# Teaching Experiences of Inclusive Spanish STEM Faculty with Students with Disabilities

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## Abstract

This paper explores the experiences of 14 inclusive STEM faculty members from five Spanish universities who taught students with disabilities. Their students with disabilities nominated them for having contributed to their success in their degrees. The article presents part of a larger qualitative study comprising individual interviews with faculty members. Data were analysed through an inductive system of categories and codes. The results show what the faculty did when they knew they had students with disabilities studying their subjects, how they valued their experiences with disability and what recommendations they would make to other colleagues regarding how to be more inclusive. The conclusions suggest that, in order to respond to diversity, faculty must be well-informed and well-trained, contact the disability office and plan the lectures in a proactive and accessible way, making reasonable adjustments. The experiences of these inclusive professionals can help other members of the university community to perceive disability as an opportunity to improve teaching practices, learn how to help their students with disabilities and design educational practices for all.

## Introduction

Education is a fundamental human right. However, the world of science is replete with social and cultural barriers to youth participation from underrepresented communities (Hinojosa et al., 2021). Specifically in the university context, ensuring

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learning opportunities for everyone throughout the life cycle remains a challenge (United Nations, 2015). Higher education (HE) still has a long way to go to guarantee that the rights of individual students are not infringed and to create environments in which the entire university community feels welcomed (Nieminen, 2022; Sandoval et al., 2021). For example, several studies have shown that students with disabilities suffer and struggle continuously to survive in a university context that is not equipped to support them adequately and effectively (Secules et al., 2018).

Over time, disability has been understood from different perspectives. The 'social model of disability' (Oliver, 1988) posits that disability is not an individual problem as the medical model pointed out but rather derives from the barriers generated by the environment. In this sense, according to Barton (1996), the practices, attitudes and policies of the social context are those that generate the difficulties and/or facilitators that hinder or foster access and participation.

However, the university culture continues imposing barriers to diverse student learning and participation. In most cases, these obstacles are linked to the need for faculty to receive more training in inclusive education (Carballo et al., 2021; Lorenzo-Lledó, et al., 2020). Therefore, in order to prevent the exclusion of vulnerable groups and to help ensure that everybody can access the labour market, universities must strive to guarantee that all students can participate in the learning process with the necessary reasonable adjustments (Braun et al., 2018; Scanlon et al., 2018). To make this possible, it is necessary to re-emphasise faculty's responsibility to carry out an inclusive pedagogy that supports the presence, participation and success of all students (Gale et al., 2017). In this way, faculty become key players in students' inclusion (Carballo et al., 2021; López-Gavira et al., 2021).

Through the voices of faculty members, this paper presents an analysis of their experiences with students with disabilities. Unlike other previous works that identify faculty as a barrier (Carballo et al., 2021), in this study, faculty members are facilitators of learning processes. The participants in this study were selected by their students with disabilities for having contributed to their inclusion. All participants were specialised in different fields (science, engineering and technology).

## Spanish Context and University Students with Disabilities

The structure of university education in Spain, which leads to the award of official degrees, consists of two levels: (a) undergraduate studies, with a duration of 4 years, which aim to prepare students for the exercise of professional activities, and (b) postgraduate studies, which include master's degrees (1 or 2 years) and doctorate programmes (lasting between 3 and 5 years).

In Spanish universities, in addition to face-to-face training, virtual learning platforms (such as Blackboard Collaborate or Moodle) have been used for years as technological resources to support the teaching and learning process.

Faculty training in Spain is voluntary and free of charge. Universities have training centres that regularly offer courses on various topics: teaching methodologies, technologies, languages and social skills, among others. However, training on inclusive education and disability care is less frequent.

In terms of disability, the number of students with disabilities is increasing. In particular, among the 19,910 students with disabilities who attended university in the last academic year for which statistics are available (2019–2020), 33% were in STEM disciplines (Universia Foundation, 2021).

