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Trayectorias de mujeres estudiantes en STEAM: elección de carrera, percepciones y expectativas profesionales

Trajectories of women students in STEAM: career choice, perceptions and professional expectations

Trajetórias de estudantes do sexo feminino em STEAM: escolha de carreira, percepções e expectativas profissionais

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Resumen

En el presente artículo se abordan las trayectorias de mujeres estudiantes en programas educativos de carreras *STEAM* (ciencia, tecnología, ingenierías, artes y matemáticas) en una universidad pública mexicana. El objetivo es aportar conocimiento situado de sus itinerarios escolares. Los ejes de análisis de las trayectorias escolares que se plantearon fueron: las motivaciones en la elección de carrera, las expectativas y las percepciones de su formación en *STEAM* y su entorno. La investigación se diseñó desde un enfoque cualitativo mediante el método de estudio de caso múltiple. Para la recolección de los datos se utilizó la técnica de la entrevista semiestructurada, posteriormente, el procesamiento y el estudio de los datos se analizó el contenido con el apoyo del software MAXQDA versión 2024.

Los resultados dan cuenta de los itinerarios de las estudiantes, las motivaciones en la elección de carrera, las expectativas ante el egreso, las percepciones en torno a su formación y la carrera, así como los vínculos establecidos en su trayecto escolar. El análisis evidencia que las trayectorias de mujeres estudiantes en carreras *STEAM* aún enfrentan desafíos. Entre ellos la

necesidad de eliminar estereotipos de género, incrementar el número de profesoras particularmente en las áreas de ingenierías y fortalecer vínculos que favorezcan su inserción profesional.

Palabras clave: Carreras *STEAM*, Educación superior, Formación profesional, Mujeres estudiantes, Orientación vocacional, Trayectorias escolares.

Abstract

This article deals with the trajectories of women students in educational programs of *STEAM* (Science, Technology, Engineering, Arts and Mathematics) careers at a Mexican public university; its objective is to provide situated knowledge of their school itineraries. The analysis focused on three aspects: motivations for career choice, expectations regarding their education, and perceptions of their STEAM training and environment. The study followed a qualitative approach using the multiple case study method. Data collection was conducted through semi-structured interviews, and content analysis was performed using MAXQDA version 2024 software.

The results show the students' itineraries, motivations in the choice of career, expectations before graduation, perceptions about their education and career, as well as the links established in their school career. The analysis highlights the need to eliminate gender stereotypes, increase the number of women professors, particularly in engineering, and strengthen networks that facilitate professional integration.

Keywords: *STEAM* careers, Higher education, Vocational training, Women students, Vocational orientation, School trajectories.

Resumo

Este artigo aborda as trajetórias de estudantes do sexo feminino em programas educacionais STEAM (ciências, tecnologia, engenharia, artes e matemática) em uma universidade pública mexicana. O objetivo é proporcionar conhecimento situado dos seus itinerários escolares. Os eixos de análise das trajetórias escolares propostos foram: motivações para a escolha da carreira, expectativas e percepções sobre sua formação STEAM e seu ambiente. A pesquisa foi delineada a partir de uma abordagem qualitativa utilizando o método de estudo de caso múltiplo. Para a coleta de dados foi utilizada a técnica de entrevista semiestruturada. Posteriormente, os dados foram processados e estudados, e o conteúdo foi analisado com o apoio do software MAXQDA versão 2024.

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Os resultados refletem a jornada dos alunos, suas motivações para escolher uma carreira, suas expectativas após a formatura, suas percepções sobre sua formação e carreira e as conexões que estabeleceram durante sua jornada acadêmica. A análise mostra que as trajetórias de estudantes do sexo feminino em carreiras STEAM ainda enfrentam desafios. Entre elas está a necessidade de eliminar estereótipos de gênero, aumentar o número de professoras, principalmente em engenharia, e fortalecer laços que promovam sua inserção profissional.

Palavras-chave: Carreiras STEAM, Ensino superior, Formação profissional, Estudantes do sexo feminino, Orientação profissional, Trajetórias escolares.

