the perspective of the study presented here is that the way in which a student finds it easiest to understand information is associated with the way in which the lecturer presents it. This association should activate motivational mechanisms that lead the student to employ learning strategies of more or less sophistication, which will ultimately impact their academic performance. In this way, each student's learning style has the potential to be a powerful tool for schools and teachers to take advantage of in the design of how to carry out the transmission of content [24,25].

Drawing on [26,27] model of learning styles, a taxonomy was constructed in which Kolb's styles (Accommodator, Assimilator, Diverges, and Converges) are renamed as the Activist, Reflector, Theorist, and Pragmatist styles [28].

One of the main aims of this paper is to describe the learning styles of university students in the field of the social sciences. For this purpose, the model we took as reference is a well-established model among the scientific and educational community at both national and international level. According to this model, learning follows a cyclical and orderly process in which the student first takes in the new information (Activist style), second, analyses this information (Reflector style), third, processes it, classifies it and integrates it into their existing knowledge (Theorist style), and fourth, applies it (Pragmatist style) (Figure 1), [28].
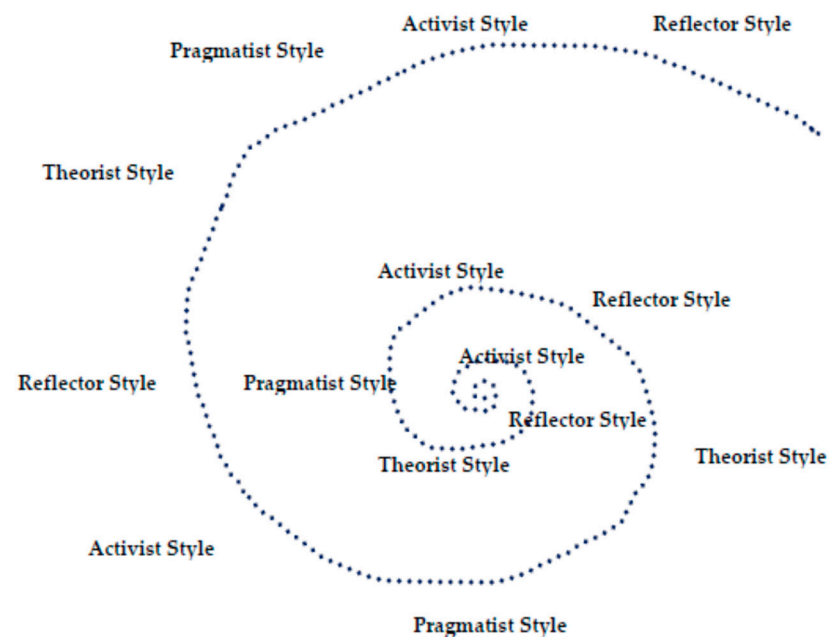

Figure 1. Learning styles according to [28].

The main features defining the skills that comprise each of these styles are as follows:

1. Activist style: emphasis on concrete experience. Fully involved in new experiences. Open-minded, non-sceptical, and enthusiastic. People-oriented, concerned for others. Willing to rise to a challenge. Encouraging, improvisational, exploring, risk-taking, and spontaneous. People with this style prefer to solve problems, compete in teams, lead discussions, and make presentations. They can find it difficult to explain topics with a high degree of Theorist content, remain focused on details, work alone, repeat an activity, take a passive role, listen to academic talks, and remain seated for along time. The question their learning seeks to answer is "how".

2. Reflector style: emphasis on reflective observation. Learners collect data and meticulously analyse it. They weigh up various options, observe, listen, and act when sure of themselves. They are thoughtful, conscientious, receptive, analytic, and exhaustive. They prefer to observe, think, assimilate, listen to alternatives and carry out detailed analysis. The limitations of this style are that they feel uncomfortable in the role of leader, they dislike taking part in meetings without having the opportunity to prepare, they are reluctant to express ideas spontaneously, they find working to tight deadlines difficult, and feel frustrated by a lack of sufficient data to draw conclusions. The question their learning seeks to answer is "why".

3. Theorist style: emphasis on abstract thinking. Those with this style draw logical conclusions from their observations. They are perfectionists. They analyse and synthesise information. They shun the subjective. They are methodical, logical, objective, critical, and structured thinkers. With this style, learners prefer structured situations, taking part in question and answer sessions, and working on rational and logical concepts. Conversely, they are uncomfortable with being required to carry out a task without a clear purpose, taking part in situations in which emotional responses dominate, and debating open-ended problems. The question their learning seeks to answer is "what".

4. Pragmatist style: emphasis on experimentation. Those with this style look for the positive aspects in new ideas. They are impatient of excessive theorisation. They are practical experimenters, direct, efficient, and realistic. With this style, learners prefer to learn techniques that can be applied, and to be given plenty of examples and the opportunity to experiment and practise. This style can inhibit students' learning if what is to be learnt lacks an immediate applicability, and if the task in hand lacks clear instructions. The question their learning seeks to answer is "what for".

Various studies carried out using this model in a university setting found that the most frequent learning styles were the Reflector, followed by the Theorist, the Activist, and finally the Pragmatist [29,30]. Those with a Reflector style learn best in situations that allow them to put themselves in the position of another person, where they can observe, think, and gather information. Those with a Theorist style learn best in structured situations, and rely on models, systems, theories, and methods that they can test out. The less frequent styles are the Activist, an experiment-oriented, practical style, and the Pragmatist, which is favoured by a significant practical element to the content. Nevertheless, the studies affirm that these findings could vary according to the gender and course of study of the students involved [31] and according to changes in learning style over the course of an individual's degree [32]. In this respect, on the question of the effect of a particular branch of science or degree course on the adoption of one particular learning style in preference to another, the literature of the last decade or so offers no clear consensus. Some researchers maintain that, irrespective of whether the degrees followed pertain to the technical sciences or the arts, the preferred learning styles fall into one of two frequency sequences.