In Spain, Organic Law 4/2007 of universities states that university environments must be accessible to all people. It also states that institutions shall ensure equal opportunities, non-discrimination and universal accessibility (Official State Gazette, 2007). The same is also reflected with the Royal Legislative Decree 1/2013 (Official State Gazette, 2013) on the rights of persons with disabilities and their social inclusion (resources, educational support and adjustments that respond to their needs and demands).

Moreover, by law, it is compulsory for all universities to have disability offices. These will be responsible for offering the support and services required by these students during their university studies (Royal Decree 1791/2010). To this end, the disability support offices will be responsible for informing the faculty members (if the student authorises it) of the presence of a student with a disability in their subject and of the adjustments they have to make in order to enable the student to access the curriculum. This means that until the student initiates the request for help to the office, the office cannot communicate with the faculty. Therefore, Spanish faculty members do not know whether or not they have students with disabilities (especially invisible disabilities) until they receive an email from the office or the student voluntarily decides to talk to the faculty member in person about their needs.

## STEM Faculty Members and Their Experiences with Disability

In the STEM fields, Scanlon et al. (2018) concluded that, although a large number of students with disabilities enter university, many of them encounter difficulties when attempting to complete their degree.

In some cases, students drop out due to academic issues, unfriendly environments, feelings of rejection and concern about not being suitable for the job market or future training (Geisler & Rolka, 2021; Taylor et al., 2020; Walker et al., 2016). Moreover, previous studies of STEM faculty members have demonstrated that they had little or no experience with people with disabilities (Braun et al., 2018; Da Silva et al., 2016). Other studies also conclude that faculty members have low expectations about their students with disabilities and do not feel capable of addressing their needs (Braun et al., 2018; Da Silva et al., 2016; Moon et al., 2011), especially in the case of hidden disabilities (Grimes et al., 2019). This makes faculty a barrier to inclusion (Martins et al., 2018; Osborne, 2019).

On the one hand, other challenges identified by the literature (through the voices of faculty members) in relation to the STEM fields are the time taken by faculty members to make adjustments in their discipline (Birt et al., 2017; Moon et al., 2011; Moriarty, 2007), architectural and environmental barriers in classrooms, a non-inclusive mindset (Moriarty, 2007) and a lack of institutional support (Rao & Gartin, 2003).

On the other hand, through the voices of students with disabilities, other barriers have also been identified, including budget cuts (Da Silva et al., 2016), a lack of knowledge and understanding among faculty members, inadequate strategies for responding to hidden or more severe disabilities (Apanasionok et al., 2019; Lovett et al., 2015), the costly preparation required to adapt teaching resources and classmates themselves (Da Silva et al., 2016).

## The Need for Training Among STEM Faculty Members

Listening to the voices of faculty members reveals that the difficulties encountered by students with disabilities during their time at university underscore the urgent need for sensitive, in-service training schemes for STEM faculty. This would enable them to contribute to the learning of students with disabilities by providing the necessary supports and making reasonable adjustments (Birt et al., 2017; Love et al., 2015).

The importance of training is highlighted also by Scanlon et al. (2018), who found that many faculty members were unaware of the work carried out by disability services until they received information about them from their institution's office. They also lack knowledge about inclusive education, types of disability, inclusive teaching strategies, how to make adjustments and how to use assistive technologies in the lab (Moon et al., 2011). The results reported by Behling and Linder (2017) also corroborate the need for training, as STEM faculty members may even feel that it is not their job to make simple adjustments. The study by Rao and Gartin (2003) clearly shows that making adjustments does not mean giving someone a special treatment but is a legal responsibility of the faculty. Moriarty (2007) and Ross and Yerrick (2015) also suggest that this negative attitude may be due to a lack of inclusive thinking, whose absence among faculty members makes it much more likely that they will teach in a traditional way, without focusing on the person. For their part, Walker et al. (2016) proposed that these professionals need to change the nature of their instruction, moving toward student-centred teaching approaches.