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Introduction

The concept of trajectory has been widely studied in the university setting (Toscano et al., 2015), as it allows us to explain elements such as schooling, mobility, and connections with the professional field. School trajectories describe the educational and professional processes that students experience in the university setting. School trajectories explain the paths within formal education, which, according to Carballo and Rodríguez (2019), are expected to occur under ideal circumstances . Likewise, the academic trajectory represents the itinerary of students in educational institutions, being the result of their personal experiences, the social and cultural context, as well as institutional policies within universities (González, 2023).

The analysis of academic trajectories allows us to identify delays, continuity of the path, and the times of entry and exit of students (Guevara and Belelli, 2012) . This allows us to precisely identify the factors that influence the delay or, conversely, the uninterrupted continuity of the academic path .

In this regard, the notion of academic trajectory is revived as the journey of students in a time and space determined by institutional conditions (Nicastro, 2018). During this process, students exhibit academic behaviors related to performance and to institutional curricular, pedagogical, and regulatory criteria (Martelon, 2015; Cano, 2018). These factors determine the outcomes of their trajectory, from entry to completion of their studies. However, these trajectories are impacted by various circumstances such as their gender, family environment, sociocultural context, and extracurricular and school social environments (Filardo, 2016; Cotignola et al., 2017).

Characterizing students' university trajectories is a process of ongoing construction, with continuous or discontinuous and situated itineraries (Bustos, 2023). That is, the transitions are not linear; rather, they are comprised of diverse institutional and sociocultural aspects with

which they interact or distance themselves, whether objectively or subjectively (Moreno, 2018; Chandia, 2021).

Another element present in student trajectories refers to the dimensions of temporality, efficiency, and achievement (Sánchez, 2011). While aspects such as dropping out, failing, performance, and efficiency are items that characterize students' academic trajectories and are frequently studied, incorporating the analysis of itineraries, aspects such as gender and the sociocultural and family context during the educational transition allow us to recognize them as not isolated and incipient (Otero, 2012; Verdugo et al., 2019); this is key to identifying the interrelationships that they experience and impact their academic journey.

University paths in STEAM

The study of the university trajectories of women in training in STEAM careers is increasingly common. This research addresses various issues that students face in their education. Nasep (2021) explored and characterized the trajectories, representations, and gender stereotypes of young female university students in social sciences. Her study describes career choices from a situated perspective, which involved establishing a sex-gender differentiation, as well as the continuities and transformations that occur within the disciplinary field. The results presented by the author highlight that analyzing trajectories in a specific context of time and space allows for a simultaneously reflexive and critical perspective. This perspective integrates elements of the past, present, and future, combining constant aspects with potential transformations.

Studies on the perceptions of high-achieving women in STEM fields address their motivations for choosing careers, beliefs about male dominance in these fields, and experiences with potential discrimination (Hernández, 2021). Research such as this shows that, from an early age, participants demonstrated a significant interest in mathematics and enjoyed family support in their academic development. However, the results also reveal concerns about the future of women in *STEM fields* ; the persistence of stereotypes that associate engineering with masculine roles. Furthermore, they found they had faced discrimination throughout their academic and professional careers.

On the other hand, stereotypes that attribute greater competences to men in *STEM fields* can influence women to opt for educational and professional paths far removed from these disciplines, as pointed out by García (2020) and Ramos (2023); this raises concern due to its impact on the lack of identification of girls and women with *STEM education* , which not only promotes negative attitudes towards science, but also reduces their sense of belonging to this field (Melo, 2019; Martín et al., 2022). It was found that these circumstances influence women

to pursue academic and professional paths in *STEM* . The studies consulted agree that women's educational paths are affected by various personal, social and cultural factors, which affect not only their education but also their professional practice; this contributes to the fact that the academic results achieved are a key reference in this case study.

Therefore, this [1]study aims to contribute situated knowledge about the academic trajectories of women pursuing STEAM degrees at a public university. To this end, the analysis of their academic trajectories was structured along two main axes: first, motivations for choosing a career and expectations regarding the completion of their vocational training; second, students' perceptions of their university career and how they are perceived in their field of study.