On the one hand, the sequence is Reflector followed by Pragmatist, Theorist, and Activist [33], and on the other, the sequence is Reflector–Theorist–Pragmatist–Activist. Incontrast, other studies do find different preferences in relation to the subject of the degree studied [34]. This is especially the case with the technical degree courses, where there is little consensus and the findings vary with respect to the relative frequencies of learning styles. For example, [35] found that the Theorist style predominated, followed by the Pragmatist [36]. The Theorist style was found to be followed by the Reflector. Other studies underline the predominance of the Reflector style, with the other styles displaying the same relative frequencies in the case of Engineering degrees [37], but differing in the case of degrees such as Architecture, where the predominating styles were the Pragmatist and Reflector, with no alteration in the frequencies for the Theorist and Activist [38].

With respect to the way in which students' learning styles develop over the course of their studies [39], the research findings show that the most frequent style at the outset is the Activist, whilst at the end the Reflector and Pragmatist predominate. Elsewhere,

similar results were found in terms of the preferred style—the Activist—at the beginning of students' degree courses, but this case found the Theorist was predominant by the end [40]. The authors account for this finding by suggesting that as the university students progress through their courses, they recognise a growing need to complement the active and experiential models with more theoretical foundations.

Finally, with respect to gender, the literature supports the contention that there are differences in preferred learning style between men and women. Whilst the Reflector style is the most frequent among the latter, the former returned significantly higher scores in the Pragmatist and Activist styles, with no significant difference obtaining for the Theorist style. Other studies, by contrast, found no differences in preferred learning style in terms of gender [41]. The above overview of the literature and published research brings to the fore the importance of promoting studies aimed at identifying and analysing undergraduates' preferred learning styles [42].

Equally important is the need to disseminate the findings throughout the education community, in particular university teaching and management staff, with respect to the implications for the professional prospects of university graduates. In order to do so, the objective of this study is to discern the most significant social sciences students' learning styles in view of their dependence on gender, course, degree, and institutional context.

3. Materials and Methods

3.1. Description of the Sample

Data collection took place during the academic year 2017/2018 using, for convenience, non-probabilistic sampling. A total of 636 students took part, of which 190 were male (29.9%) and 446 were females (70.1%); ages ranged between 18 and 54 (M = 22.2; SD = 4.2).

The students participating in the study were from three public universities in Andalusia, the University of Huelva (UHU), the University of Pablo de Olavide, Seville (UPO), and the University of Cadiz (UCA), accounting for 62.9%, 11.9%, and 25.2% of the sample, respectively. The breakdown in terms of degree courses was Nursery Education (19.7%), Primary Education (20.8%), Social Education (14.6%), Psychology (39.9%), and a double degree in Social Work and Social Education (5%). The main demographic parameters are as follows: in first year, 18.7%; in second, 26.1%; the third course, 14.3%; and the last course, 40.7%; regarding gender, 70.1% of the sample were female.

3.2. Procedure

Questionnaire completion was undertaken by the students. The administrators explained the purpose of the study and gave the instructions for completing the questionnaire, emphasising that all items should be answered. Using a simple plus and minus code, the respondents were asked to indicate their agreement (+) or disagreement (-) with the statement presented in each item.

The questionnaires were designed to ensure the anonymity of all respondents and were completed on a voluntary basis by all those attending class across the degree subjects involved on the day stipulated for their administration. The questionnaire was applied the last week of May of the course. The response rate was 100%, as the questionnaire was reviewed prior to delivery to prevent incomplete questionnaires.

3.3. Measures

Sociodemographic data such as gender, age, university, degree, and course were analysed. The questionnaire used for determining the students' preferred learning styles and analysing the data for patterns was the Honey–Alonso Learning Styles Questionnaire *CHAEA* [28] (acronym in Spanish: Cuestionario Honey–Alonso de Estilos de Aprendizaje). This questionnaire has been measured in the Spanish population (Table 1).

Table 1. General scale for interpreting the scores for each of the four learning styles [28].

Style/Preference	Very Low	Low	Moderate	Strong	Very Strong
	10%	20%	40%	20%	10%
Activist	0–6	7–8	9–12	13–14	15–20
Reflector	0–10	11–13	14–17	18–19	20
Theorist	0–6	7–9	10–13	14–15	16–20
Pragmatist	0–8	9–10	11–13	14–15	16–20

The questionnaire, which can be completed by respondents themselves either individually or in groups, consists of 80 items that measure the respondents' affinity to the four learning styles: Activist, Reflector, Theorist, and Pragmatist. Each style is represented by 20 statements with which the respondents indicate their agreement (+) or disagreement (−).
Items representative of each style:

5. Activist: 3, 5, 7, 9, 13, 20, 26, 27, 35, 37, 41, 43, 46, 48, 51, 61, 67, 74, 75 and 77.
6. Reflector: 10, 16, 18, 19, 28, 31, 32, 34, 36, 39, 42, 44, 49, 55, 58, 63, 65, 69, 70 and 79.
7. Theorist: 2, 4, 6, 11, 15, 17, 21, 23, 25, 29, 33, 45, 50, 54, 60, 64, 66, 71, 78 and 80.
8. Pragmatist: 1, 8, 12, 14, 22, 24, 30, 38, 40, 47, 52, 53, 56, 57, 59, 62, 68, 72, 73 and 76.

