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Scientific articles

Emprendimiento interdisciplinario: el motor del éxito académico en el Sistema Universitario

Interdisciplinary entrepreneurship: the driving force of academic success in the University System

Empreendedorismo interdisciplinar: o motor do sucesso acadêmico no Sistema Universitário

Guillermo José Navarro del Toro
Universidad de Guadalajara, México
guillermo.ndeltoro@academicos.udg.mx
https://orcid.org/0000-0002-4316-879X

Víctor Katsumi Yamaguchi Llanes
Universidad de Guadalajara, México
victor.yamaguchi@cualtos.udg.mx
https://orcid.org/0009-0006-8973-452X

Resumen

Uno de los principales retos de la educación universitaria es elevar su calidad, lo que para el Centro Universitario de los Altos (CUAltos) significa contribuir no solo a la formación de profesionistas que respondan satisfactoriamente a las demandas del mercado laboral, sino que también sean competentes para generar sus propios negocios. A partir del emprendimiento y de la transversalidad, CUAltos está desarrollando un modelo para mejorar la calidad educativa, que logre un mayor empoderamiento de sus egresados y pueda ser adoptado en los demás centros de la red de la Universidad de Guadalajara (U de G), a la que pertenece. Este método busca potenciar a los estudiantes, que su meta no sea solo conseguir un empleo, sino que sean capaces de trabajar en equipos interdisciplinarios para el desarrollo de emprendimientos innovadores. De esta manera, el modelo ha dado resultados palpables

en este sentido, con registros de marcas e incubaciones de empresas de estudiantes y egresados.

Palabras clave: calidad educativa, emprendimiento, mejora continua, transversalidad.

Abstract

One of the main challenges of university education is to raise its quality, which for the Centro Universitario de los Altos (CUAltos) means contributing not only to the training of professionals who respond satisfactorily to the demands of the labor market, but who are also competent. to generate their own businesses. Based on entrepreneurship and transversality, CUAltos is developing a model to improve educational quality, which achieves greater empowerment of its graduates and can be adopted in the other centers of the network of the University of Guadalajara (U de G), to which it belongs. This method seeks to empower students, so that their goal is not only to get a job, but to be able to work in interdisciplinary teams to develop innovative ventures. In this way, the model has given palpable results in this sense, with brand registrations and incubations of student and graduate companies.

Keywords: educational quality, entrepreneurship, continuous improvement, transversality.

Resumo

Um dos principais desafios da educação universitária é elevar a sua qualidade, o que para o Centro Universitário de los Altos (CUAltos) significa contribuir não só para a formação de profissionais que respondam satisfatoriamente às exigências do mercado de trabalho, mas que também sejam competentes . para gerar seus próprios negócios. Baseada no empreendedorismo e na transversalidade, a CUAltos está a desenvolver um modelo de melhoria da qualidade educativa, que consegue uma maior capacitação dos seus licenciados e pode ser adotado nos restantes centros da rede da Universidade de Guadalajara (U de G), à qual pertence. Esse método busca capacitar os alunos, para que seu objetivo não seja apenas conseguir um emprego, mas poder trabalhar em equipes interdisciplinares para desenvolver empreendimentos inovadores. Dessa forma, o modelo tem dado resultados palpáveis nesse sentido, com registros de marcas e incubações de empresas estudantis e pós-graduadas.

Palavras-chave: qualidade educacional, empreendedorismo, melhoria contínua, transversalidade.

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Introduction

Higher Education Institutions (HEIs) aim to prepare students with the best tools in knowledge, skills and teamwork, which are called "competencies", since they are derived from the educational model with this name, whose application in CUAltos seeks to induce its students and graduates to become entrepreneurs who start their own business, who are even generators of employment for others, or, if they join public or private entities, have a proactive attitude, whose distinctive characteristic is the search for continuous improvement of methods, processes, techniques, goods or services, inherent to their organization. In short, according to authors such as Barrero et al. (2018), the purpose is to turn them into agents of change.

However, authors such as Cuadra-Martínez, Castro and Juliá (2018) propose that the competency model be considered as a stable set of knowledge, behaviors, and standard reasoning procedures, which can be put into practice without having to learn anything new. This does not necessarily mean that the educational model cannot be improved. According to Loayan (2022), a tool that is very useful for improving existing processes is the continuous improvement method or Kaizen, which is an excellent tool to guide the educational model described in this text. This perspective allows us to consider that changes in the university curriculum cannot all be achieved instantly, from one school period to the next; sometimes, this can take up to a decade to achieve. For this reason, the development of this model initially contemplates the instrumentation and application of a subject that is incorporated into all educational programs offered at CUAltos and, according to the results obtained in a period of at least two years, can be exported to all the courses of the university centers of the U de G.

Theoretical Framework

Most of the educational models used in the last half century worldwide are based on different variants of the proposals of Piaget, Vygotsky and Ausubel among others, since they take into consideration Piaget's cognitive or evolutionary theory, Vygotsky's sociocultural theory and Ausubel's theory of meaningful learning . For this reason, they have been very influential in educational models that seek to improve the quality and quantity of knowledge that the student needs to acquire before graduation, which agrees with what was expressed

by Asubel (as cited in Medina, 2018), since experience is essential in education. Evidence and discoveries are the basis for evaluating the progress and increase of knowledge, so Ausubel's theories are satisfactorily fulfilled and these achieve the development of the cognitive, affective and physical capacities of that student who participates in the formal educational process.