Materials and methods

This research adopted a qualitative methodology based on the multiple case study method, which allowed for the characterization of school trajectories based on the participants' testimonies. A multiple case study involves examining two or more subjects, settings, or data sources (Bogdan and Biklen, 2003), an approach applied in this research. Content analysis was also employed, which allows for the examination of discourse from various perspectives, including narrative (Ruiz, 2012; Díaz, 2018).

The study was conducted at a Mexican public university. This institution is located in a geographic context where the predominant economic activities are agroindustrial, which influences career choices and job placement opportunities in the region. The institution offers 15 undergraduate programs. Three engineering programs and one bachelor's degree were selected for this research: Computer Engineering, Agroindustrial Engineering, Livestock Systems Engineering, and Psychology. These programs belong to the disciplinary areas established by CONAHCYT (National Council for Humanities, Science, and Technology), specifically engineering and technology, agricultural sciences and technologies, and humanities and behavioral sciences .

The procedure followed was as follows: with support from the university, the students were contacted by email and telephone. Initially, 20 female students between the ages of 18 and 23 enrolled in the selected programs were contacted. However, only 12 agreed to participate: six from Computer Engineering, three from Psychology, one from Agroindustrial Engineering, and two from Livestock Systems Engineering. The rest declined the invitation. The exclusion

[1] He is part of the CONAHCYT postdoctoral research

criterion was related to the numerical representativeness of participants per educational program.

Data collection was carried out using a semi-structured interview based on a script that included identification information, motivations for choosing this career, perceptions about their education, and how they are perceived by their peers. The objective was to characterize their academic trajectories. The purpose of the study was explained to the participants, and their signed consent to record the interviews was obtained. All agreed. The interviews were conducted both in person and online, seeking to generate the greatest possible level of interaction. The information obtained is dynamic and reflects their experiences in real time. The audio recordings were transcribed using the Microsoft Word transcription tool. The interviews were subsequently analyzed using MAXQDA version 2024 to establish study codes. The process began with open coding, which identified units of meaning that guided the definition of the axes of analysis (Bonilla and López, 2016). The data were then grouped by educational program and compared with each other.

Results

This section presents the findings obtained from the analysis and coding of the 12 interviews conducted with female students in STEAM programs. The results were organized into two axes of analysis: first, motivations for choosing a career and expectations regarding the completion of their professional training; second, perceptions about their studies and career path, as well as how they are viewed in these disciplines by their peers and surroundings.

The information is presented in tables, organized according to the identified analysis codes, and the participants' responses are compared based on their educational program. Participants' responses are presented in the form of quotations. The corpus of discourse was selected and processed using MAXQDA version 2024 software, allowing the information to be systematized, points of convergence to be identified, and responses to be compared .

During the analysis, identification and differentiation units were established, which are reflected in the tables. The Psychology students were identified as *EP1, EP2, and EP3* ; the Computer Engineering students as *EIC1, EIC2, EIC3, EIC4, EIC5, and EIC6* ; and the Agroindustrial Engineering and Livestock Systems students as *EIP1, EIP2, and EIP3* .

Tables 1 and 2 present the results of the content analysis carried out on motivation around the degree course, which is addressed from two moments: initial motivation and upon graduation.