The affinity to learning styles is measured by counting the number of agreement markers (+) for the items constituting each style, 20 being the maximum achievable for any particular style. According to the internal reliability studies carried out by various researchers [43–45], the implementation of the HALSQ in Spanish-speaking samples achieved acceptable reliability scores across the range of styles, the Cronbach's Alpha for each being Activist style (0.63), Reflector style (0.73),Theorist style (0.66), and Pragmatist style (0.59) [46].

An exploratory factor analysis was performed using the principal components extraction method and the varimax rotation method, where the Kaiser–Meyer–Olkin (KMO) value = 0.639 is the Bartlett test (χ^2 = 510.8, $p < 0.01$).

The factorial structure found explained 45% of the variance for the Reflector style, 30.1% for the Theorist style, 14.3% for the Pragmatist, and 10.4% for the Activist style. Regarding the reliability of the CHAEA, it was found that its internal consistency got a value of α = 0.48. There were no lost cases, as they were eliminated before entering them into the database or when performing the statistics. A first review of the data was made and those data that were very atypical were eliminated.

The Kolmogorov–Smirnov test is applied to test the hypothesis of normality of the population. The test statistic is the maximum difference; Fn (x) is the sampling distribution function and Fo (x) the theoretical function or corresponding to the normal population specified in the null hypothesis.

Finally, we have carried out a multivariate analysis where the regression test was used to check if the four dependent variables learning styles varied according to the independent variables such as age, sex, degree, year of degree, and university.Our results were interpreted against the general scale (Table 1).

3.4. Data Analyses

We analysed the data using SPSS 15. After checking for outliers, missing data, and the assumptions of linearity and normality, we conducted several ANOVAs, chi-squared test, and Pearson's correlational analysis to study the relationships between each variable in the models and sociodemographic variables to determine whether we would need to control for demographic variables in subsequent analyses. The sampling error was ± 5% (giving a confidence level of 95.5).

4. Results

4.1. Learning Styles in Terms of Participating Students

Analysis of the results shows that it is the Reflector style that obtained the highest average score (M = 14.7. SD = 3.1), followed by the Theorist (M = 12.7; SD = 2.9) and then, with little between them, the Pragmatist (M = 12.5; SD = 2.6) and Activist (M = 12.1; SD = 3.0) (Figure 2).
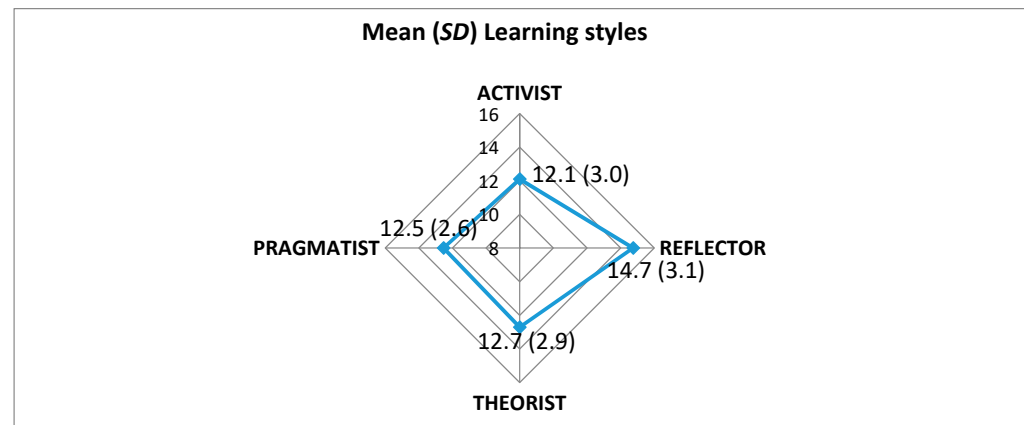

Figure 2. Mean and standard deviation (SD) of learning styles.

These results, in which the predominant style is the Reflector, signal the type of students who collect data, analyse it, weigh up the alternatives, observe, listen and act when they are sure of themselves. They are thoughtful, conscientious, receptive, analytic, and exhaustive.The Theoretical style is the second most used, which points to perfectionist students, methodical and logical, preferring structured situations and work on rational and logical concepts. The third style is the Pragmatic style, the most relevant characteristics being the preference for experimentation, practicality, and the applicability of new knowledge, as it is difficult for them to work without following clear instructions. The Activist style is the one that obtains the lowest score, which leads us to suggest that students with this style find it difficult to work individually, pay attention to details, or be passive, preferring concrete experiences, problem solving, and directing debates (Table 2).

Table 2. Mean and standard deviations for each of the learning styles.

	Activist Style	**Reflector Style**	**Theorist Style**	**Pragmatist Style**
Very strong	16–20	18–20	16–20	16–20
Strong	14–15	17	14–15	14–15
Moderate	9–13	13–16	11–13	11–13
Low	8–10	11–12	9–10	9–10
Very low	0–7	0–10	0–8	0–8
Mean (SD)	12.1 (3.08)	14.74 (3.1)	12.73 (2.9)	12.53 (2.6)

4.2. Learning Styles According to Age, Sex, Degree, Year of Degree and University

4.2.1. Learning Styles According to Gender

The results in terms of gender are very similar to those of the whole sample. The predominant style for both male and female respondents was the Reflector, followed in order by the Theorist, Pragmatist, and Activist. No significant differences in terms of gender can be observed for any of the styles, as the p value is consistently >0.05.