Authors such as Guzmán (2017) suggest that the competency model is oriented towards the institutional reorganization of the educational system, the definition of study plans and programs, training practices, evaluation processes, certification and accreditation of modern education. However, depending on the country in which the educational model is applied, the educational policies dictated by the government in turn must be taken into consideration for its operation at all levels that make up its system.

Thus, for example, the Finnish educational system is based on equality, whose meaning according to *The Observer* (2017) comes from Latin and means equality, fair proportion, similarity, equity where all students have the space and role to grow and develop their maximum potential. Teachers are also trained in the effective sense, a comprehensive approach that prioritizes student well-being, encourages collaboration and adapts to individual needs, creating an environment conducive to continuous and meaningful learning. Another of the educational models that have been highly highlighted worldwide is the Japanese one, which according to what is described by Iborra (2019) is based on So-Ka which means "value creation"; it was used by Tsunesaburo Makiguchi in his work "The pedagogy of the value creation system", from 1930, in which he proposes generating a teaching system that emphasizes creating value as a vital goal, with happiness being the main purpose of education, which is described by Sakurai (2022).

It goes without saying that the competency-based educational approach adopted in Mexico is very different from the educational model applied, for example, in Hong Kong, which, according to Mosquera (2017), is one of the best according to the Organization for Economic Cooperation and Development (OECD), which presents great differences with the one applied in Mexico, since it is based on the culture of effort, demand, memorization and sacrifice.

However, at first glance, the difference between the results obtained from educational models applied in other countries can be seen, which are different between them and the Mexican ones. For this reason, the model described in this text is an approximation, using the method of continuous improvement, to gradually reduce the gap existing in the results

obtained. To do so, a determined participation and great interest is required on the part of researchers and teachers directly involved in group activities, since they are the ones who take the pulse of what happens in each group directly.

For this reason, CUAltos, through its Research and Innovation Center for Organizations (CIIO), conducts various studies on new students to establish a diagnosis of their characteristics, knowledge and skills in entrepreneurship. Based on this, CUAltos seeks to improve its performance as an educational institution and generate professionals oriented toward the culture of entrepreneurship, who are proactive and have a vision of change.

Methodology to be used

In order to improve the quality of education at the Centro Universitario de los Altos, among other tools, the analysis of the characteristics and conditions of the labor market and, in general, of the productive environment is used. The study plans and programs used in the preparation of the new generations of students are generally not updated at the pace at which public and private organizations change. Therefore, there is often a gap between what is taught in the educational institution and what is required in the field in which the graduate will be inserted.

The continuous improvement method, which, according to Generación Anáhuac (2020), bases its operation on achieving small objectives as part of a larger whole, means that they are tasks that must be achieved so that at a certain moment a larger objective can be achieved. This is interpreted as the way in which goals must be proposed and that once each one is met, the next can be moved on to. This is reflected in the implementation of small changes in the study plans and programs, instead of a complete and radical replacement. In addition to the gradual modification of the governing documents of the different careers, it is pertinent and necessary to train teachers at the same time, so that they have the skills to successfully implement these changes.

To increase educational quality through continuous improvement, one of CUAltos' strategies is the combination of transversality and entrepreneurship. This translates into the development of soft skills, based on the notion of business with social awareness, in all educational programs, which allows the creation of multidisciplinary teams based on entrepreneurship and innovation projects.

Development

CUAltos launched a project that aims to move from a general educational model to one that allows transversality, where a cultural change of mentality oriented towards entrepreneurship is privileged, which makes it possible for the student, upon graduation, to have developed the ability to undertake regardless of the specialty of their studies.

For this reason, it is assumed that learning, according to Díaz Barriga (2018), is based on updating the curriculum supported by two combined aspects to obtain better educational results, with which it is possible to respond to new social and business demands.

The aim is for transversality to be the bridge between the traditional educational model based on competencies and the new strategies of teaching performance, the learning of new curricular content with the learning of procedures and strategies aimed at learning more and better, that is, to be the bridge between academic and natural learning that promotes effective learning.

According to authors such as Cortés and Puga (2015), transversality has become a goal of recent educational models, such as CUAltos. Through this approach and methodology, we seek to trigger innovation and changes that impact the curriculum, and therefore the pedagogical and organizational positions of CUAltos in particular, and in general, in all the university centers that make up the U de G.

The decision was made to use transversality as the core part of this project, which agrees with what was expressed by Cuesta (2018), since it has been proven that it connects and articulates knowledge with a didactic sense, which is why it is oriented towards achieving the expected learning, as well as the development of the capabilities, and aims to ensure that students acquire the skills necessary to enrich their educational work through the connection and articulation of the knowledge that makes up the different learning sectors.

For these reasons, CUAltos, through CIIO, aims to implement the activities and actions necessary to increase the quality of education offered to its students, as well as to collaborate with other university centers of the U de G, especially in the specialties where it has greater strength, such as entrepreneurship.

