Artículos científicos

Estilos de aprendizaje en educación media superior bajo los enfoques por objetivos y competencias

Learning Styles in High School Students Under the Objective-Based and Competency-Based Models

Estilos de aprendizagem no ensino médio sob as abordagens de objetivos e competências

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Resumen

El objetivo de este estudio fue caracterizar los estilos de aprendizaje (EA) de estudiantes de la Universidad Autónoma Chapingo (UACh) para comparar los programas por competencias (propedéutico) y por objetivos (preparatoria agrícola). Se aplicó el "Cuestionario Honey-Alonso de estilos de aprendizaje" (Chaea), que evalúa cuatro categorías: activo, reflexivo, teórico, y pragmático, para identificar los EA de 339 estudiantes (199 hombres y 140 mujeres). La edad promedio de los estudiantes fue de 19.2 ± 2.8 años y provenían de los propedéuticos localizados en Texcoco, Tabasco, Veracruz y Yucatán. Se preparó una base de datos que se analizó con el programa JASP. Además, se realizó un análisis de varianza, los baremos de interpretación, se calculó la consistencia interna y se evaluó la correlación entre los EA. Se observó similitud en los promedios de los EA reflexivo, teórico y pragmático y se observaron diferencias ($p < 0.05$) en el promedio de calificaciones a favor del programa por competencias desarrollado con propedéutico (8.8 ± 0.74) y menor valor en el programa por objetivos en preparatoria (8.5 ± 0.54). Los resultados generales mostraron que el EA activo (11.8 ± 3.1) tuvo el menor puntaje del baremo realizado. El reflexivo (14.7 ± 2.9), teórico (13.6 ± 2.9) y pragmático (13.6 ± 3.0) tuvieron similares valores. Todos los EA tuvieron una distribución normal y la consistencia interna fue aceptable. Se concluye que los EA reflexivo, teórico y pragmático de los programas por objetivos y por competencias fueron similares. En el estilo activo los estudiantes por objetivos tuvieron mayor valor que los de competencias.

Palabras clave: aprendizaje, competencia, educación, rendimiento académico.

Abstract

The objective of this study was to characterize the learning styles (EA) of upper secondary education students and to compare the programs by competencies (propaedeutic) and by objectives (agricultural preparatory) of the Universidad Autónoma Chapingo (UACh). The Honey-Alonso questionnaire of learning styles (Chaea) was applied with which four categories are evaluated: Active, reflective, theoretical, and pragmatic to identify the EA of 339 students (199 men and 140 women). with an average age of 19.2 ± 2.8 years, from the headquarters located in Texcoco, Tabasco, Veracruz and Yucatán. A database was prepared and analyzed with the JASP program. In addition, an analysis of variance was performed, the interpretation scales, the internal consistency was calculated and the correlation between the

EA was evaluated. Similarity was observed in the averages of the reflective, theoretical and pragmatic styles and differences ($P < 0.05$) were observed in the average grades in favor of the competency-based program developed with propaedeutic (8.77 ± 0.74) and lower value in the program by objectives in high school (8.5 ± 0.54). The general results show that the active EA (11.8 ± 3.1) had the lowest score of the scale made. The reflective (14.7 ± 2.9), theoretical (13.6 ± 2.9) and pragmatic (13.6 ± 3.0) had similar values. All EA had a normal distribution and the internal consistency was acceptable. It is concluded that the reflective, theoretical and pragmatic EA of the programs by objectives and by competencies were similar. In the active style, the students by objectives had higher value than those of competencies.

Keywords: learning, competence, education, academic performance.

Resumo

O objetivo deste estudo foi caracterizar os estilos de aprendizagem (EA) dos alunos da Universidade Autônoma de Chapingo (UACh) para comparar os programas por competências (propedêutica) e por objetivos (ensino médio agrícola). Foi aplicado o "Questionário Honey-Alonso de estilos de aprendizagem" (Chaea), que avalia quatro categorias: ativa, reflexiva, teórica e pragmática, para identificar a EA de 339 alunos (199 homens e 140 mulheres). A idade média dos alunos foi de $19,2 \pm 2,8$ anos e eles vieram de escolas preparatórias localizadas em Texcoco, Tabasco, Veracruz e Yucatán. Um banco de dados foi preparado e analisado com o programa JASP. Além disso, foi realizada análise de variância, escalas de interpretação, calculada a consistência interna e avaliada a correlação entre os EAs. Observou-se semelhança nas médias da EA reflexiva, teórica e pragmática e diferenças ($p < 0,05$) foram observadas nas notas médias a favor do programa por competências desenvolvidas com propedêutica ($8,8 \pm 0,74$) e menor valor no programa por objetivos no ensino médio ($8,5 \pm 0,54$). Os resultados gerais mostraram que o EA ativo ($11,8 \pm 3,1$) teve a menor pontuação na escala realizada. O reflexivo ($14,7 \pm 2,9$), teórico ($13,6 \pm 2,9$) e pragmático ($13,6 \pm 3,0$) tiveram valores semelhantes. Todos os EAs tiveram distribuição normal e consistência interna aceitável. Conclui-se que a EA reflexiva, teórica e pragmática dos programas por objetivos e por competências foram semelhantes. No estilo ativo, os alunos por objetivos tiveram um valor maior do que os por competências.