4.2.2. Learning Styles in Terms of Years of Study

The distribution of learning styles according to year of study across the range of subject areas indicates that the predominant style is the Reflector. It can be noted that in

the third year, the average scores drop across all styles with the exception of the Theorist, whilst in the fourth, again with the exception of the Theorist, the average scores increase again (see Table 3).

Table 3. Mean standard deviations (SD) and ANOVA of learning styles in terms of years of study.

Style/Yr. of Study	Activist (SD)	Reflector (SD)	Theorist (SD)	Pragmatist (SD)
First	12.62 (3.00)	15.16 (2.69)	12.37 (2.64)	13.16 (2.57)
Second	12.85 (2.73)	14.65 (2.86)	12.80 (2.83)	12.73 (2.47)
Third	10.86 (3.38)	13.81 (4.09)	13.25 (3.19)	11.80 (3.06)
Fourth	12.11 (3.05)	14.74 (3.18)	12.50 (3.00)	12.36 (2.65)
ANOVA	$F_{(3.631)} = 9.882$, $p < 0.01$	$F_{(3.631)} = 3.992$, $p < 0.01$	$F_{(3.631)} = 5.5289$, $p < 0.01$	$F_{(3.631)} = 2.812$, $p > 0.05$

Using the analysis of variance, significant differences can be seen in the Activist style between the first and third year students, in which the former returned higher average scores than the latter ($p < 0.01$), and between the higher averages obtained by the second year students with respect to both the third year students ($p < 0.01$) and the fourth ($p = 0.01$). Similarly, with respect to the Reflector style, the first year students scored higher averages than those in the third year ($p = 0.01$), and those in the third year higher averages than those in the fourth ($p < 0.05$). Finally, with regard to the Pragmatist style, the first year students returned statistically significant higher average scores than those in their third year ($p < 0.01$).

4.2.3. Learning Styles in Terms of Degree Subject

With regard to degree subject, it can be seen that the Reflector style remains the preferred style across the range of subject areas covered by the study (Table 4).

Table 4. Mean and standard deviations of learning styles in terms of degree subject.

Degree	Activist (SD)	Reflector (SD)	Theorist (SD)	Pragmatist (SD)
Nursery Education	13.10 (2.82)	14.98 (2.58)	12.95 (2.48)	13.01 (2.47)
Primary Education	12.19 (2.72)	15.20 (2.77)	13.27 (2.80)	12.84 (2.58)
Social Education	13.10 (3.10)	14.38 (3.07)	12.70 (2.98)	12.78 (2.58)
Psychology	11.37 (3.09)	14.98 (3.37)	12.58 (3.12)	12.25 (2.67)
Double degree (Social Work/Social Education)	10.78 (3.41)	11.09 (3.39)	10.56 (2.48)	10.88 (3.42)
ANOVA	$F_{(4.630)} = 11.416$, $p < 0.01$	$F_{(4.630)} = 12.966$, $p < 0.01$	$F_{(4.630)} = 5.971$, $p < 0.01$	$F_{(4.630)} = 5.502$, $p < 0.01$

Numbered lists can be added as follows: Analysis of variance provides the following significant differences:

- Activist style: the degree in Primary Education received higher average scores than Psychology ($p < 0.01$) and the double degree in Social Work and Social Education ($p < 0.01$), while Social Education scored higher averages than Psychology ($p < 0.01$) and the double degree in Social Work and Social Education ($p < 0.01$).
- Reflector and Theorist styles: the degrees in Nursery Education ($p < 0.01$), Primary Education ($p < 0.01$), Social Education ($p < 0.01$), and Psychology ($p < 0.01$) received higher scores than the double degree in Social Work and Social Education.
- Theorist style: the degrees in Nursery Education ($p < 0.01$), Primary Education ($p < 0.01$), Social Education ($p = 0.01$), and Psychology ($p < 0.01$) received higher scores than the double degree in Social Work and Social Education.
- Pragmatist style: Nursery Education ($p < 0.01$), Primary Education ($p < 0.01$), and Social Education ($p < 0.01$) received higher scores than the double degree in Social Work and Social Education.