Transversality

To meet the objective of increasing the quality of knowledge that the student receives from the Centro Universitario de los Altos, and as a university according to authors such as Simbaña (2015), it has a great commitment to society, which is why it takes its role as an

agent of change capable of generating theoretical-practical knowledge that elevates the creation and recreation of its students and becomes the necessary knowledge to solve problems through projects aimed at stimulating university-community interaction, for which the need to incorporate at least one transversal subject to the school curriculum as part of the existing organization by subjects was raised. Thus, three key points were taken into consideration to solve the problem that implies adding transversal subjects to an already consolidated curricular structure.

a. Develop a curriculum project based on the development of teaching units that include relevant content for all disciplines in which it will be implemented.
b. The vertical disciplinary structure, which considers the transversal subject as a line that intersects them, offering the student the possibility of working on alternative problems of personal and social interest.
c. Ensure that the subject has its own entity and characteristics, which distinguish it from the rest of the curriculum and have value for all students.

It was assumed that the transversals are like lines where it is necessary to know at what moments of the areas the contents can be developed taking into consideration the attitudes, behaviors and values, which are involved in developing through the objectives, learning activities, evaluation, interpersonal relationships and hidden curriculum that is being generated.

Entrepreneurship

The complementary part of transversality lies in the entrepreneurship whose product is due to the contributions it makes to the community, and can be considered, as stated by authors such as Méndez Quintanilla and Sánchez (2018), the trigger of economic development and social change, while also showing itself as a driving force that encourages the acquisition and appropriation of knowledge, technological change, competitiveness and innovation.

In addition, there is a great interest on the part of CUAltos to help solve the problems that arose as part of the economic crisis that occurred in the Altos Region as a result of the pandemic and the economic consequences of the current wars, which is why the productive structures were involved not only in the region, but in many countries that saw their economic growth decrease, reflected in the labor market with unemployment, especially among the younger generations, as reported by Perfil (2022).

Therefore, there is an urgent need to rethink development based on the "entrepreneurial" sense, which becomes a requirement of CUAltos, being committed to the existing need to combine public policies and private investments but also considering non-profit organizations, to be able to relaunch an "entrepreneurial society".

Unfortunately, the lack of an entrepreneurial culture that is widespread in the region and the country is very noticeable, which is why, according to authors such as García-Bullé (2019), it is one of the main obstacles to the creation of entrepreneurial and innovative initiatives.

Therefore, in any IES, as in the Centro Universitario de los Altos, it became necessary and obligatory to implement measures aimed at promoting the creation of new companies, which agrees with what was stated by Castro de Moura (2014), since they are intended to have as their objective the generation of new opportunities based on technological, socioeconomic and market changes, which have a greater chance of success and thus gradually replace companies that leave the market due to their low efficiency in the service or production of goods.

Therefore, the entrepreneurial process, according to what is stated by Ramos (2019), can contribute to the development of an entrepreneurial culture that will allow the development of skills and capacities that are important to overcome the inertia that current society has so far.

Results

Once the design of a cross-curricular subject was completed, it became possible to insert it into the 14 degrees offered at CUAltos. It was suggested that it be taught in the seventh semester of the degree, which was done with the purpose of ensuring that every student had enough time to prepare a project in their specialty and, if possible (although highly recommended), involve other students from their same degree, or even better, from other disciplines, which according to iProUp (2019), is even more profitable and beneficial for the enterprise, and the members of the multidisciplinary teams that participate in it.

Similarly, the subject was placed in the seventh semester based on the fact that the interdisciplinary team of students could be advised by CUAltos teachers and researchers, so that their undertaking could be strengthened and taken to the point of applying for a patent, when possible.

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Figure 1. Survey applied to the student of the Centro Universitario de los Altos via the Internet

ENCUESTA DIRIGIDA AL ESTUDIANTE PARA DETERMINAR LOS ASPECTOS A REFORZAR SOBRE EMPRENDIMIENTO

1	*Abogado*	2	*Administración*
3	*Cirujano Dentista*	4	*Contaduría Pública*
5	*Enfermería*	6	*Ingeniería Agroindustrial*
7	*Ingeniería en Computación*	8	*Ingeniería en Sistemas Pecuarios*
9	*Médico Cirujano y Partero*	10	*Médico Veterinario Zootecnista*
11	*Negocios Internacionales*	12	*Nutriólogo*
13	*Psicología*	14	*Químico Farmacobiólogo*