Palavras-chave: aprendizagem, competição, educação, desempenho acadêmico.

Introduction

One of the most important aspects for educational institutions is the comprehensive training of students and, therefore, a guiding principle is to consolidate the educational and curricular model, focusing the didactic method on learning and strengthening the contents, orientations, and common and own components. of the academic project (Chapingo Autonomous University [UACh], 2010). In the teaching-learning process, it is essential to know the learning styles (EA) that students have, since this knowledge serves as a reference to think about the design of learning environments where didactic strategies that address the way of learning are used. and that promote learning to learn (Esquivel, González and Aguirre, 2013).

The term EA has been thoroughly scrutinized. Derived from this process, the word style has been defined as a set of aptitudes, preferences, tendencies and attitudes that a person has to do something and that is manifested through a behavioral pattern and different skills (García, Santizo and Alonso 2009). For its part, learning is the process of acquiring a relatively lasting disposition to change perception or behavior as a result of an experience (Alonso, Gallego and Honey, 2007). Academic learning has characteristics such as autonomy, intrinsic motivation, self-control, self-direction, and self-regulation of student activity, and allows for reflection; it also promotes the active and effective use of product knowledge through formal, but also non-formal learning, and allows students to implement higher order skills in the use of acquired knowledge (Magdalena, 2015). Garcia et al. (2009), taking into consideration several previously published concepts, have defined AEs as follows:

> The cognitive, affective, and physiological traits of preferences for the use of the senses, environment, culture, psychology, comfort, development, and personality that serve as relatively stable indicators of how people perceive, interrelate, and respond to their learning environments and their own methods or strategies in their way of learning (p. 4).

Other authors have also made an extensive search to define this term (Ortiz and Canto, 2013) and have applied it to different situations, including a current mandatory topic such as distance learning (Costa, Souza, Valentim and Castro, 2020).

A document that has widely supported EA is that of Gallego (2004), where he describes in detail theories such as that of the onion, which includes the concept of learning by strata: the first is instructional preference and learning environments; the second layer is based on preferences about how information is processed, and the third, the center, is related to learning preferences due to personality. Gallego (2004) also describes other classification approaches that focus on diagnostic methods (Guild and Garger, 1998). Other studies address EA as processes to incorporate knowledge and distinguish the relationship with certain abilities or tendencies to learn in a certain way (Riding and Rayner, 2013), on the other hand, there is the classificatory scheme followed by Alonso et al. (2007), which collects a good number of questionnaires to develop his theory.

The EA have been widely used to categorize groups of students of different educational levels, although some authors indicate a series of problems with the theory and the activities developed for schools, since it is assumed that the instruction based on this approach produces better achievements; while they describe and categorize behaviors, they do not explain the developmental processes and causal mechanisms that underlie these behaviors. Another problem is that EA measures often use a rank order that ranks individuals one style higher or lower than another, creating differences that are not obvious (An and Carr, 2017). Among the most important criticisms, those who consider EAs as a myth stand out and who indicate that the most popular current conception of these simply equates the style associated with the preferred bodily sense through which information is received, be it visual, auditory or kinesthetic (tactile or olfactory) (Riener y Willingham, 2010).

To evaluate AEs and their dimensions, several models have been developed in different areas. A compilation of the instruments to measure AEs was carried out by García et al. (2009), who list 38 instruments used to measure and learn about preferences. Among the models that have been most frequently used are: The Gregorc style outliner (Gregorc, 1984), the cognitive style analysis (Riding, 1991), the verbalizer-visualizer questionnaire (Richardson, 1977), the AD inventory Kolb (Kolb, 1999), which seems more appropriate for students in the preschool and primary school pedagogical academic program (Magdalena, 2015), and the Honey-Alonso questionnaire (Alonso et al., 2007), which has been used widely.

The "Honey-Alonso Questionnaire on learning styles" (Chaea) considers four EAs: active, reflective, theoretical, and pragmatic (Alonso et al., 2007). And, indeed, it has been

used in many investigations and in different degrees of study, such as secondary (Quintanal and Gallego, 2011) and middle level (Ramírez, Lozano and Zárate, 2017). At the undergraduate level, it has been applied in different areas of knowledge: psychology (Esguerra and Guerrero, 2010; Juárez, Hernández and Escoto, 2011), pedagogy (Moreno and León, 2015), in computer systems of industrial engineering and electromechanical engineering (Ortiz and Canto, 2013); also in the forest engineering career (Piorno, 2014) and in social work university students from Mexico and Chile (Caballero, Norambuena, Gálvez and Salamé, 2015). And of particular interest for this work, Aguilar, García and Antonio (2017) identified the teaching styles and their influence on the EE of the students of the specialty in Rural Sociology at the UACh.