Table 1. Analysis code: initial motivation

ANALYSIS CODE: INITIAL MOTIVATION		
PSYCHOLOGY	COMPUTING	AGROINDUSTRIAL-LIVESTOCK
EP1 *In high school, we started taking a Psychology class at the school , so I felt drawn to that field, especially because the teacher talked a lot about group dynamics and all that, so I found it very interesting.*	EIC1 *I think it started when I was little, since my dad was studying electromechanical engineering. Besides participating in many math competitions, that's also where this passion began . It was something related to industry or applications like logic and things like that.*	EIP1 *My family is in the business of buying and selling cattle. So, we're dedicated to fattening. So I've always liked productive animals, like cattle, meat, which is what we do, and I wanted to study something related to that, but not veterinary medicine.*
	EIC2 *I was always interested in technology, but it wasn't until high school that I learned a little more about it, I prepared myself , and I had no difficulty getting in.*	
EP2 *In high school they start to give you a little more information, so I learned a little more about psychology and how human beings work, I entered the emotional skills workshops they gave, so that's when my interest began to emerge , I left high school and said, this is the program I want to apply to and I applied, so here I am.*	EIC3 *In high school , when I took some computer classes and from there, I kind of got the hang of it and got my first cell phone, that's when I started. I've always been interested in knowing the whys and wherefores of things, I mean, everything in general... But I've always been more focused on technological things.*	EIP2 *First of all, I met people in the livestock industry who asked, "What did you study?" I thought veterinary science, and many said livestock engineering, so that's when I learned about the program. Later, when it was time to graduate from high school and decide what I was going to study, veterinary science didn't seem to appeal to me. It was very health-focused, and my family is in the livestock industry. So, I finally saw what the program was all about.*
	EIC4 *I'd had other plans since I was little until I got to high school. In the last semesters of high school, I became really interested in robotics , but it was very difficult for me to move to another place to study it. So I did some research, and the most relevant field was computer engineering.*	
EP3 *I was interested in social sciences, but I thought it was a better option to study psychology than criminology because it seemed a little more comprehensive , that is, like studying all the areas more and seeing which one I could focus on best.*	EIC5 *Well, my interest has always been in technology , so I was researching options where technology programs were offered. The one that caught my attention the most was computer engineering, especially because of the curriculum it offered.*	EIP3 *In high school, I had the idea of studying pharmacobiological chemistry, but my expectations changed when I learned about the agricultural science program. I heard about it, and I began to thoroughly research what it was, and I really liked it.*
	EIC6 *In high school, I once started questioning what majors or*	

	options one has . I've always liked math . So I wanted something related to that, but I wasn't sure exactly what it was geared toward. A friend of mine had studied engineering, and so I started getting a little interested in engineering in general, because you have to take math, and so, I didn't get in.	

Source: Own elaboration

Regarding their motivation for choosing a career, all participants agreed that they defined their professional interests during their high school years. In the case of the Computer Engineering students, they indicated having had an affinity for mathematics or logic from an early age; only one of them mentioned family influence in their academic preferences. The Engineering students stated that their choice was influenced by their family background and lifestyle, while the Psychology students mentioned that their teachers were the ones who motivated them at this stage.

Table 2. Analysis code motivation upon graduation

ANALYSIS CODE: MOTIVATION FOR GRADUATION		
PSYCHOLOGY	COMPUTING	AGROINDUSTRIAL-LIVESTOCK
EP1 *I had colleagues who did internships at companies, others at hospitals, and so on. Some stayed where they did their internships . That's been the only way, but they still need to offer job opportunities , because you leave and are left facing the world.*	EIC1 *But if I see potential in this, such as specializing in all these computational areas , I think it also gives the added value of the meaning it has, because it can take us much further.* EIC2 *I plan to work in my career and maybe later study for a postgraduate degree and so on.*	EIP1 *I think I won't stay here, because my dad has a lot of work at home , I think I'd rather go back to help out there . I already feel the commitment, and besides, they've always told us, how are you going to work for someone else when you have your own business?*
EP2 *I think we've had good professors, whose leadership in research motivates us to excel academically, or who have that intention.*	EIC3 *I'm excited to soon become another engineer . I'm not sure where I'll work yet , but I'm excited to continue learning.* EIC4 *Well, I hope for the truth: to succeed, to show my learning, what I've achieved, to learn, to take advantage of it, not to stagnate, to get a job related to my career, and perhaps in the very near future to study a specialty.*	EIP2 *My family is dedicated to cattle production , I think I will return to help my father, to improve, more efficient production on the ranches and in the numbers.*
EP3 *Well, I'm still 100% sure which one I'd like to pursue; I think I need to learn a little more about it in practice . But I've been very interested in organizational psychology, and there's also social psychology.*	EIC5 *Well, I'd like to focus on software development and also web application development . That's what interests me the most.* EIC6 *I am motivated to continue learning, although it is very necessary to gain experience , I believe that, and well, the teachers who motivated us.*	EIP3 *What I am not well informed about is that it really works out for the girls who do well in their internships, they end up getting a job right there.*

Source: Own elaboration

Regarding graduation motivations, most agree that the internship phase is key to their employment. In the case of livestock students, they state that this is not their expectation, but rather that they are clear about returning, becoming involved in and strengthening the family business. For computer engineering students, specializing is among their expectations, and practicing a career in line with their major is a recurring theme. In the case of psychology

students, there is agreement only on internships and the need for an institutional employment relationship, as well as the influence of teachers on research, and finally, indecision.