		SI	NO
1	*¿Sabes la diferencia entre ser empresario y ser empleado en una empresa?*		
2	*¿Sabes cómo puedes convertirte en empresario?*		
3	*¿Sabes qué son los financiamientos para empresas que inician su operación?*		
4	*¿Sabes qué organismos te pueden ayudar a iniciar tu propia empresa?*		
5	*¿Sabes qué tipo de apoyos brindan los organismos públicos a las empresas?*		
6	*¿Sabes a qué rubros en la empresa se pueden destinar los apoyos que otorgan los organismos públicos?*		
7	*¿Sabes qué organismos estatales son los que brindan apoyos a las empresas?*		
8	*¿Sabes en dónde se ubican los organismos estatales que brindan apoyos económicos a las empresas?*		
9	*¿Sabes en dónde se puede obtener información sobre los organismos estatales que brindan apoyos económicos a las empresas?*		
10	*¿Sabes qué tipos de apoyos económicos brindan los organismos estatales a las empresas?*		
11	*¿Sabes qué tipo empresas pueden recibir apoyos económicos de los organismos estatales?*		
12	*¿Sabes qué requisitos se deben cubrir para obtener un apoyo económico de los organismos estatales para la empresa?*		
13	*¿Sabes qué organismos municipales son los que brindan apoyos a las empresas locales?*		
14	*¿Sabes en dónde se ubican los organismos municipales que brindan apoyos económicos a las empresas?*		
15	*¿Sabes en dónde se puede obtener información sobre los organismos municipales que brindan apoyos económicos a las empresas?*		
16	*¿Sabes qué tipos de apoyos económicos brindan los organismos municipales a las empresas?*		
17	*¿Sabes que tipo empresas pueden recibir apoyos económicos de los organismos municipales?*		
18	*¿Sabes qué requisitos se deben cubrir para obtener un apoyo económico de los organismos municipales para la empresa?*		
19	*¿Sabes cuál es la diferencia entre un startup y un emprendimiento?*		
20	*¿Sabes cuál es la diferencia entre un apoyo económico inicial para la empresa y el apoyo económico para potencializar la empresa?*		

Source: *Own elaboration. IN FIGURE 1, question 1 should say Do you know what type of companies…?, in question 17 it should say Do you know what type of companies…?*

For this reason, a survey was generated that was applied through one of the Internet servers of the Centro Universitario de los Altos, in the classes in front of the group, an invitation was extended to them to participate in filling it out, as can be seen in Figure 1.

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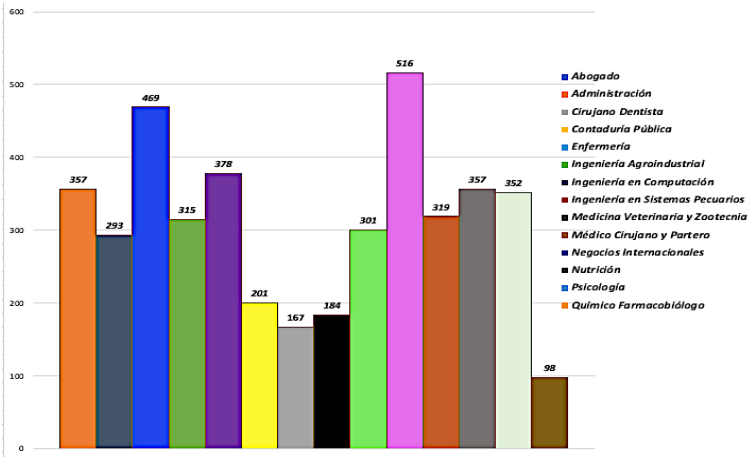
To validate that there was sufficient participation of students who filled it out, we went to see the enrollment registration that was had per semester period, which is, according to Planter's data (2023), there are a little more than 4,000 students on a semester basis in the present decade, so Figure 2 shows the current population that the Centro Universitario de los Altos has by major.

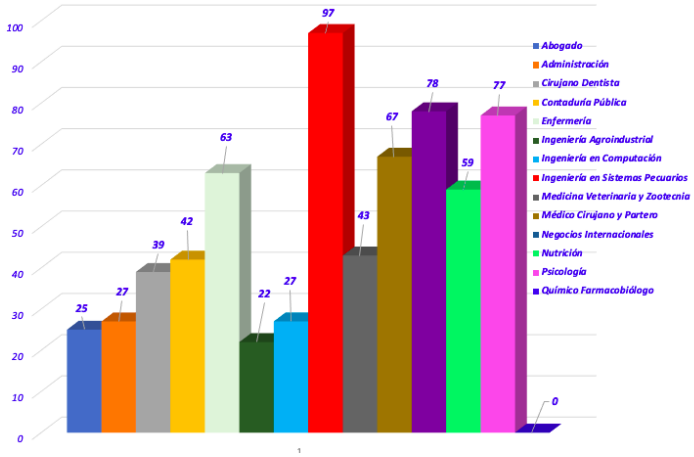
Figure 2. School population of the Centro Universitario de los Altos by major



Fountain: *Prepared with data from the 4th Activities Report 2022-2023 of the Centro Universitario de los Altos*

Figure 3 shows the number of students per program who participated by completing the survey that was directed to them.

Figure 3. Student population of the Centro Universitario de los Altos by major that participated by filling out the survey



Source: Prepared with data from the surveys completed by the students

The percentage of student participation in each career filling out the survey was: ***(1)*** Lawyer 3.75%, ***(2)*** Administration 4.05%, ***(3)*** Dental Surgeon 5.86%, ***(4)*** Public Accounting 6.31%, ***(5)*** Nursing 9.46%, ***(6)*** Agroindustrial Engineering 3.3%, ***(7)*** Computer Engineering 4.05%, ***(8)*** Engineering in Livestock Systems 14.56%, ***(9)*** Veterinary Medicine and Zootechnics 6.46%, ***(10)*** Medical Surgeon and Midwife 10.06%, ***(11)*** International Business 11.71%, **(12)** Nutrition 8.86%, ***(13)*** Psychology 11.56% and ***(14)*** Pharmacobiologist Chemist 0%.