However, at the UACh two types of study programs are developed at the upper secondary level: 1) by objectives in the agricultural high school and 2) by skills in the propaedeutic. The comparison of both programs is of interest to determine the differences in the EA of the students according to the type of study program that is developed. The program by objectives is based on formulations of a didactic nature that clearly and precisely express the changes in behavior that must be carried out in the student as an effect of the teaching-learning process (Salcedo, 2011). While education with a focus on competencies appeals to constructivism and reflection on classroom practice, assigning an active role to students. It assumes that the student concurs with their perceptions, meanings, and sense of reality and is integrated into a gradual and unique process that connects concepts and questions in a permanent interactive teaching-learning cycle (Bustamante, Grandón, Lapo and Oyarzún, 2016). The term competencies is of from polysemic nature, its use and application depends on the way in which it is conceptualized (in different fields, such as, for example, professional, labor and educational, among others). Specifically, in education it varies depending on the approach from which it is addressed as part of a school curriculum (Andrade and Hernández, 2010). Currently, it is sought that university students develop a greater capacity in the generic competence of learning to learn. This competition has resulted from the demands of the globalized world and seeks for university students to be professionals capable of learning throughout life (García, 2012). Due to this situation, the programs by objectives have been changed by those of competences. In the competency approach, the Tuning Europe and Latin America projects have been used, which classify competencies as generic and specific (Trujillo, 2014).

Because the UACh has both types of programs at the same level, the objective was to characterize the EA of high school students to compare the programs by competencies (propaedeutic) and by objectives (agricultural high school) of the UACh. The hypothesis is that the educational model can influence academic performance: students who study under the competency-based model have a better EA average than students whose model is the objectives model.

Methodology

Sample of participants

The EE questionnaire was applied by means of a non-probability sampling for convenience, to upper secondary education students of the UACh whose programs were designed by competences (propaedeutic) and by objectives (agricultural high school). The propaedeutic students came from high schools and high school graduates from other institutions and had entered the UACh propaedeutic to match the agronomic knowledge before entering the career. The questionnaire was applied one semester after their admission, so their experience in the skills program was only six months. In addition, surveys were applied to preparatory students in three locations located in the center and southeast of the country. In the case of the agricultural high school students who responded to the survey, they were in their third year, so their experience in the program by objectives was five previous semesters. In both cases, the next grade to take would be a bachelor's degree at the UACh.

In the analysis of the information, a total of 339 records were used, coming from the offices located in Texcoco, Tabasco, Veracruz and Yucatán. Four groups of third-year students from the agricultural high school (n = 36, n = 37, n = 40 and n = 44, respectively) from the Central Texcoco campus, two propaedeutic groups from the South-Southeast Regional University Unit (Urusse) were evaluated (n = 19 and n = 40), in Tabasco, a propaedeutic group at the Yucatán Peninsula Regional University Center (Crupy) (n = 40), located in Mérida, Yucatán, and two groups from the Oriente Regional University Center (CRUO) (n = 42 and n = 45), in Huatusco, Veracruz. The sample consisted of 199 men and 140 women, with an average age of 19.2 ± 2.8 years. The place of origin of the students was very varied. They mainly came from Oaxaca, Chiapas, Campeche, Quintana Roo, Veracruz and Yucatán, states, in the case of propaedeutic students, and from states in the center of the

republic where they entered agricultural high school. Up to the time of the application of the survey, the students were in person with all the support that the UACh grants them, such as scholarships and assistance services, including a dining room or payment for food at the Veracruz, Yucatan and Tabasco campuses.

Evaluation instrument

The Chaea (Alonso et al., 2007) was used to identify the EA of each student. The instrument was handed out in print during a previously planned session, in which the procedure was explained to the student, and the students responded dichotomously (agree or disagree). The 20 items of each EA were randomly distributed in the questionnaire to obtain the precise data and thus determine the individual EA.

Analysis of the information

With the information generated, an Excel database was created, which was processed with the JASP program to develop the descriptive statistics of globally variables and the groups studied. The Shapiro-Wilk test was also applied to determine the normality of variables and the analysis of variance (Anova) was performed. In addition, with the R program, the information was represented by a box plot at the different scales.

Since the interpretation of the scores is a function of all the participating subjects against whom the individual data is compared, the interpretation scale for the sample of upper secondary education students from the UACh was prepared. For this, the results of all the students were grouped in a scale that consisted of samples of five levels, according to what was indicated by Alonso et al. (2007), that is, the results were divided into a) very high preference, 10% of the people with the highest score, b) high preference, 20% of people with the high score, c) moderate preference, 40% of people with medium level, d) low preference, 20% of people with low score and e) very low preference, 10% of people with the lowest score.

To calculate the reliability of the instrument, the JASP program was used. The internal consistency method of Cronbach's alpha and McDonald's omega coefficient was used. In addition, the correlation between the different EA scales was evaluated using the Spearman procedure.

Results

Comparison between programs by objectives and by competencies

In the analysis of variance, only statistical differences ($p < 0.05$) were observed between the programs by objectives (agricultural high school) and by competencies in the active style (figure 1), although the numerical differences in the average were only 0.6 units between the two programs.