Table 3. Self-perception analysis code

ANALYSIS CODE: SELF-PERCEPTION		
PSYCHOLOGY	COMPUTING	AGROINDUSTRIAL-LIVESTOCK
EP1 *Horrible, it wasn't what I expected, honestly . I mean, considering they're making up my internships because I chose places, well, interesting ones. But, no, obviously, I didn't expect the pandemic. I didn't expect the group to be the way it was. And the teachers were very good, honestly, but overall, no, I didn't love it .*	EIC1 *Yes, there are times when I despair, but I find order and the reason for things. What I really liked is that it opens your mind a lot because it makes you think more critically about things.* EIC2 *Yes, spending extra time in front of the screen with headphones was more emotionally draining, as were the technical difficulties. In some areas, yes, it was very difficult to teach us the topics, but socially, I feel like I benefited from the fact that we started online. It helped me avoid feeling pressured, and when we returned, it was easier to adapt.*	EIP1 *I really enjoyed the program, although I may not have paid much attention to it in the first few semesters because we had to take four in a row due to the pandemic at the time . But the practical classes have been much better now.*
EP2 *For example, as a councilor, I can take charge of more administrative matters , direct contact with teachers and so on. But at some point, when it comes to organization, reaching an agreement , I'm there, but a boy always intervenes, and he's also a student leader. I think he's one of the most influential . So, even though there are more girls, this leadership is present.*	EIC3 *I was online and had the comfort of my home, and when I returned, I felt like I was taking it more seriously, like I was already in college and studying engineering. Yes, there was a lot of math to start with, but I think I did well, and I also participated a lot .* EIC4 *I started college during the pandemic , and almost half of my studies were online. Truthfully, that time was a real disappointment because I didn't learn much online, but the other half of my studies was extraordinary. In person, the interaction with classmates and the support they provide for learning were better.*	EIP2 *Well, in my classroom, I don't feel like it wasn't anything significant. Rather, we all felt we had the same capacity, like we can all do the same thing.*
EP3	EIC5	EIP3

Well, I really liked it; I think it exceeded my expectations . I thought it was really nice to learn more about these areas and these opportunities.	*I was studying practically half of my degree during the pandemic , meaning I was online for two years and then in person afterward. So yes, there was an impact on learning. It's very different from just learning to seeing everything in person. It was easier for me this way.*	*Yes, I had some challenges. But I think I've learned a lot from three teachers who are demanding but know how to teach , and from the way they share their learning with us.*
	EIC6 *I started when we were doing virtual classes. I barely spoke much on video calls , maybe because they asked me questions, but after that, no, not so much. And when I started in-person classes, everyone seemed to get along better, and it was a more enjoyable dynamic.*	

Source: Own elaboration

The participants mentioned that at the beginning of their degree programs, they experienced both challenges and advantages associated with the pandemic. The computer science students cited advantages in their process of adapting to their degree program by being remote, but acknowledged that in-person classes have been excellent for their training. On the other hand, the agroindustry and livestock students highlighted the pandemic as a challenge both in their training and in their university life. In the case of psychology, only one student highlighted an aversion to this period due to the socialization expectations of the program, and in her narrative, she describes it as a critical stage in her university journey.