4.2.4. Learning Styles in Terms of University of Study

With regard to the institutions from which the sample was drawn, the Reflector was the preferred style across the three universities (see Figure 3).
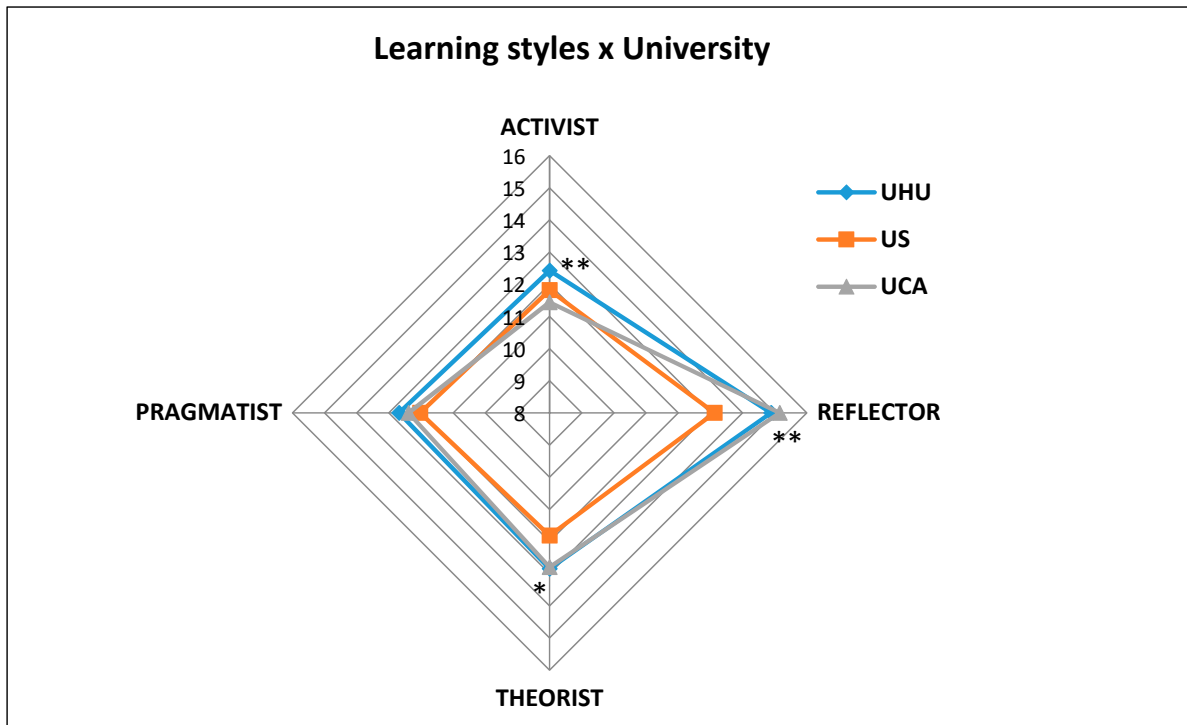

Figure 3. Learning styles preferences by university. ** *p* < 0.01 * *p* < 0.05.

Analysis of the data reveals significant differences in the Activist style ($F_{(2.632)}$ = 6.353, *p* < 0.01), the Reflector ($F_{(2.632)}$ = 11.890, *p* < 0.01), and the Theorist ($F_{(2.632)}$ = 4.070, *p* = 0.01), but not the Pragmatist ($F_{(2.632)}$ = 2.243, *p* > 0.05).

Post-hoc multiple comparison using, the Schefft method gave the following results:

- The Activist style: The University of Huelva recorded higher average scores than the University of Cadiz (*p* < 0.01).
- The Reflector style: The Universities of Huelva and Cadiz recorded higher average scores than the Pablo de Olavide University in Seville (*p* = 0.01).
- The Theorist style: The University of Huelva recorded higher average scores than the Pablo de Olavide University in Seville (*p* = 0.01).

It is necessary to indicate that the comparative analysis of students from different universities provides data of interest on the possible influence of this variable, especially when their results have significant differences, because they promote the subsequent scientific interest to study this variable in an explanatory way. However, this study does not analyse the educational approaches of each university, but rather focuses on students and their learning preferences.

The following correlations between variables found (Table 5):

Table 5. Pearson's Correlation between variables.

Variable		1	2	3	4	5	6	7	8	9
1. University	Pearson's Correlation									
	Sig. (bilateral)									
	N	–								
2. Gender	Pearson's Correlation	0.025								
	Sig. (bilateral)	0.526								
	N	636	–							
3. Age	Pearson's Correlation	0.141 (**)	−0.015							
	Sig. (bilateral)	0.000	0.714							
	N	635	635	–						
4. Degree	Pearson's Correlation	0.413 (**)	−0.019	0.090 (*)						
	Sig. (bilateral)	0.000	0.625	0.024						
	N	636	636	635	–					
5. Yr. of course	Pearson's Correlation	0.323 (**)	0.105(**)	0.289 (**)	0.499 (**)					
	Sig. (bilateral)	0.000	0.008	0.000	0.000					
	N	636	636	635	636	–				
6. L. S. ACTIVIST	Pearson's Correlation	−0.140 (**)	0.052	−0.038	−0.215 (**)	−0.138 (**)				
	Sig. (bilateral)	0.000	0.189	0.345	0.000	0.001				
	N	635	635	634	635	635	–			
7. L. S. REFLECTOR	Pearson's Correlation	0.006	0.045	0.046	−0.116 (**)	−0.015	−0.234 (**)			
	Sig. (bilateral)	0.889	0.258	0.252	0.003	0.705	0.000			
	N	635	635	634	635	635	635	–		
8. L. S. THEORIST	Pearson's Correlation	−0.025	0.011	0.013	−0.129 (**)	−0.097 (*)	−0.214 (**)	0.495 (**)		
	Sig. (bilateral)	0.531	0.778	0.749	0.001	0.014	0.000	0.000		
	N	635	635	634	635	635	635	635	–	
9. L. S. PRAGMATIS	Pearson's Correlation	−0.058	0.029	−0.083 (*)	−0.157 (**)	−0.111 (**)	0.201 (**)	0.223 (**)	0.409 (**)	
	Sig. (bilateral)	0.146	0.468	0.037	0.000	0.005	0.000	0.000	0.000	
	N	634	634	633	634	634	634	634	634	–

L. S.: Learning Style. ** The correlation is significant at the 0.01 level (bilateral). * The correlation is significant at the 0.05 (bilateral).