Figure 1. Comparison of the active EA of the program by objectives (agricultural high school) and by competencies (propaedeutic)
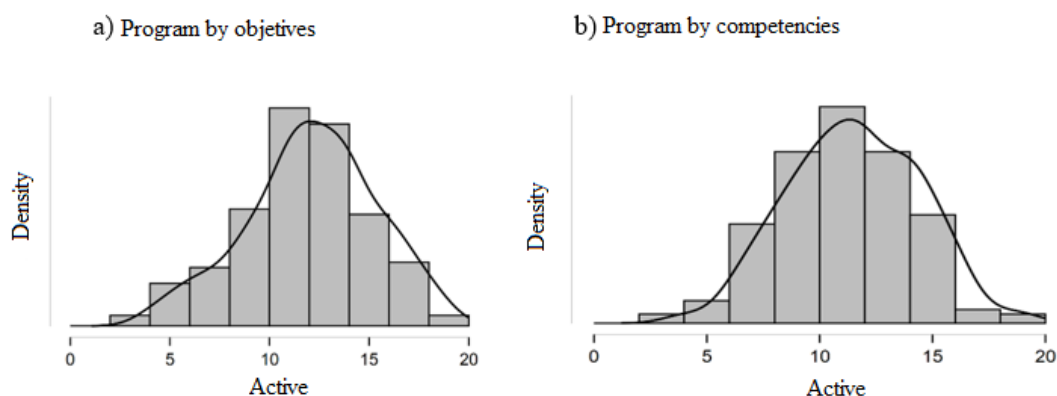
Source: self made

Descriptive statistics of AEs

The comparison between the two types of programs showed similarity in the averages of the reflective, theoretical and pragmatic EA and statistical differences were observed in the average grades in favor of the competency-based program developed in the propaedeutic (table 1).

Table 1. Comparison of the EA between the educational program by objectives (agricultural high school, n = 157) and by competencies (propedeutic, n = 182).

	Active		Reflective		Theoretical		Pragmatic		Grade average	
	Obj	Comp	Obj	Comp	Obj	Comp	Obj	Comp	Obj	Comp
Mean	12.1[a]	11.5[b]	14.7	14.7	13.5	13.6	13.8	13.4	8.52[b]	8.77[a]
Median	12.0	12.0	15.0	15.0	14.0	14.0	14.0	14.0	8.5	8.9
Mode [λ]	11.0	12.0	16.0	15.0	15.0	14.0	16.0	13.0	8.0	9.0
SD	3.3	2.9	2.9	2.9	2.8	2.9	3.0	2.9	0.54	0.74
Variance	10.6	8.5	8.6	8.3	8.1	8.6	9.0	8.9	0.29	0.54

[λ] There is more than one mode, but the first is the one indicated. Different letters between the means of the active style are statistically different ($p < 0.05$). SD: standard deviation. Obj: program by objectives sixth semester (third year) of agricultural high school. Comp: second semester of propaedeutic competition program.

Source: self made

The general results indicate that in the UACh students the active EA (11.8 ± 3.1) was the one with the lowest score, while the reflective style (14.7 ± 2.9), the theoretical (13.6 ± 2.9) and the pragmatic (13.6 ± 3.0) had the highest values, but similar among them. The variables had a normal distribution when using the Shapiro-Wilk test, which showed a $p > 0.05$ when analyzed in each group (figure 2).

Figure 2. Distribution of the frequency of upper secondary education students of the UACh in the different EA
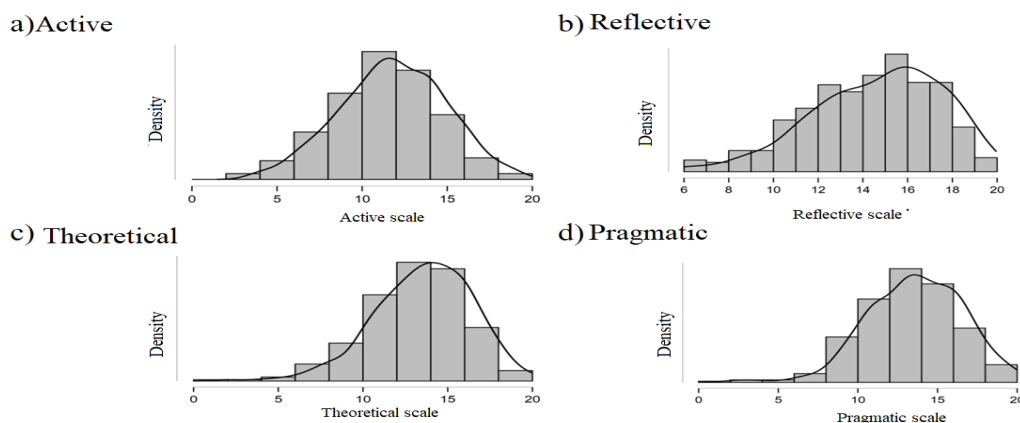
Source: self made

Regarding the type of program (by objectives and by competencies) and the gender of the students (men and women), no differences were found between the EA, except in the pragmatic one, in which differences were observed between men and women ($p < 0.05$). The EA of men in the programs by objectives and competencies was more pragmatic (figure 3), and although numerically the theoretical was also above the value observed in women, no statistical differences were observed ($p > 0.5$).