It should be noted that the Centro Universitario de los Altos has a total enrollment of 4,209 students, of which 98 are from the *Pharmacobiological Chemist Degree* that opens in 2023, the remaining students are distributed as shown in Table 1.

Table 1. Career with its Number and Percentage of Students from the University Center of Los Altos

#	*Name of the Race*	Population	C1	C2	C3
1	Lawyer	357	0.083	25	7.00
2	Administration	293	0.068	27	9.22
3	Dental Surgeon	469	0.109	39	8.32
4	Public Accounting	315	0.073	42	13.33
5	Nursing	378	0.088	63	16.67
6	Agroindustrial Engineering	201	0.047	22	10.95
7	Computer Engineering	167	0.039	27	16.17
8	Engineering in Livestock Systems	184	0.043	97	52.72
9	Veterinary Medicine and Animal Husbandry	301	0.070	43	14.29
10	Medical Surgeon and Midwife	516	0.120	67	12.98
11	International Business	319	0.074	78	24.45
12	Nutrition	357	0.083	59	16.53
13	Psychology	352	0.082	77	21.88
14	Pharmacobiological Chemist	98	0.023	0	0
		4307	-	*666*	-

C 1: Percentage of the total population of the University Center of Los Altos.

C 2: Number of students of that degree who filled out the survey

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C 3: Percentage of the population of the career that completed the survey

Source: Prepared by the authors with data from 4th. 2022-2023 Activities Report of the Los Altos University Center

Now, the results of the students' participation in filling out the survey are made using tables, which have facilitated their analysis of response frequencies. Table 2 shows the results obtained from the survey in questions 1 to 5, in the first column are: The number identifies the degree (C), the number of students of the degree who responded (E), and the percentages obtained from both positive and negative responses and their corresponding percentages.

Table 2. Student responses by major and their % participation in the survey questions

C	AND	Question 1				Question 2				Question 3				Question 4				Question 5			
		YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%
1	25	18	0.72	7	0.28	15	0.60	10	0.40	3	0.12	22	0.88	3	0.12	22	0.88	3	0.12	22	0.88
2	27	24	0.89	3	0.11	22	0.81	5	0.19	2	0.07	25	0.93	2	0.07	25	0.93	2	0.07	25	0.93
3	39	38	0.97	1	0.03	33	0.85	6	0.15	5	0.13	34	0.87	4	0.10	35	0.90	4	0.10	35	0.90
4	42	42	1.00	0	0.00	40	0.95	2	0.05	6	0.14	36	0.86	5	0.12	37	0.88	5	0.12	37	0.88
5	63	19	0.30	44	0.70	30	0.48	33	0.52	9	0.14	54	0.86	8	0.13	55	0.87	8	0.13	55	0.87
6	22	21	0.95	1	0.05	10	0.45	12	0.55	1	0.05	21	0.95	12	0.55	10	0.45	12	0.55	10	0.45
7	27	19	0.70	8	0.30	5	0.19	22	0.81	2	0.07	25	0.93	6	0.22	21	0.78	6	0.22	21	0.78
8	97	80	0.82	17	0.18	53	0.55	44	0.45	4	0.04	93	0.96	7	0.07	90	0.93	7	0.07	90	0.93
9	43	39	0.91	4	0.09	40	0.93	3	0.07	6	0.14	37	0.86	15	0.35	28	0.65	15	0.35	28	0.65
10	67	20	0.30	47	0.70	55	0.82	12	0.18	8	0.12	59	0.88	27	0.40	40	0.60	27	0.40	40	0.60
11	78	75	0.96	3	0.04	70	0.90	8	0.10	12	0.15	66	0.85	12	0.15	66	0.85	12	0.15	66	0.85
12	59	54	0.92	5	0.08	45	0.76	14	0.24	9	0.15	50	0.85	21	0.36	38	0.64	21	0.36	38	0.64
13	77	70	0.91	7	0.09	25	0.32	52	0.68	14	0.18	63	0.82	11	0.14	66	0.86	11	0.14	66	0.86
14	0	0	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Prepared by the authors using data from the 666 surveys completed by the students

Table 3 shows the results obtained from the survey in questions 6 to 10. The first column identifies the program (C), the number of students in the program who responded

(E), and the percentages obtained from both positive and negative responses and their corresponding percentages.