The numerous significant relationships between the variables involved in the study can be observed in Table 5, and the following correlations from the subsequent interpretative analysis stand out:

- Universities showed a significant inverse correlation with the activist learning style, being preferred by 62.9% of the UHU, while in the UCA it was 25.2% and a scant 11.9% of the UPO those who showed this style.
- Sex showed a correlation with the current year, with female representation being higher from the second year, while men outnumbered women only in the first year.
- Age was inversely correlated with the pragmatist learning style, indicating that the older you are, the less preference you have for learning in a practical way.
- The degree is inversely related to the learning styles with each degree showing a different preference.
- Courses showed an inverse correlation with learning styles, with Activist, Theorist, and Pragmatist styles being less preferred the further one advances in the career.
- Finally, the relationships between the learning styles showed that the Activist style is inversely correlated with the other three styles, showing that as the active one decreases, the preference for the Reflector, Theorist, and Pragmatist increases. It is worth noting the significant direct correlation between Reflector, Theorist, and Pragmatist styles.

The main results of the regression analysis are indicated.

The results are significant, but with weak variances (R^2) in the learning styles, among which the dependent variable is *Activist profile*: the independent variable "University" explained 2.0% of its variance (R^2) (b = -0.140, 95% confidence interval, -0.778 to -0.224, $p < 0.01$), the variable "Year of degree" explained 1.9% (b = -0.138, 95% confidence interval, -0.566 to -0.159, $p < 0.01$), and the variable "Degree" explained 4.6% (b = -0.215, 95% confidence interval, -0.712 to -0.339, $p < 0.01$). The independent variable "Degree" explained 1.7% of the variance (R^2) of the dependent variable *Theorist profile* (b = -0.129, 95% confidence interval, -0.482 a -0.121, $p < 0.01$). The dependent variable *Pragmatic profile* had a variance of 2.5% explained by independent variable "Degree" (b = -0.157, 95% confidence interval, -0.499 to -0.170, $p < 0.01$) and 1.2% explained by variable "Year of grade" (b = -0.111, 95% confidence interval, -0.434 to -0.078, $p < 0.01$). Finally, no independent variable explained variance (R^2) of the *Reflector profile*, which indicates that the analysed factors did not influence the preference for this profile in this sample of subjects. However, this should be taken with caution, until the sample in each university and other variable control measures are not increased.

5. Discussion

Universities throughout Spain have experienced major changes as a result of complying with the European Higher Education Area (EHEA). Chief among the reforms is a profound reorientation of the teaching focus so as to positively impact the teaching–learning relationship, a key element of which is a shift from the old emphasis on teaching to a new emphasis on learning [47].

For this reason, there is a perceived need by teachers of acting on the contextual dimension through the design of plural teaching methodologies that combine theoretical instruction with seminars, debates, oral presentation, research work, group work, or production of materials applicable to real situations. These actions favor the individual dimension, as students can adjust to different possibilities of learning in function of their learning style. The accommodation of the instructional process to diversity of learning styles allow search student to learn according to their preference. In line with Education for Sustainability, knowing undergraduate students' learning styles allows a starting point to be set up to address a kind of education that helps the student to understand what is happening (to know), feel a part of society (to know how to be), and be aware of how participate in social development process (to know how to do).

With this in mind, the main aim of this study is to identify the preferred learning styles of students from three universities in Western Andalusia and to analyse these preferences in terms of four variables: gender, year of study, degree course, and institution.

The general results of this study into learning styles indicate a clear preference for the Reflector style. This style is structured around the question "why?", and is characterised by a preference for analytical consideration of the alternatives available. Conversely, it is a style that is typically marked by difficulties in reaching conclusions from the analysis— "what?"—and/or by taking decisions regarding the alternatives—"which?'. Likewise, those favouring this style tend to prefer not to express themselves spontaneously and find it difficult to work without meticulous planning.

These results are consistent with the findings of the majority of studies on the topic [48], such as others that were carried out with architecture students [49], with first year students of all degree subjects [50], and the study into medical students [51], most notable in this regard being the literature review of the previous ten years [52]. All of these studies identified the preferred style as the Reflector, and in our study, this style likewise received the highest average scores, confirming the students' preference for learning with this style, followed by the Pragmatist, the Theorist, and with least preference, the Activist.

With respect to the comparative analysis of learning styles in terms of the four specific aspects of this study, the following points can be made about our results.

First, no significant differences were found across the whole sample regarding the variable "gender", with very similar male and female average scores for each learning style in the same order of preference, the Reflector style thus being the most chosen by both. These findings are similar to those resulting from comparable studies [53] in which no significant differences in learning styles were found between male and female respondents, with the exception of the Theorist, which received higher average scores among men; however, the conclusions indicated that learning styles had no relation to gender.

Nevertheless, our results contrast with those of them in which significant differences in terms of gender were found. Specifically results showed that women scored higher in the Reflector style, while men scored higher in the Pragmatist, which also found significant differences, in this case, higher scores among men in the Activist and Pragmatist styles, and higher scores among women in the Reflector style [54]. In summary, our reflection on this variable would be in line with the literature regarding gender, and the processes and styles of learning are given extensive coverage [55]. This study finds few significant differences in terms of gender, and when these do appear, they would seem to be the result of interactions with the studied degree, the distinct subjects and their manner of working, cultural factors, and/or methodological limitations, consideration of which is beyond the scope of this study [56].

With respect to the second research variable—year of study—our aim was to discover whether the learning styles of the participating students fitted the developmental order according [28] to year of study indicated model: first year, Activist style (collects new information); second year, Reflector style (analyses information); third year, Theorist style (synthesises, classifies and integrates information with previous knowledge); and finally, in the fourth year, the Pragmatist style (information is put to practical application).