However, the difficulties encountered in HE in relation to disability can be overcome, as attested by a number of promising studies (Carballo et al., 2021; Sandoval et al., 2021), which conclude that, when faculty members are trained in disability and inclusive education, their sensitivity to diversity and competence in inclusive education improves, resulting in actions which impact the entire student body. Moreover, other studies highlight the fact that the most effective teaching is that which is sensitive to the potential of each person and promotes the participation of all students by incorporating innovative and varied teaching methods (Moriarty, 2007; Taylor et al., 2020). This model of teaching can benefit all students and addresses their needs and interests through a proactive teaching process which responds to multiple forms of representation, expression and engagement (Ferreira & Lawrie, 2019; Scanlon et al., 2018).

## Inclusive Pedagogy as Levers for the Transformation of Universities

The literature on STEM and disability highlights that dropout among students with disabilities is not caused by their individual needs but rather by the relationship between those needs, planning, resources and teaching practices (Lewis & Fisher, 2016).

The inclusive pedagogy model (Florian & Black-Hawkins, 2011; Gale & Mills, 2013) is an approach that recognises the value of all individuals, avoiding the categorisation of those who are considered different, such as students with disabilities. Inclusive pedagogy implies that decisions made when teaching are determined not only by the professional knowledge, skills and actions of faculty members but also by the values and beliefs that they hold about students, the nature of teaching and learning and social processes and interactions. Therefore, teaching attitudes influence what is done and how it is done.

Adopting this inclusive approach means caring about the people being taught, paying attention to their emotional well-being and ensuring a positive faculty–student relationship, all of which are vital to the development of teaching practices that are respectful of students with disabilities. To this end, Moriña (2019) emphasises the importance of emotions, affectivity and horizontal relationships.

Nevertheless, an institutional culture that is properly supported and resourced, and which includes professional development, is also underpinning (Carballo et al., 2021). Studies such as those by Da Silva et al. (2016) and Minkara et al. (2015) highlight support networks and identify the importance of academics' efforts and coordination with disability staff and services, as well as other colleagues and student learning communities.

The extant literature within the STEM fields focuses primarily on students with disabilities (Groen-McCall et al., 2018; Pearson & Boskovich, 2019), and no studies have explored the narratives of those faculty considered by their own students to be inclusive. This is one of the main gaps in the literature that the present study aims to fill. Furthermore, the studies which have analysed the experiences of faculty members with students with disabilities have mostly been carried out from a quantitative approach rather than from a qualitative one (Rao & Gartin, 2003), as in our case. Another contribution made by this study is that, unlike all existing works (most of which focus on the primary and high school stages rather than on HE), it also includes recommendations for other colleagues.

This study can therefore help universities to move forward by transforming STEM campuses into more inclusive and equitable settings. Learning about the disability experiences of faculty may be particularly relevant for other colleagues who teach STEM degrees, due to the scarcity of existing research and the lack of training identified in these fields (Da Silva et al., 2016; Kurth et al., 2020; Moon et al., 2011). Thus, we aimed to answer three research questions:

1) How do faculty members act upon learning that they will be teaching a student with a disability?
2) How do faculty members value their experiences with students with disabilities?

3) What recommendations would faculty members make to other colleagues to help them become more inclusive?

## Method

The results of this qualitative study are part of a larger research project (EDU2016-76587-R and PID2020-112761RB-I00) funded by the Spanish Ministry of Economy and Competitiveness, which aims to identify, analyse and understand what Spanish faculty in various fields are doing to carry out inclusive pedagogy and how and why they are doing it (Gale & Mills, 2013). In this paper, we focus on inclusive STEM faculty and explore their experiences in relation to disability.