Figure 3. Relationship of the EA with the applied study plan (by objectives and by competences) of students of upper secondary education of the UACh
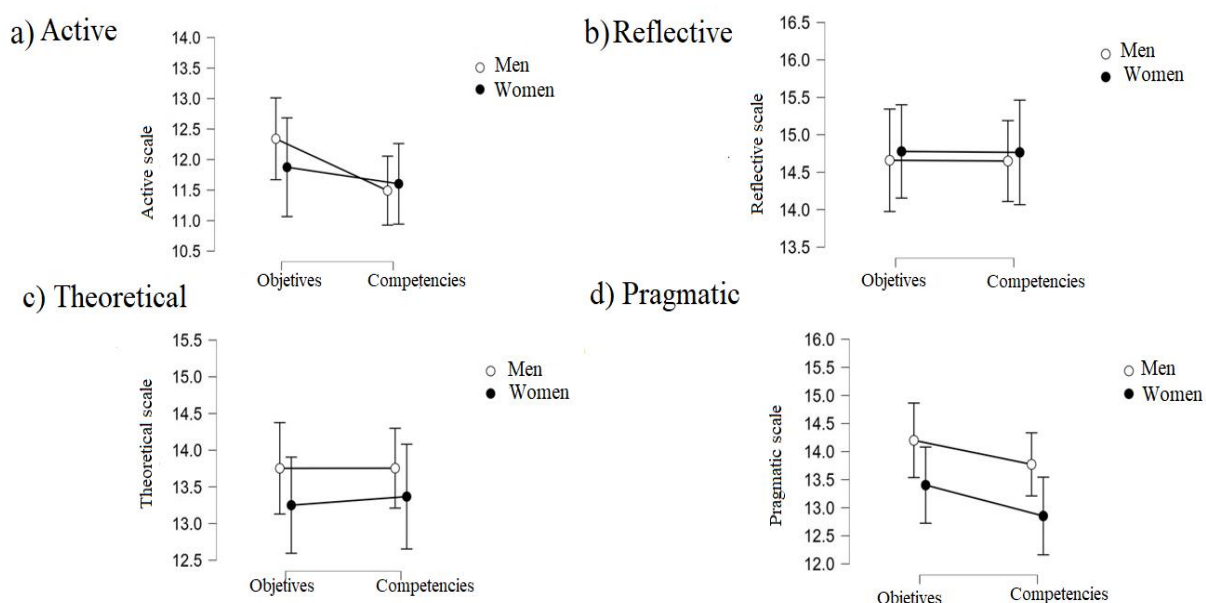
Source: self made

Chaea scales in upper secondary education students

In the interpretation scales, it was observed that the average in all the AEs was located in the moderate preference. Because all the scales had a normal distribution, the highest percentage of students are around the mean, which corresponds to a moderate preference (table 2). With these scales, a comparative interpretation of any result obtained in Chaea applications can be made. The maximum score that can be obtained is 20 points in each style. The interpretation of the scores is a function of the results of all the participating subjects with whom the individual data is compared. With the scales it is easier to know who is in the average, who is above and who is below.

Table 2. Scales of the EA of the students of upper secondary education of the UACh

N = 339	Preference				
	10 % Very low	20 % Low	40 % Moderate	20 % High	10 % Very high
Active	0-7	8-10	11-13 Mean (11.8)	14-15	16-20
Reflective	0-10	11-13	14-16 Mean (14.7)	17-18	19-20
Theoretical	0-9	10-12	13-15 Mean (13.6)	16-17	18-20
Pragmatic	0-9	10-12	13-15 Mean (13.6)	16-17	18-20

N: number of students.

Source: self made

Instrument reliability

The reliability of the instrument, measured through internal consistency, was at the lower limit of the acceptable value (table 3), both for the Cronbach's alpha test and for the McDonald's omega test (0.62 and 0.64, respectively). Of the scales, the highest value was recorded in the active style (0.69) and the lowest for the pragmatic in both tests (0.45 and 0.55, respectively).

**Table 3.** Reliability statistics of the EA scales and individual items

	Reliability		By each item		
	McDonald´s Omega	Cronbach´s alpha	Scale	Cronbach´s alpha	McDonald´s Omega
Confidence interval (CI)	0.640	0.620	Active	0.691	0.697
95 % Lower CI	0.580	0.548	Reflective	0.553	0.630
95 % Upper CI	0.701	0.683	Theoretical	0.474	0.612
			Pragmatic	0.450	0.546

Source: self made

Correlations between AEs

The highest correlations occurred between the theoretical-pragmatic EA (r = 0.41) and the reflective-theoretical (r = 0.43), while there was no correlation between the active and reflective (figure 4).