Table 3. Student responses by major and their % participation in the survey questions

C	*AND*	*Question 6*				*Question 7*				*Question 8*				*Question 9*				*Question 10*			
		YEAH	*%*	*NO*	*%*	*YEAH*	*%*	*NO*	*%*	*YEAH*	*%*	*NO*	*%*	*YEAH*	*%*	*NO*	*%*	*YEAH*	*%*	*NO*	*%*
1	25	3	0.12	22	0.88	8	0.32	17	0.68	8	0.32	17	0.68	25	1.00	0	0.0	0	0.0	25	1.00
2	27	2	0.07	25	0.93	9	0.33	18	0.67	9	0.33	18	0.67	27	1.00	0	0.0	0	0.0	27	1.00
3	39	4	0.10	35	0.90	7	0.18	32	0.82	7	0.18	32	0.82	39	1.00	0	0.0	0	0.0	39	1.00
4	42	5	0.12	37	0.88	6	0.14	36	0.86	6	0.14	36	0.86	42	1.00	0	0.0	0	0.0	42	1.00
5	63	8	0.13	55	0.87	11	0.17	52	0.83	11	0.17	52	0.83	63	1.00	0	0.0	0	0.0	63	1.00
6	22	12	0.55	10	0.45	9	0.41	13	0.59	9	0.41	13	0.59	22	1.00	0	0.0	0	0.0	22	1.00
7	27	6	0.22	21	0.78	8	0.30	19	0.70	8	0.3	19	0.70	27	1.00	0	0.0	0	0.0	27	1.00
8	97	7	0.07	90	0.93	12	0.12	85	0.88	12	0.12	85	0.88	97	1.00	0	0.0	0	0.0	97	1.00
9	43	15	0.35	28	0.65	5	0.12	38	0.88	5	0.12	38	0.88	43	1.00	0	0.0	0	0.0	43	1.00
10	67	27	0.40	40	0.60	12	0.18	55	0.82	12	0.18	55	0.82	67	1.00	0	0.0	0	0.0	67	1.00
11	78	12	0.15	66	0.85	10	0.13	68	0.87	10	0.13	68	0.87	78	1.00	0	0.0	0	0.0	78	1.00
12	59	21	0.36	38	0.64	9	0.15	50	0.85	9	0.15	50	0.85	59	1.00	0	0.0	0	0.0	59	1.00
13	77	11	0.14	66	0.86	7	0.09	70	0.91	7	0.09	70	0.91	77	1.00	0	0.0	0	0.0	77	1.00
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Prepared by the authors using data from the 666 surveys completed by the students

Table 4 shows the results obtained from the survey in questions 11 to 15. The first column identifies the program (C), the number of students in the program who responded (E), and the percentages obtained from both positive and negative responses and their corresponding percentages.

Table 4. Student responses by major and their % participation in the survey questions

C	AND	Question 11				Question 12				Question 13				Question 14				Question 15			
		YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%
1	25	12	0.48	13	0.52	2	0.08	23	0.92	15	0.60	10	0.40	20	0.80	5	0.20	20	0.80	5	0.20
2	27	13	0.48	14	0.52	3	0.11	24	0.89	18	0.67	9	0.33	26	0.96	1	0.04	26	0.96	1	0.04
3	39	21	0.54	18	0.46	5	0.13	34	0.87	31	0.79	8	0.21	36	0.92	3	0.08	36	0.92	3	0.08
4	42	30	0.71	12	0.29	6	0.14	36	0.86	29	0.69	13	0.31	40	0.95	2	0.05	40	0.95	2	0.05
5	63	35	0.56	28	0.44	2	0.03	61	0.97	57	0.90	6	0.10	60	0.95	3	0.05	60	0.95	3	0.05
6	22	12	0.55	10	0.45	5	0.23	17	0.77	19	0.86	3	0.14	21	0.95	1	0.05	21	0.95	1	0.05
7	27	16	0.59	11	0.41	7	0.26	20	0.74	20	0.74	7	0.26	25	0.93	2	0.07	25	0.93	2	0.07
8	97	25	0.26	72	0.74	8	0.08	89	0.92	80	0.82	17	0.18	87	0.90	10	0.10	87	0.90	10	0.10
9	43	35	0.81	8	0.19	1	0.02	42	0.98	39	0.91	4	0.09	40	0.93	3	0.07	40	0.93	3	0.07
10	67	50	0.75	17	0.25	7	0.10	60	0.90	59	0.88	8	0.12	60	0.90	7	0.10	60	0.90	7	0.10
11	78	39	0.5	39	0.5	5	0.06	73	0.94	69	0.88	9	0.12	71	0.91	7	0.09	71	0.91	7	0.09
12	59	45	0.76	14	0.24	4	0.07	55	0.93	48	0.81	11	0.19	56	0.95	3	0.05	56	0.95	3	0.05
13	77	66	0.86	11	0.14	3	0.04	74	0.96	63	0.82	14	0.18	71	0.92	6	0.08	71	0.92	6	0.08
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Prepared by the authors using data from the 666 surveys completed by the students

Table 5 shows the results obtained from the survey in questions 16 to 20. The first column identifies the program (C), the number of students in the program who responded (E), and the percentages obtained from both positive and negative responses and their corresponding percentages.