### Participants

The participants were selected on the basis of nominations by their own students with disabilities, who identified them as having contributed to their learning, participation and achievement at university. During the recruitment process, the disability offices of various Spanish universities helped us by contacting students with disabilities and asking them to nominate those faculty members who had contributed to their inclusion. Specifically, to ensure the suitability of the sample, students were provided with a description of the characteristics of an inclusive faculty member (Moriña et al., 2015): 'someone who believes that all students have potential; facilitates learning processes; is active in teaching; uses different methodological strategies; is concerned about student learning; is flexible, willing to help; motivates students; maintains close relationships and encourages interactions between students; and makes students feel that they are important and that they are part of the group'.

At the same time, to obtain a considerable number of participants for each area of knowledge, the snowball technique was used (Cohen et al., 2000). Students with disabilities known to the research team from previous projects (related to the barriers and facilitators for inclusion) were asked to participate, and other colleagues (faculty members from different areas of knowledge) who knew and had had students with disabilities in their classroom were also contacted. We initially received 24 nominations, but 10 faculty members refused to participate in the study due to lack of time and personal situations. Thus, the total sample was constituted by 14 STEM faculty members from five public Spanish universities (Table 1).

### Procedure and Data Collection

In the large qualitative study, we carried out individual semi-structured interviews with faculty, along with classroom observations and face-to-face group interviews with some of their students. In this paper, we only make use of the results of a semi-structured interview on beliefs and actions from the point of view of the faculty.

**Table 1** Participants' profile

| Participant | Gender | Age | Years of teaching experience | Field | Type of disability of students |
| --- | --- | --- | --- | --- | --- |
| P1 | Female | 54 | 26 | Engineering | Physical, mental, learning disability (LD) |
| P2 | Male | 45 | 20 | Science | Physical, mental, hearing, visual |
| P3 | Male | Omitted | 35 | Science | Physical, mental |
| P4 | Female | 59 | 20 | Science | Physical, mental, hearing, LD |
| P5 | Male | 50 | 17 | Science | Physical, mental, hearing |
| P6 | Male | 40 | 11 | Science | Physical, mental, hearing |
| P7 | Female | 45 | 20 | Science | Physical, mental, visual |
| P8 | Female | 47 | 20 | Engineering | Mental, hearing |
| P9 | Male | 42 | 14 | Engineering | LD |
| P10 | Male | 38 | 10 | Engineering | Physical, mental |
| P11 | Male | 58 | 25 | Technology | Mental, hearing |
| P12 | Male | 53 | 17.5 | Science | Mental, hearing |
| P13 | Female | 40 | 15 | Science | Physical, hearing, visual, LD |
| P14 | Female | 48 | 15 | Science | Physical, hearing, visual |

The semi-structured interview script was piloted with other faculty, i.e. faculty members who did not participate in the study, and their suggestions and recommendations were taken into account in the final version.

We conducted one interview per participant. Each individual interview lasted an average of 1 h and 30 min. Most interviews were conducted face to face ($N = 11$). However, due to scheduling difficulties, we adapted to the needs and demands of three faculty members and held their interviews via video call (Skype). Some of the questions we asked them were as follows: When you learn that there is a student with a disability taking your subject, what steps do you take? What would you say about your experience with students with disabilities? What do you like best and least about your experience with students with disabilities? What difficulties have you encountered in working with these students? How has having students with disabilities in the classroom influenced you personally and professionally? If you had to give advice to a colleague who had a student with a disability for the first time, what recommendations would you make?

## Data Analysis

Once all the interviews had been transcribed, they were returned to the participants for review. Following Smith and Deemer (2000), validity in our qualitative research was built on the basis of access and negotiation between the participants and the researchers. Therefore, the participants were able to approve the transcripts and corroborated the accuracy of the transcripts before conducting the analysis.

An inductive system of categories and codes was created to make sense of the information collected (Kuckartz & Rädiker, 2019). The qualitative software Max-QDA12 was used to analyse the data.

The data analysis was carried out in two phases. In the first phase of coding, we used a broad and generic category system. In the second phase, new subcodes for the fundamental themes and ideas emerged (Table 2).