Table 4. Code of analysis of perception of others

ANALYSIS CODE: PERCEPTION OF OTHERS		
PSYCHOLOGY	COMPUTING	AGROINDUSTRIAL-LIVESTOCK
EP1 *I think men were more neutral on many issues, such as decisions about jobs and so on . And because there were more women, I think there were more conflicts —the messiness that arose, the interactions, the interpersonal communication.*	EIC1 *Yes, but I think it's more like the other way around. They almost let us participate more or do more things because they know we're like a smaller group and they like that we have a lot of participation.*	EIP1 *We had well-off colleagues, and they were the leaders , because they were the ones with the truck, because they were the ones in charge of this, somehow they stood out. So the difference was noticeable, and they made it known.*
	EIC2 *In the case of my colleagues, yes, there have been jokes, there are many humorous jokes, let's say ...* *There is no gender distinction , but for a teacher there is a distinction in favoritism ... Because, I mean, in some, yes, in the majority, well yes, it's very clear that they don't think in that discriminatory way, I mean, it's noticeable.*	
EP2 *So yes, I do think that here in the classroom, for example, it is more noticeable or the teachers have more influence now , if we talk about leaders, this one about student leaders, for example, this one also in the classroom, despite the majority being girls, the leader, this one is a boy , I mean, it's very noticeable.*	*EIC3* *But yes, how do you always feel? No, that thing about always thinking you won't be able to or that you won't, and then, oh, you do know how to play or you know how to do things. Or a teammate doesn't say it badly, I mean, I understand that's how he is, he didn't mean it in a bad way, I understand that's how he's raised or how he believes . I don't know about machismo disguised as chivalry , so to speak.*	EIP2 *Yes, they were also divided, just as you could see how the personality of one little ball and that of others who were more relaxed, were different personalities.*
	EIC4 *In that regard, it was very curious because almost no women participated. In fact, when a woman did participate, it was because the professor requested it . And, ultimately, the men stood out more ; they were always the ones who participated; they knew more than any woman, really .*	
EP1	EIC5	EIP3

Yes, at first they commented that it seemed a little difficult, like the fact that they were with so many women because there were so few men. So, what did they find difficult? Like giving opinions or something like that because they felt that... that women might get upset about some opinion they gave or something like that.	*Well, normally, like in every group, the same, because there was a woman in the group then, so everyone was aware of what they had to do anyway, so the opinions we had, and whether or not you contributed, were listened to.*	*I realized there were fewer girls , but the way we treated boys was always very respectful . They always looked out for us . I mean, it was never exclusive treatment of either girls or boys. I did encounter a teacher who, yes, this became a bit sexist in that she gave more preference to boys than to us as girls, but afterward I didn't take this into account .*
	EIC6 *No, we already knew each other and there were already like the classic little groups between us, we talked to each other and everything, I didn't feel that there was a distinction between how I was a woman or not, but as just another student.*	

Source: Own elaboration

The findings of the content analysis of the responses provided by the psychology participants all indicate that male students in the program are a minority, yet they possess greater leadership skills and influence within the group. Women are perceived as conflictive and less skilled at teamwork and integration. The computer engineering students report the presence of gender stereotypes in how female students are viewed; they mention aspects such as their academic ability and performance, and describe protectionist behaviors toward them from both peers and faculty. In the case of the livestock and agroindustrial students, they indicate that they are recognized for their academic ability, yet underlying issues related to treatment and coexistence are present, in which aspects linked to economic inequality and discrimination are present. Finally, the presence of sexist behavior by some female faculty members in the training dynamics experienced in the classroom is revealed.