Table 5 Student responses by major and their % participation in the survey questions

C	AND	Question 16				Question 17				Question 18				Question 19				Question 20			
		YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%	YEAH	%	NO	%
1	25	19	0.76	6	0.24	19	0.76	6	0.24	5	0.20	20	0.80	2	0.08	23	0.68	12	0.48	13	0.52
2	27	18	0.67	9	0.33	18	0.67	9	0.33	6	0.22	21	0.78	3	0.11	24	0.67	15	0.56	12	0.44
3	39	21	0.54	18	0.46	21	0.54	18	0.46	5	0.13	34	0.87	5	0.13	34	0.82	17	0.44	22	0.56
4	42	32	0.76	10	0.24	23	0.55	19	0.45	9	0.21	33	0.79	4	0.10	38	0.86	22	0.52	20	0.48
5	63	54	0.86	9	0.14	35	0.56	28	0.44	11	0.17	52	0.83	5	0.08	58	0.83	33	0.52	30	0.48
6	22	15	0.68	7	0.32	11	0.50	11	0.50	15	0.68	7	0.32	3	0.14	19	0.59	18	0.82	4	0.18
7	27	17	0.63	10	0.37	15	0.56	12	0.44	9	0.33	18	0.67	4	0.15	23	0.70	22	0.81	5	0.19
8	97	75	0.77	22	0.23	57	0.59	40	0.41	19	0.20	78	0.80	5	0.05	92	0.88	39	0.40	58	0.60
9	43	37	0.86	6	0.14	37	0.86	6	0.14	12	0.28	31	0.72	6	0.14	37	0.88	35	0.81	8	0.19
10	67	54	0.81	13	0.19	57	0.85	10	0.15	9	0.13	58	0.87	6	0.09	61	0.82	55	0.82	12	0.18
11	78	62	0.79	16	0.21	71	0.91	7	0.09	8	0.10	70	0.90	7	0.09	71	0.87	68	0.87	10	0.13
12	59	54	0.92	5	0.08	50	0.85	9	0.15	19	0.32	40	0.68	8	0.14	51	0.85	49	0.83	10	0.17
13	77	69	0.90	8	0.10	73	0.95	4	0.05	21	0.27	56	0.73	8	0.10	69	0.91	55	0.71	22	0.29
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Prepared by the authors using data from the 666 surveys completed by the students

Analysis of Survey Data

Once the responses provided by the students who participated in the survey were gathered, the analysis stage began. Through the analysis carried out, it was discovered which topics might require more reinforcement within the ***Entrepreneurship and Innovation Project Development course,*** which was implemented to achieve transversality in all the degrees taught at CUAltos, which must be taken in the seventh semester.

This fact is based on the fact that a large number of students enrolled in the various disciplines offered at the Centro Universitario de los Altos are not from the Altos Region, since according to Planter (2023), in his 2022-2023 activities report, although the majority of the students are from Jalisco (only 10% are originally from the Altos region), but students from 18 other federal entities are also enrolled. Therefore, there are doubts about whether or not they know the location of the municipal (Fondo Jalisco de Fomento Empresarial) and state (Secretaría de Desarrollo Social del Estado de Jalisco) offices that are aimed at

providing financial support to companies, entrepreneurs, artisans and SMEs in general, which is important in some responses to the questions asked in the survey.

Knowing the answer that the student gives to this question is very valuable, since it is a way of letting the student of the subject know that they can undertake by starting a *startup* and have the possibility of obtaining funds to materialize their idea, in the same way, they can do it with a business and, in both cases, obtain the support to enhance it and not be left with the idea that the financial aid (often non-refundable) can be requested only once.

Likewise, the heads of these organizations (Secretariat of Economic Development of the State of Jalisco and the Jalisco Business Development Fund) have been invited to make presentations in which they explain to the students the support that they can benefit from and in this way, further promote entrepreneurship that strengthens transversality.

The effort that has been employed as part of the subject of ***Development of Entrepreneurship and Innovation Projects*** , has been fruitful, since it could be considered that the number of products (see Table 6) obtained by students supported by researchers and teachers is not very representative of what could have been obtained, but after only one year of having implemented the pilot plan of transversality in the Centro Universitario de los Altos, it is a great achievement for the institution, since it is an excellent opportunity to transfer the model used to the network of university centers of the U de G. and in this way promote entrepreneurship throughout the state.

Table 6. Results of transversality at the University Center of Los Altos

Career	C 1	C 2	C 3	C 4	C 5
Lawyer	8	4	2	0	5
Administration	10	3	4	1	7
Dental Surgeon	8	2	1	1	4
Accounting	9	2	3	0	9
Nursing	8	1	2	0	4
Agroindustrial Engineering	8	1	4	0	3
Computer Engineering	10	3	1	0	8
Systems in Livestock Systems	2	1	1	0	4
Medical Surgeon and Midwife	2	2	1	1	4
Veterinary Medicine and Animal Husbandry	2	1	0	0	4
International Business	11	6	9	2	8
Nutrition	12	4	3	0	6
Psychology	8	2	1	0	7
Pharmacobiological Chemist	0	0	0	0	0

C1: Marathons in which they participated
C2: Trademark Registration
C3: Companies Formed
C4: Incubated Projects
C5: Linkage to Companies

Source: Prepared by the authors using data from CIIO

Column C1 (Marathons in which they participated) is related to academic events in which they participate by competing with students from other universities at the local, state and national level. This is focused on the student demonstrating in competitions the level of knowledge they have acquired during their training, as well as the quality of these.

There are other events such as competitions, exhibitions and knowledge fairs in which a large number of students from different CUAltos courses take an active part, and they stand out for the projects they present, making the university presence stand out and occupying a very relevant place among the network of university centers that the U de G has.