Figure 4. Correlations between the EA of agricultural and propaedeutic high school students of the UACh
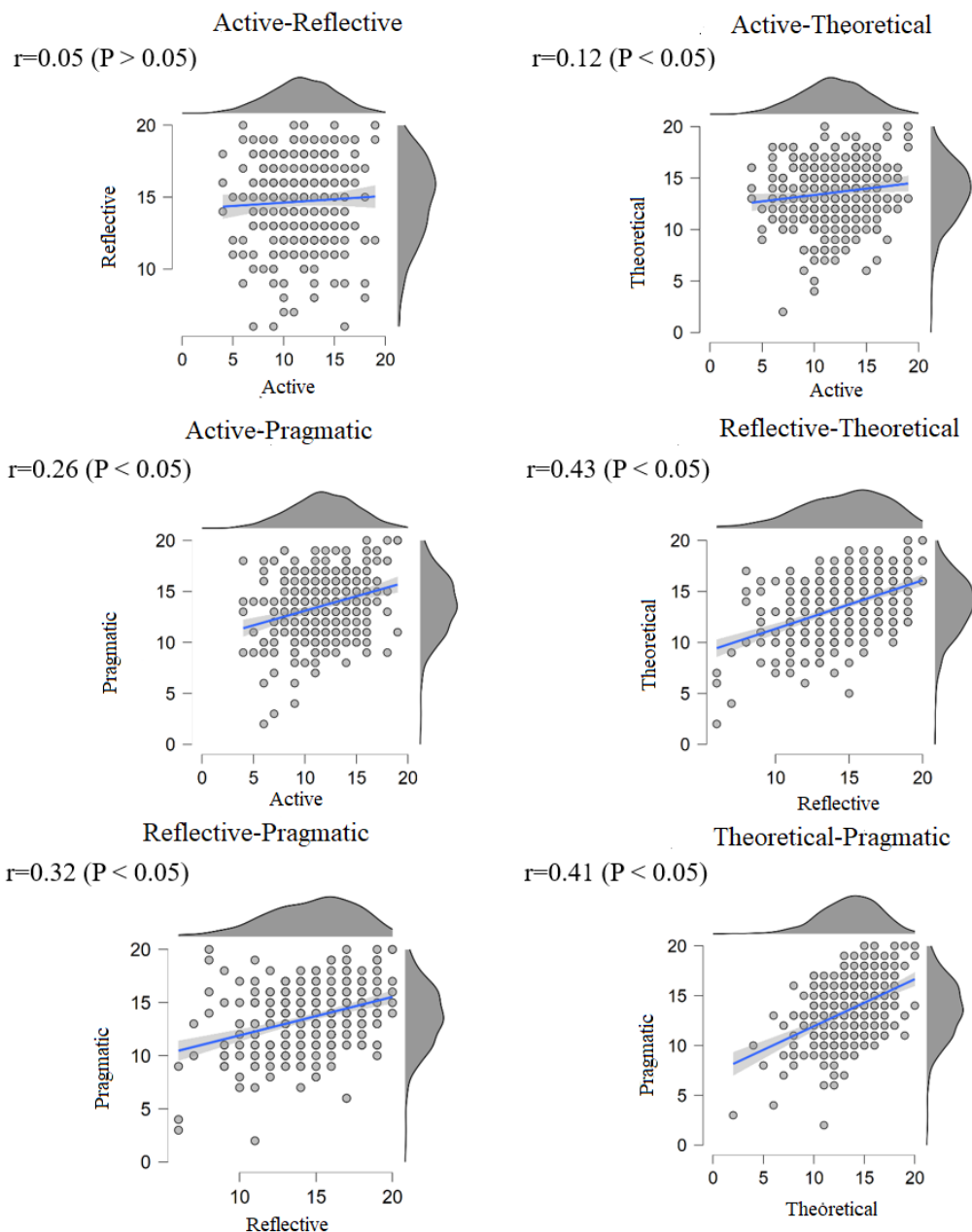
Source: self made

In the reflective, theoretical and pragmatic scales, the correlations with academic performance were not significant and it was only observed that the students with a greater preference for the active style had a lower grade (p < 0.01), therefore the correlation coefficient was negative ($r = -0.133$).

Discussion

Due to the current modifications in the educational models, some universities have transformed their programs from a model based on objectives to one based on competencies, with which cultural integration, social mobility and productive development are sought, all to promote that students reach high educational levels, positive achievements and improve the levels of quality and coverage of the programs (Barbosa and Amariles, 2019). In the present study, the educational model did not affect the EA of the majority of the students and, therefore, no differences were observed between the majority of the EA in the study plans by objectives and by competencies. Only a small difference was found in the active style between the two types of programs, with 0.6 units in favor to program by objectives (p < 0.05), while the grade point average was slightly higher in the program by competencies compared to the of objectives (8.7 vs 8.5, respectively).

According to what was mentioned as the benefits of the educational programs by competencies, it was expected that the students would have a higher average in the EA and that the educational model could influence academic performance, so this hypothesis was rejected, since the values were similar in the reflective, theoretical and pragmatic EA. Several reasons are described below that could explain the similar response between these styles in both programs, but surely it contributed that the teachers who started the competencies program previously taught it for objectives and, as has been indicated in some studies, academic performance is influenced by the pedagogical intervention of the teacher (Sánchez, Flores and Flores, 2016); this could have caused the result obtained. Additionally, the tutorial programs corresponding to the competency-based program that are taught at the UACh are also recently created and have not focused on the application of EA for the development of competencies in teaching practice, as is done in some institutions. to improve student performance (Marcos, Alarcón, Serrano, Cuetos y Manzanal, 2020)

Although the wide controversy about whether EEs are a myth or not is not supported, the few statistical differences between them could support the idea that apparently it is not

such an important element in the educational performance of students, as indicated by some theories with a more extreme cut (Kirschner, 2017). Before taking any position in this regard, it is important to study the result of applying the EA in academic performance with some systematized theory (Marcos et al., 2020). The concept of EA as an educational tool is quite simple and follows three steps: 1) individuals will express a preference regarding their EA, 2) individuals show differences in their ability to learn about certain types of information, and 3) the correspondence of the instructional design with the EA of an individual will give better educational results (Newton, 2015). The EA theories indicate that people learn in different ways, not only because of their abilities, but also because of their preference to process some type of information, and this could be of great importance in instruction, since student performance would be the result of the interaction of the instruction and the EA of each student (Willingham, Hughes and Dobolyi, 2015).