Table 5. Analysis code: career perception

ANALYSIS CODE: CAREER PERCEPTION		
PSYCHOLOGY	COMPUTING	AGROINDUSTRIAL-LIVESTOCK
EP1 *Everyone told me the same thing, that I would starve to death if I studied psychology.*	EIC1 *I've seen many people have the idea that they don't know how to run a business . Others stay in their internship or develop a good LinkedIn profile to gain easier access to a good company.*	EIP1 *It is that we are educated or education is to be employed, they have always told us like, an example take a good look at the place of the practices , because that is where they will stay, very few teachers mentioned doing something, to be their own boss, the majority, that is 90% of the time, we are educated to be employed.*
	EIC2 *There are more male professors than female . I only got the OKs off the top of my head; I think they taught me. Four women throughout my degree. But I've only identified two who are actually engineers , computer science, or software engineering, that is, primarily related fields. And both are researchers at CUALTOS.*	
EP2 *The fact that I studied psychology in my town— I'm from a town, a small town—so it was like going against the grain. How are you going to study that? And that's for crazy people. And this and that. And that's not even worth it.*	EIC3 *He dropped out and even went into something very different from psychology. He didn't tell us he didn't feel comfortable there. I think he didn't feel supported, but I don't know if that's in general or just because, well, there were three of us and there were more men.*	EIP2 *Being a woman, they sort of look down on you, sort of taking the seriousness out of what you're doing. In the workplace, I feel there is a difference. Making a deal isn't the same as being a woman. They don't see you with the same recognition as a professional.*
	EIC4 *I had to listen several times to professors who mentioned that women could integrate more into that type of careers, that, yes, it was strange to see women, because It's like women always went more to nutrition or doctorate , but not to that career and they really liked that women were included, it was more like a comment they mentioned, but they never said anything bad or anything like that.*	

EP1 *Since we started, there have always been more women than men. Very few men actually entered. And I think that's how it usually is in psychology, at least in CUALTOS. I don't know about other universities, but here I've heard that way, since more women than men enter.* *Well, I've seen that people sort of expect psychologists to have the perfect life , to have no problems. It's usually expected that they be women . I've also heard from people outside the profession who have told me, "Psychologists are crazy ," like the word in the phrase "sorry."*	EIC5 *Well, there were times when some of my colleagues in programming situations felt that women took longer to grasp a topic , meaning that they had more difficulty developing software and were therefore not as skilled. However, this came up several times in the program.* EIC6 *I had a coworker who happened to be studying that program a year ahead of me, and she'd already told me, "The majority are men; there are very few women in the program, because generally, men are more interested in studying it than women ." And it was good, so I went with the mentality that this is how you're going to go.*	*EIP3* *Well, in that way it would be balanced between both girls and boys , but there are fewer of us girls outside.*

Source: Own elaboration

In the case of Psychology students, the results indicate a perception of social discredit toward the profession, considering it a career "for women" and linking it to the expectation that those who practice it will not have personal problems. Computer science students emphasize the masculinization of both students and faculty. Although women's access to the field has increased, it is still perceived as unusual, and their academic abilities are questioned. This has led some students to discontinue or change programs. Finally, students in Agriculture and Agroindustry agree that these programs are perceived as exclusive to men, which raises doubts about their abilities in the professional field.

Discussion

The results of the study on the academic trajectories of STEAM students seek to provide situated knowledge about the journeys of women in training at a public university. Their voices and experiences are explored regarding their motivation for choosing a career, their professional expectations, their perceptions of their educational journey, and how they are viewed by their peers and community.

Choosing STEAM careers

Regarding career motivation, it was found that participants defined their educational interests until high school, influenced primarily by psychology professors or their family background. In the case of the Computer Engineering students, they mentioned an affinity for mathematics and logic from an early age, although they did not receive mentoring. Only one of them reported family influence on their academic decision. See Table 1.

In this regard, Avendaño, Magaña, and Crespo (2020) argue that career choice is one of the most important decisions, as it defines one's personal and professional trajectory. They also emphasize that family plays a key role in motivation and educational achievement. Family support is crucial for women when studying *STEM careers* and throughout their educational journey (Nasep, 2021). The results obtained are consistent with what has been explored.

STEAM career expectations

Regarding graduation motivations, it was identified that internships represent a key moment for job placement. Furthermore, several participants mentioned their intention to return to their hometowns to join the family business, specialize in their field, or pursue a career . Regarding institutional support, participants highlighted the support received from some professors and tutors during their training, considering it valuable. However, they noted that the university does not offer sufficient support in areas such as job placement.

Regarding gender differences in enrollment behavior, there is a clear predominance of women in psychology programs and a minority of men; the opposite is true in engineering programs, where students report experiencing stereotypes and prejudices from their peers regarding women studying non-traditional programs. This is consistent with research (Nasep, 2021; Jurado, 2017), which indicates that enrollment and its distribution, as well as practices and representations in certain academic programs, continue to be shaped by a stereotypical perspective.