Finally, we analysed each of these subcodes in depth to see if they could be broken down further or merged with other codes. Moreover, to ensure the reliability of the analysis, it was carried out individually by the two authors (Silverman, 2010). Once the individual analysis was conducted, those parts of the interviews which were unclear were discussed and agreed upon by both researchers.

## Ethical Issues

All the participants signed an informed consent form and agreed to the recording and use of the data for the stated research purposes. Additionally, to safeguard the participants' confidentiality, their real names were replaced with numbers to identify them (P1–P14).

In this study, we took into account and respected the ethical principles of the University of Seville and the Spanish State Research Agency (AEI), as well as those of process ethics and practice (Moriña, 2021). The research process was approved by the AEI.

## Results

### How Do Faculty Members Act Upon Learning that They Will Be Teaching a Student with a Disability?

The participants acted in many different ways upon learning they were going to be teaching a student with a disability. Almost all of them ($N = 13$) explained that they did not give students a special or favourable treatment but provided them with support and personalised attention from the very beginning. For this reason, it was important for faculty members to trust in their abilities, be approachable, make themselves available and offer alternatives. For example, one faculty member explained how, in his classes, he tried to facilitate learning by letting his students record the lessons. With this alternative and by offering support, he ensured that a student with learning difficulties could feel safe in the classroom and listen to the explanations as many times as necessary at home:

> I usually treat them the same as everyone else. Nevertheless, I remember that I had a student with writing difficulties. I told him that he could record me. (P7)

The vast majority ($N = 13$) also explained that they asked for help and exchanged information with other colleagues. However, their narratives revealed that, above all, they contacted the disability office and followed their recommendations (reasonable

**Table 2** Category and code system

| Category | Description | Code |
|---|---|---|
| Actions | Teaching practice when they know that there are students with disabilities in the class | Personalised mentoring, information (colleagues, disability services), reasonable adjustments, teamwork in the classroom, depends on student's collaboration |
| Experience teaching and impact | Faculty' opinions of the experiences they have enjoyed most and least with students with disabilities, as well as their impact | Experiences they liked the most: knowledge about types of disabilities, student resilience, disability service and classmates<br>Experiences they liked the least: lack of information and training, invisible disabilities and students who hide their disabilities, architectural barriers, time and effort<br>Impact: professional (opportunity to improve, empathise and value effort) and personal (life lesson, satisfaction and enrichment) |
| Recommendations for inclusion | Recommendations that faculty members make to other colleagues to help them become more inclusive | Mentoring and naturalness, disability service, specific training in disability, flexibility in the discipline, empathy |

accommodations in terms of time, format, assessment, etc.). In fact, these actions show that it is important for faculty members to be committed to their profession, care for the people they work with, have a proactive attitude and seek out the resources they need to meet their students' needs. This is reflected in their practice, such as when, for example, they inform their students of the existence of the disability office:

> I tell my students with disabilities that there are disability services at the university that can help them. (P1)

Many of the participants ($N=10$) also stated that, right from the beginning of the course, they observed their students with disabilities and worked hard to build a trusting relationship with them. In particular, the faculty members called them in for tutoring so that they could explain their needs and what specific help they required. These actions reflect the fact that the participants understood that the best source for an inclusive response is the information provided by the students themselves:

> What I do is talk to my students, or contact them first. I tell them to come to my office and we talk on the first day of class, when I give a general presentation of the subject. I ask them what they need and how I can help them. (P11)

Some participants ($N=6$) also referred to the importance of making reasonable adjustments (horizontal relationships based on trust and open communication, well-organised resources, flexible methodology, personalised exams, etc.). This suggests that these faculty members did not view these adjustments as an overload but rather as a task that was intrinsic to the correct performance of their teaching work for all students:

> I applied the adjustments I made for a student with Asperger's syndrome to everyone. This means I gave them well-structured, well-planned materials. In the end, it's just a matter of preparing the classes well, and that doesn't really involve too much effort, right? (P2)