The findings of this study indicate a different sequence. In addition to the predominance of the Reflector style throughout the four years, the second preference among students in the first year is the Pragmatist, while in the remaining years (second, third and fourth), it is the Theorist. In this study, the Activist style, which according to the model above should predominate among first year students, is third in order of preference in the first and second years, and last in the third and fourth years.

These findings are entirely consistent with studies [56] that suggest that the lack of preference for the Activist style may be accounted for by the fact that the process of selecting information already forms part of students' learning experience when they choose which university degree to follow, and perhaps earlier in their pre-university courses [57,58].

The findings of this study suggest a profile of student development through their course, as was also found by other researchers [56]. In our study, results showed a development through years similar to the model, but somewhat modified. Hence, students initiate their time at university analysing information, which preferably has practical applications (Reflector and Pragmatist styles); as they progress, they analyse information so as to synthesise, classify, and integrate it into their existing knowledge (Reflector and Theorist styles). By this means, as students continue through their university studies, they become less Pragmatist and more conservative and Theorist in approach, but without ceasing to reflect analytically and exhaustively on the information.

Regarding the aim of comparing the distribution of learning styles in terms of "degree subject", our findings revealed significant differences that bore similarities with those of other studies focussing like ours on degrees in the social sciences [56,59,60], although at the same time, they differed from other studies that found a strong preference for the Reflector style across the range of degree subjects with no significant differences [61,62].

As observed in the theoretical section above, there is a lack of consensus among the research community on this point. Our findings thus contribute evidence that, with the exception of the Reflector style, which is preferred equally across the range of degree subjects, there are significant differences between the different branches of the Social Sciences regarding the preference for the three styles. Thus, in terms of second-year course preferences, students of Primary Education and Psychology showed a tendency towards the Theorist style, while those of Nursery Education and Social Education inclined towards the Activist style, and those studying a double degree in Social Work and Social Education favoured the Pragmatist style.

Regarding the "institution" variable, our findings on learning styles indicated statistically significant differences with respect to the Activist style, which received higher average scores in the University of Huelva than in the other two universities, and the Reflector and Theorist styles, which received lower average scores than in the other institutions. There were no significant differences between the three universities with regard to the Pragmatist style.

Finally, on the significant correlations found in our study and already exposed in the results section, our interpretation that the courses show an inverse correlation with the learning styles, the Activist, Theoretic, and Pragmatist styles being less preferred as they progressed in the degree, may be because of changes in the teaching methodology marked by EEES (commented on at the beginning of the Introduction), since the model followed was framed in previous period.

Regarding the multivariate analysis with the regression test, to check if the four learning styles were influenced by the independent variables analysed, the following reflections stand out. The relearning styles showed significant results, but with variances. We infer two possible reasonings. One, that learning styles are resistant to the influence of these factors, and another, that the sample may be small when coming from three university contexts and five degrees, although it would be appropriate if it was a single university and fewer degrees. However, we prioritise the comparison between different contexts. In fact, these two independent variables, "University" and "Degree", have been the ones explaining the greatest variances in learning styles, except in the Reflector style, which did not obtain variance. The high significant preference of students for Reflector style, together with not obtaining variance explained by any independent variable, suggests that it may be a potent, non-influenced style and that it is being imposed by students, such as the optimal for the acquisition of knowledge. However, this should be taken with caution until testing by future similar studies that have larger samples from each university to contrast.

In the same way that we have found clear preference for the Reflector style, currently, university professors should try to make this adaptation of the teaching–learning process (less theoretical and more autonomous for their students in the acquisition of knowledge), so we provide a methodological proposal in this sense.

6. Conclusions

The university students participating in the study showed a higher degree of preference for the Reflector style (60.2%), in comparison with the Theorist, Pragmatist, and Activist styles [63]. This style also remained the preferred style throughout the four years of study, irrespective of degree subject (Nursery Education, Primary Education, Social Education, Psychology, and double degree in Social Work and Social Education), and institutions (UHU, UCA, and UPO) should contribute to developing students' more effective educational performance.

No significant differences were found when the sample was analysed in terms of gender, either as a whole or broken down into degree course, year of study, and institution. In contrast, other studies analysing similar variables found significant differences in terms of gender, degree, and course. Multivariate analysis also showed significant differences in when the interaction between gender and academic year was taken into consideration [56]. In all cases, there was parity between the average scores for men and women, with the same order of preferences in learning styles.

The development of the participants' preferences in learning styles over the course of their studies diverged from the sequence proposed by the model (year 1: Activist; year 2: Reflector; year 3: Theorist; year 4: Pragmatist). In the study presented in this paper, the preferred sequence was the following (first: more and last: less):

- Year 1: Reflector–Pragmatist–Activist–Theorist.
- Year 2: Reflector–Theorist–Activist–Pragmatist.
- Years 3 and 4: Reflector–Theorist–Pragmatist–Activist.

Significant differences between preferred learning styles were found in terms of degree subject. Whilst the Reflector style was the preferred style across all degree subjects, obtaining the highest average scores throughout, the Theorist style was second preference for Psychology and Primary Education students, the Activist style in Nursery Education and Social Education, and the Pragmatist style in the double degree in Social Work and Social Education.