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Perceptions about STEAM

This section examines the findings on female students' self-perception, how they are viewed by others, and their perception of their STEAM career (see Tables 3, 4, and 5). Regarding the former, when questioned about their student participation and leadership roles, they agree that they participate and receive equal treatment among their peers. One student mentions her experience as a student representative in computer engineering, highlighting the importance of involvement beyond academics, as it allows them to gain greater visibility, broaden their perspective, and develop more critical thinking. This is in contrast to the findings

of a psychology student, who, while she has a leadership role via institutions, does not play a leadership role in classroom interactions, but is instead exercised by a man. This coincides with the findings of the agroindustrial and livestock students.

The participants indicated that, throughout their careers in STEAM careers, they have experienced discrimination and unfavorable treatment. These experiences create an environment that undermines their continued presence and calls into question their participation in these disciplines. They identified a perception of dynamics that seek to minimize their presence, as well as the preference of some professors to delegate tasks to male students, relegating women to a secondary role.

As Lagarde (2000) points out, self-esteem helps women visualize and appreciate their abilities and qualities, empower them, and share them in educational processes with other women. Previous studies have shown that women's leadership practice continues to be questioned and compared with male leadership practices (Hernández, 2021; Juvera, 2021) . This circumstance is more prevalent among women, as evidenced by the results achieved.

Regarding the online learning experiences compared to in-person activities that they experienced during the pandemic, it was less satisfactory and made this training stage difficult for them; also that face-to-face interaction with classmates and teachers makes learning much easier and more motivating. Furthermore, regarding the perception of the career, the participants report social prejudices about these, gender stereotypes as a feminized or masculinized career (Lizana et al., 2018).

Choosing a university degree program is a complex interaction between personal aptitudes, sociocultural backgrounds, emotional ties, vocation, and environment. This process is multifaceted, dynamic, and influenced by a variety of factors.

Conclusions

It is concluded that female students still face challenges both in their career choices and during their education, due to interactions with peers, teachers, and family members throughout their academic careers. These findings are valuable for better understanding the needs and expectations of female students in STEAM careers, which will allow for the design of more effective institutional strategies and policies to support them in their academic journeys. In a predominantly male academic environment, female students' self-perception is shaped by a combination of challenges and opportunities. Some female students have experienced leadership and active participation, despite gender stereotypes. However, they have also experienced frustration and discomfort due to the preference given to their male classmates and sexist comments.

Despite these obstacles, many students have developed a greater sense of empowerment by recognizing that gender stereotypes don't have to define them and that they can overcome them. The university experience has provided them with the opportunity to broaden their perspective, develop critical thinking, and find spaces where they can express themselves and participate without restrictions. They have demonstrated their determination and ability to challenge gender stereotypes and achieve their goals, establishing themselves as agents of change in their disciplines.

While the data collected are valuable, the study has some limitations. It did not delve into aspects such as the participants' family backgrounds, diverse motivations, and external pressures on their academic careers. These factors could be explored in future research from different perspectives.

Another aspect that was not addressed in depth was the role of teachers as facilitators of gender equality in education, which was evident in some episodes of discrimination described by the participants . Finally, regarding student participation and graduate outreach programs, these are aspects that were not considered in the study but are important in the trajectories of *STEAM* students .

Future lines of research

It is suggested that future studies investigate the role of female professors in building mentorship and leadership in the training of women in STEAM careers. It is also essential to analyze the role of universities in promoting equitable teaching conditions and creating hostile environments. Finally, follow-up studies of female graduates are recommended to assess their professional integration and success in these disciplines.

Implementing mentoring programs for female students would strengthen their motivation and confidence throughout their university careers. It would also highlight the career paths of female professors in their disciplines and encourage the development of individual academic and professional pathways. It is also considered that awareness-raising courses or workshops for students and faculty on teaching practices without gender stereotypes can be useful in fostering discrimination-free teaching environments; providing female students with programs or scholarships that support their continued participation in university; and, finally, facilitating meetings or dialogues between female professors and students that foster their interest in *STEAM disciplines* .

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