Other faculty members ($N=5$) explained that they took measures to encourage teamwork, since they saw that, when they set group activities, each student contributed different skills and found their place in the class. These faculty members felt that the best way to deal inclusively with any situation that arose in the classroom was to rely on peer support. This suggests that, even when a student (with or without a disability) had a specific need, they always felt welcome and supported by the group:

> For example, one girl was pregnant and couldn't enter the lab when chemicals were being used. So, since it was a group assignment, they organised themselves so that they passed the data to her and she took responsibility for drafting the report. (P6)

A few participants ($N=3$) made it clear that, if students disclosed their disability and informed them of their educational needs, they would always listen carefully to their recommendations and make all possible resources available to them.

Nevertheless, they also stated that they only had access to information about the student's disability and the adjustments required if the student authorised the office to inform them. Moreover, when the participants detected that a student might have a hidden disability (which they chose not to disclose), they simply remained alert to possible needs and took care to show confidence in and support for each of their students:

> If students collaborate, then we adapt things. If they don't disclose their needs, then I try not to leave them too far behind and try to help them in a less standard way. (P1)

### How Do Faculty Members Value Their Experiences with Students with Disabilities?

Firstly, the faculty's experiences teaching students with disabilities were positive because they helped them understand the importance of knowing how to act in response to each type of disability. Although these participants recognised the importance of carrying out reasonable accommodations for the class group, they also said their experience had taught them that a number of strategies had to be considered as well, depending on the type of disability.

In the case of physical disability and poor health, they stated that students were very engaged and their inclusion could be achieved by making simple adjustments (tutoring and removal of architectural barriers). They also stated that, in some cases, disabilities could remain hidden. Faced with this situation, the participants insisted on the need for training and information. They also highlighted strategies such as offering alternative activities, sitting students in the front row and allowing more time for exams. In relation to visual disabilities, the faculty members stated that it was fundamental to make adjustments to teaching resources right from the beginning (e.g. larger font size in presentations), provide tutoring, promote teamwork, hold oral tests and set more applied exam questions. With regard to learning difficulties, the faculty said it was important to be alert, since some disabilities, such as dyslexia, often go unnoticed. In connection with hearing disabilities, the participants commented that this student body often did not disclose their impairment and frequently had difficulty interacting with their peers. Thus, it was vital to vocalise clearly in class, know how to operate the classroom microphone system and have these students sit in the front row. They also stressed that the measures were diverse yet simple and did not require much work on their part:

> I had a hearing impaired student and learned that you have to look straight at them when talking. So, I haven't had to make any significant adjustments and it hasn't taken much work. (P13)

Secondly, regarding what the faculty members had learned from teaching students with different disabilities, various participants ($N=4$) highlighted the usefulness of the disability offices, stating that they had helped them respond better to their students, learn how to make reasonable adjustments and carry out inclusive practices in the classroom. Furthermore, they mentioned that what they had enjoyed most was witnessing and learning from the resilience displayed by this student body.

These experiences were meaningful because they helped the participants to understand that, if students made an effort and had an engaged faculty member, they could achieve anything they set their minds to:

> What I liked most was his positive spirit and drive to improve, despite his very serious disability. I remember that he was very interested in the discipline and worked very hard to do well in it. (P12)

Regarding what the participants liked least and what difficulties they had encountered in their experience with students with disabilities, the answers were very varied. For example, some faculty members ($N=4$) stated that they had not had any negative experiences, as the disability office had been very supportive of them. However, a large majority ($N=10$) highlighted that the most negative experience they had had was a lack of information and training regarding the different types of disability, how to act with the student and what resources the university could offer.