One limitation of the study is that, although the sample size was adequate and included the participation of three different universities, the sampling method was by convenience in that respondents were selected mainly by virtue of being students of the authors of the study, a circumstance that limits generalisation of the findings. Given the overall size of the population of primary school students in universities mentioned above, it was estimated that with 1382 students in total, with a margin of error of 5% and a confidence level of 95%, the size of the resulting sample would be 301 subjects. In the research presented, the sample is made up of 635 students, doubling this figure.

The use of the Honey–Alonso Questionnaire on Learning Styles *CHAEA* (Acronym in Spanish: Cuestionario Honey–Alonso de Estilos de Aprendizaje), can also be considered a limitation, as it takes a self-completion format. The use of self-evaluating tests entails different mistakes to take into account, such as the one expressed in previous lines. That is, we consider as a limitation the non-sampling error in which the respondents lie or do not reveal all the information due to multiple causes. Among the most common is the pressure of what is seen as socially desirable. In recent years, in social science research, quantitative and qualitative techniques have been combined that, although they do not eliminate the error, at least reduce the effects of social desirability.

This shortcoming could be overcome by administering a complementary instrument such as the ACRA Learning Strategies Scales (the Spanish acronym refers to Acquisition, Codification, Retrieval, and Support) [64], which would enable researchers to gather data on the cognitive strategies employed by respondents (the four information processing phases referred to by the acronym) in pursuit of their learning objectives. It would have the additional advantage of contributing to the debate, initiated by the ELSIN, on distinguishing between cognitive styles and learning styles [65]. In consequence, it would be of interest to repeat this study using random sampling methods and incorporating both scales for evaluating the respondents' cognitive/learning styles. Of equal interest to research into

the topic would be a study into whether any relationship between the students' learning styles and the lecturers' teaching strategies can be established, and the influence one might have on the other [66].

An additional limitation to this instrument is the obtained Cronbach value. We see it is a scale easy to use by students, but it showed a low internal consistency. However, in relevant scientific studies it was present that in [67], an estimated calculation of internal consistency could be low but it does not mean that correlations between items are absent. To solve this limitation, we propose for future research the use of a complementary scale like "Learning Style Inventory-II" [16] with better psychometric properties, as it shows an internal consistency of 0.8. The use of this scale could also provide us with the possibility of contrasting results based on Alonso's scale (*CHAEA*), due to this study having been built using Kolb's scale.

Finally, we must be aware that a cross-sectional study like the current one does not allow us to draw definitive conclusions about the cause and effect relationships between the variables analysed. That is, as it is a cross-sectional investigation, a single directionality is proposed, taken at a single moment. Future reviews could include a longitudinal study of learning styles across the entire career in order to shed light on the direction in which they develop, and a study of the extent to which most learning styles develop. Personalised learning is interested in using educational resources in an ongoing and sustainable way to play a strategic role in the sustainable job market.

Teaching Proposal for Learning Styles

The analysis of learning styles is also useful so that it can be handled as an instrument to improve achievement and inclusion [67,68]. Through knowledge of students' learning styles, it is intended to develop proposals that allow improving teaching activities that, without a doubt, should contribute developing students' more effective educational performance.

For all this, and taking into account that the four learning styles respond to the four phases of a cyclical learning process, we propose different methodological proposals that teachers can use in their classes to favour all learning styles. In this way, it enables students to apply the four learning styles and be able to expand their competences not only in a context of a class, but also to a social context where the acquired knowledge can be applied and conduct social sustainable transformations. Taking into account the cyclical process of these learning styles, elements of the active style are worked on first, to continue with activities to promote the reflective, theoretical, and finally pragmatic style:

- To promote the Active style: work should propose short questions and motivate the students to search for different ways to solve the presented task, ensure that the proposed activities are varied and different and that they investigate and seek solutions, and ask for volunteers among the students to explain or share what they have done in small groups. The teacher should try not to work with the students in the same way for a long time. It is advisable to propose several tasks at the same time and let the students themselves choose the order of completion, encourage collaborative work within groups, and encourage the teacher to make brief theoretical presentations and always within a problem or situation to solve.

- To promote the Reflective style: the teacher should give the students some time with the subject to work and not go from one activity to another while their possibilities of analysis have not been exhausted, as well as favour listening as a basis for reflection, argumentation, and reasoning from rationality and give importance to the depth and accuracy of the answers. It would also be desirable to develop the consultation of texts, bibliographic, and diverse computer sources. The teacher will encourage and insist that they think well about what they are going to say as well as regarding the revision of the exercises before handing them in, providing time for it: if videos and films are going to be used, it is advisable to provide an orientation in advance.

- To promote the Theoretical Style: the activities should be very structured, asking the students to be logical in their expositions and not express themselves with ambiguities and asking for students to solve exercises specifying or explaining the steps that are making it. It is advisable for the teacher to teach the contents always integrated into a broader theoretical framework and to present the exercises with strategies that make it possible to establish relationships and associations, and to present experiences and complex problems but with indications of the steps to follow and at the time of planning the work. The teacher must influence that everything is framed in a coherent and logical line.
- To promote the Pragmatic style: The teacher should work on experiences and activities in the environment, where the students will try brief, precise, and direct answers in said activities. It is advisable for the teacher to set tasks that require their implementation to be applied in other situations, and the students will seek applicability. Likewise, the teacher will develop with the students activities that its implementation requires to be applied in other situations; offer students many examples or models so that they can repeat or emulate them; at the time of imparting the theoretical contents, accompany them practical examples of ordinary life, such as including experts in their classes to show what they know or do; promote teaching close to reality; and get the students to work with clear instructions on what to do.

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