The confrontation of the position on the importance of the AEs cannot be carried out in the present study, since there are no previous diagnoses that have promoted any action to modify them and they focus more on the general analysis. The value of these studies is that they provide information that must be reviewed in order to take specific actions to remedy potential learning disabilities at the lower end of the scale. This implies knowing the EA of each student and attending to the detected problems in a focal and general way.

In a similar way to the results obtained in the present study, the reflective, theoretical and pragmatic EA had a predominance in the forestry engineering students who were part of the Piorno (2014) research. In another study, a high frequency has been found in the reflective style and it has been indicated as the most consistent with the area of social sciences (Aguilar et al., 2017). For secondary school students there is a slight inclination towards reflective and pragmatic EE (Quintanal and Gallego, 2011). In the same way, in the case of psychology students, studies underline a mastery of the reflective style (Esguerra and Guerrero, 2010; Juárez et al., 2011). The same has been found in engineering careers, in which the predominant style has been reflective (Ortiz and Canto, 2013). Differences have been observed in AEs when comparing the country of origin; for example, Caballero et al. (2015) found that the pragmatic and theoretical EE predominated in Mexican students, while the reflective one was the most frequent for the sample of Chilean students. The reflective and theoretical EA have been associated with students with a higher average and who carry out scientific careers (Quintanal and Gallego, 2011). "High achieving" students have been shown

to reflect a greater tendency to behave in creative, adventurous, innovative, and novel ways. And a significant relationship has been observed between EA and academic performance in students who show an active style (Esguerra and Guerrero, 2010). Although other authors indicate that the results of academic performance and EE are not necessarily associated with outstanding academic performance, because there are other factors of greater weight that influence said performance, such as: the teaching methodology by teachers, the context of the students and the curricular content taught in the careers (Caballero et al., 2015; Ramírez et al., 2017).

Regarding gender, it has been observed that the averages obtained by women in all EAs were higher than those of men (Quintanal and Gallego, 2011). In addition, and in a similar way to the results obtained in the present study, the EE of men is more pragmatic, and is above the reflective, theoretical and active style, in contrast to that of women, who have a preference for the reflective EA, then pragmatic, theoretical and active (Juárez et al., 2011). It has also been indicated that there are significant differences in the average academic performance between men and women and it has been shown that women have better academic performance (Ortiz and Canto, 2013). Regarding the relationship of EE with academic performance, there are contradictory results: while some authors do not find a direct relationship with academic performance (Juárez et al., 2011), others indicate a positive relationship between pragmatic EE and academic performance both in students of the career of engineering in computer systems and in industrial engineering (Ortiz y Canto, 2013).

There are other factors that affect AEs, such as coexistence. Indeed, it has been shown that those who live with their family have a reflective EA (Esguerra and Guerrero, 2010); and in students of pedagogical sciences in Cuba, a high dependency with the family and the tutorship of the teacher was indicated (Moreno and León, 2015). Other factors such as socioeconomic status, and also age, have had a low influence on AEs, which were not directly associated in a particular way with a style (Esguerra and Guerrero, 2010). In a study carried out on secondary school teachers, high values were presented both in the reflective and in the theoretical (Quintanal and Gallego, 2011). While in another study it is shown that the ideal is to identify the relationship between the teaching style with the learning style, with which a direct relationship has been found between the (formal) teaching style in teachers and the EA (reflexive) in students (Aguilar et al., 2017).

In general, in the present study there was no influence of the student's sex, the location of the student (Huatusco, Tabasco, Yucatán, Texcoco), the type of study program (preparatory and preparatory), or origin of the students in most of the EAs, with the exception of the sex of the students in the pragmatic EA. These results are due to the high variability found in the results obtained, so no trend was observed in the study variables. Up to this degree of analysis of the information, it would seem that the EA do not provide sufficient information to take measures, to design or improve a study program and it could be thought that this supports the idea widely discussed in other documents that suggests that there is no real scientific basis for saying that a student has a certain EA or is aware of what that personal style is (Kirschner, 2017).

However, if looked at in detail, the general results provide important information that could be taken into account for curricular design. For example, only gender differences were found in the pragmatic style. Men were more pragmatic than women, so these generalities that emerge from the information could allow action to be taken in the different careers of the university, especially if there are numerical differences in the student population. However, Newton (2015) states that framing a student in an EA can bring confusion to him, since it can frustrate him when developing an activity that he does not like. Furthermore, he concludes that EEs do not work, and most critically, he indicates that this harms education as a field of research and is likely to have a negative impact on students. This radical position does not contribute at all to the construction of alternatives that help students; on the contrary, they demotivate a reader, especially if he is a student or a teacher who intends to improve EAs.