At least two of the ventures were multidisciplinary, since students from the Public Accounting, Agroindustrial Engineering and Computer Engineering majors, through a venture, managed to register a trademark with their respective company. Similarly, students from Public Accounting, Livestock Systems Engineering and Computer Engineering, through a venture, also managed to create a company and register their trademark related to the three majors.

Discussion

The scientific discussion on interdisciplinary entrepreneurship and its influence on higher education is enriched by the comparison between the results of this study carried out at CUAltos and previous research. This comparative analysis allows us to identify consistent patterns, specific challenges and areas of potential development that contribute to a more complete understanding of this phenomenon.

In line with previous research, our findings confirm the importance of an interdisciplinary approach in promoting entrepreneurship and academic innovation (Jones *et al.,* 2014). For example, Jones *et al.* (2014) investigated entrepreneurship education programs that fostered collaboration between different disciplines at several well-known universities. They found that participating students showed a greater propensity to start their own businesses and develop innovative solutions to complex problems.

Our analysis also identifies specific challenges that require further attention. For example, quantitative assessment of curriculum achievements presents significant obstacles, highlighting the need to develop more sophisticated and adaptable assessment methods to capture the complexity inherent in transversality in higher education.

Furthermore, although multidisciplinary collaboration among students is considered a positive aspect in both contexts, there are differences in its implementation and effectiveness. For example, Smith *et al.* (2014) noted that although interdisciplinary collaboration fosters innovation, they faced logistical and communication challenges that hindered its effectiveness in certain cases.

Comparing our results with previous research reaffirms the importance of an interdisciplinary approach in promoting university entrepreneurship. However, specific areas are also identified that require more detailed and strategic attention, pointing towards new directions for future research and the continuous improvement of educational practices in this area. This comparative analysis provides a robust and rigorous perspective on interdisciplinary entrepreneurship, thus contributing to the advancement of knowledge in this area of study.

Conclusions

The growth of CUAltos is accompanied by a greater number of responsibilities, not only due to the increase in enrollment, but also due to the urgent need to encourage every student to become an entrepreneur in their area of specialty.

To date, the CUAltos entrepreneurship model has managed to create approximately 40 companies, 6 incubations of external projects and more than 50 trademark registrations. Despite these positive results, the need to strengthen the principle of transversality must be recognized, which is why it is necessary to strengthen the participation of teachers and students from disciplines not associated with entrepreneurship, such as those in the economic and administrative areas. whose students had a participation that can be as abundant as possible. Ensure that each graduate has the necessary skills to be called an “entrepreneur”.

It is noteworthy that, as part of the transversality itself, the schedules of some of the degrees were suitable for the teaching of the *Entrepreneurship and Innovation Project Development subject* and for the participation of students from at least three degrees in the same group, resulting in multidisciplinary projects as products of the course and their follow-up until the brand was registered and the company was established.

Furthermore, with the implementation of the continuous improvement method that is being used in this work and that has generated transversality as an initial product, the next step in the process consisted of the creation of companies, brands and incubators by students of the specialties offered at CU Altos.

Future Work

One of the main challenges facing the university centers of the University of Guadalajara, including CUAltos, is the continuous improvement of the educational quality they offer to the students enrolled in their programs. In addition, there is a firm commitment to the society in which these institutions are immersed.

In response to these situations, CUAltos has been working on the development and implementation of multidisciplinary teams of teachers and researchers, whose objective is to present educational proposals that foster students' interest in the acquisition and appropriation of knowledge. This approach seeks to prepare students for the labor demands they will face upon graduation, either as business owners who started out as entrepreneurs, or with projects that have successfully been incubated.

This approach has become a successful model, which will be shared with other university centers of the U de G. Its purpose is to be analyzed, evaluated, and to receive suggestions for improvement that, once considered by the educational authorities, could lead to its implementation in all university centers of the U de G, for the benefit of students and society.

In the next phase of this transversality model, which is currently applied at CUAltos, it is necessary to analyze how it can be improved to increase the number of students who become entrepreneurs and businessmen, whether individually, in groups, in a disciplinary or multidisciplinary manner. The greater the positive impact on the communities where the graduates work and the greater the number of ventures, registered trademarks, companies and incubations, the more competitive the university center will be, and therefore, the University of Guadalajara as a whole.

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Contribution Role	Author(s)
Conceptualization	Dr. Guillermo Jose Navarro del Toro
Methodology	Dr. Guillermo Jose Navarro del Toro
Software	Victor Katsumi Yamaguchi Llanes
Validation	Victor Katsumi Yamaguchi Llanes
Formal Analysis	Victor Katsumi Yamaguchi Llanes
Investigation	Guillermo Jose Navarro del Toro
Resources	Guillermo Jose Navarro del Toro
Data curation	Victor Katsumi Yamaguchi Llanes
Writing - Preparing the original draft	Victor Katsumi Yamaguchi Llanes
Writing - Review and editing	Victor Katsumi Yamaguchi Llanes
Display	Guillermo Jose Navarro del Toro
Supervision	Guillermo Jose Navarro del Toro
Project Management	Guillermo Jose Navarro del Toro
Acquisition of funds	Guillermo Jose Navarro del Toro