The EA are not going to solve the entire educational context, but they are one more element that must be handled strategically in the design of a study program. This means that teachers must know which EE predominates and integrate activities related to EE through educational research to recognize the high degree of complexity and explanatory diversity and provide practical recommendations (Arenas, 2017). The actions of the teachers on the students should have a very important influence when applying some strategies to improve and surely the evaluation should be shared and discussed with the students so that the feedback allows the students to reflect on the aspects that are evaluated in the characterization. of the AEs.

Of the negative aspects of AEs that have been indicated in the literature, there is an abundance of views on their ineffectiveness, indicating that there are fundamental difficulties both in diagnosing AEs and in aligning instruction with them. It is strongly questioned that people are grouped into nominal categories. Even classification by sex, which until recently was considered dichotomous, has proven to be rather more nuanced than that (Kirschner, 2017).

Although the reliability values were low in the present study, they are at the lower limit and therefore it is a reliable instrument. Another similar study indicates Cronbach's alpha values of 0.55 to 0.58, which were lower than those of the present study, but are considered equally acceptable (Juárez, 2014). Also the evaluation of the instrument in the study by Alonso et al. (2007) had similar values with a very large sample of students (1371 students), while there are studies with a high reliability value, such as the case of Forest Science students in Guantánamo, Cuba (Piorno, 2014). Reliability is a property of test scores that affects the precision of the results of an instrument, since it is related to three aspects: a) the variability of a person's responses, b) the measured trait, and c) the error measurement. In the latter, the greater the random error, the less reliability. The omega coefficient is more stable in the calculations than Cronbach's alpha and reflects the true level of reliability, regardless of the number of items (Viladrich, Angulo-Brunet and Doval, 2017). An acceptable value for the Omega coefficient is between 0.70 and 0.90, although in some circumstances values greater than 0.65 may be accepted (Ventura y Caycho, 2017).

The studies that oppose the AEs indicate that these are subject to the feelings of the individual at the time the test is answered and that, therefore, there is a problem with the validity, reliability, and predictive power of the tests that are used. Inconsistencies and low reliability for measurement are reported especially when individuals complete a particular measurement at two different times. In other words, the test-retest reliability is quite low. The reason for this is that students are not willing to honestly report what they do (Kirschner, 2017). However, there is a statistical foundation that is only questioned, but cannot be refuted, and that provides the basis for the variability with which students respond.

With similar tendencies to the present study, engineering students in Yucatán, Mexico, showed Pearson correlation coefficients between theoretical-pragmatic ($r = 0.38$) and reflective-theoretical (0.55) EE similar to those of upper secondary education students from the UACh ($r = 0.41$ and 0.43, respectively). Although, in contrast, the values between

the active-reflective and active-theoretical had negative correlations in that study (Ortiz y Canto, 2013).

Conclusions

The averages of the reflective, theoretical and pragmatic EA of the students who attended the program by objectives (agricultural high school) and by competencies (propaedeutic) were similar; while in the active style, the students by objectives showed a slightly higher average than the students of the competition program, which could be related to the time in which they were part of the programs, since the agricultural high school students were two years and means in the program by objectives and in the case of preparatory students, they only developed the competencies program during a semester prior to the application of the questionnaire.

The program by objectives has been developed in the traditional way at the UACh for many years with a great academic load and responsibility of the professors in the training of the students. However, it is necessary to review other options that improve academic performance and reduce school dropout from the agricultural high school, for which currently the implementation of the program by competencies in the propaedeutic groups has incorporated new elements in the training such as the mandatory tutorials, which is an improvement to allow better academic performance as observed in the results.

The averages of the EA in the upper secondary education students of the UACh corresponded to a moderate preference, although the tendency of the four scales studied (active, reflexive, theoretical and pragmatic) was to average near the lower limit of moderate preference in the scale. Of the factors that affected some of the styles, the sex of the students showed an influence and thus, the men had an EA to a greater extent pragmatic and theoretical, while the women were more reflective, both in the program by objective and in the program by objective. skills. In the active style, no gender trend was found since the averages between men and women were very similar.

The reliability of the instrument, measured through internal consistency using Cronbach's alpha and Mcdonald's omega, was acceptable, although with a small value close to the limit considered optimal. Of the scales, the highest value was recorded in the active style, while the theoretical and pragmatic styles were the lowest, which represents high variability in the responses in these last two scales and therefore the lowest reliability.

The correlations between the theoretical-pragmatic (r = 0.41) and reflective-theoretical (0.43) EAs were the only positive correlations of medium magnitude and therefore of importance; the other correlations between AEs were not significant. A small and negative correlation was also observed between the active style and school performance (r = -0.133), indicating that reflective, theoretical and pragmatic EAs have no influence on school performance.

Future lines of research

It is important that educational institutions, in addition to evaluating EA, develop improvement plans and determine the impact on academic performance and school dropout.

It would be convenient to carry out multivariate studies in which, in addition to AEs, study habits, family functionality and other aspects that affect academic performance are integrated.

Acknowledgment

Conflict of interests

The authors of this document declare that they have no conflict of interest.

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