In particular, the participants highlighted their uncertainty and lack of knowledge regarding how to deal with students with an invisible disability. This was one of the most complex difficulties they had experienced, since they received no recommendations on how to respond proactively to this situation in the classroom, since the student had not authorised the disability service to disclose their disability to the staff. Specifically, one participant claimed that it was vital for students to inform them of their disability right from the beginning:

> One of the cases that bothered me a little was when he told me on the day of the exam that he had a disability and needed more time. If students are going to ask for something, they should ask for it from the beginning. (P8)

Only a few participants ($N=3$) mentioned the architectural barriers present in the labs as a negative experience, remarking that these obstacles made it impossible for students with reduced mobility to learn and participate as well as their peers. In this sense, the faculty members were clear about the fact that it was the environment that disabled the person and not the other way around:

> The laboratories we have are not adapted for people in wheelchairs. I remember one student who couldn't do anything, simply because she couldn't reach the tables or see what her classmates were doing. (P13)

Some participants ($N=5$) also drew attention to the extra work, time and effort required to respond adequately to their students. Although these aspects changed in accordance with students' specific needs, they pointed out that this was part of their profession. These participants stated that they do not choose what students to teach and that everyone (with and without disabilities) has the right to receive an education adjusted to their needs:

> I mean, it's more work, but it's our job. A student with a disability is still a student. (P14)

Despite these difficulties, teaching students with disabilities had a positive impact on the faculty members, both professionally and personally. From

a professional standpoint, almost all the participants said they believed having students with disabilities in class had been an opportunity. In particular, these participants did view disability as a motivation to improve their syllabi and classroom resources, as well as to foster the learning of all their students:

> Until you have a student with a disability, you don't realise how important it is to be a 'good lecturer', because you realise that what you do for a student with a disability is also good for others. (P14)

Moreover, one participant felt that teaching students with disabilities had made them more empathetic toward the effort being made. In turn, this prompted them to be more sensitive, fair and humane in adapting to their needs and facilitating the teaching–learning process:

> They are super-motivated students who make an extra effort compared to the rest. This effort must be reciprocated by adapting to their needs. (P8)

On a personal level, most participants ($N=13$) said that teaching students with disabilities had taught them a valuable life lesson and that the students set an example they hoped to follow. Their narratives reveal that this experience taught them about resilience, opened their minds and helped them appreciate what is important and understand that anything can be achieved if the necessary effort is made:

> It's been a bit of a life lesson for me. It's made me realise that, despite the difficulties these people have, they also have a capacity for resilience that motivates me personally. (P6)

Finally, some participants ($N=3$) also referred to the satisfaction and enrichment they had gained from meeting a variety of different students. Therefore, it can be deduced that they positioned themselves as agents of change who seriously influenced the lives of their students, since they felt useful every time they helped a student with a disability to progress and finish their degree:

> I like it and I find it comforting to know that I can do my bit for people who have a disability. (P4)

## What Recommendations Would Faculty Members Make to Other Colleagues to Help Them Become More Inclusive?

The participants made five recommendations to help colleagues become more inclusive when teaching students with disabilities. The first recommendation referred to being available, offering help and organising tutoring sessions in which they ask their students how they can help them and what exactly they need. They also referred to treating them naturally, just like any other member of their class. In brief, ensuring good communication and listening to students as they deserve are key didactic principles that enable them to adapt to their circumstances and meet their requirements:

I recommend other colleagues to listen to their students first, in order to understand their needs. This meeting should be held in a natural way and should take place before the beginning of the semester, or on the first day. (P13)

The second suggestion was to stay in constant contact with the disability office. The faculty members said it was essential to establish support networks with this service. They saw the disability service as an essential part of their work, since it informed them of their students' needs and let them know what accommodations they should make to render their disciplines accessible:

I would tell my colleagues to get good advice from the disability service, who can tell you what extra skills and attention your student may need. (P5)

The third suggestion was to learn about different types of disability. The faculty members said they firmly believed that specific training would help the teaching staff become more inclusive, since, by fully understanding each case, they could provide a more adapted response to the needs in question:

I believe that training focused on the characteristics of students with disabilities is important. As a good faculty member, you have to know how to respond appropriately to each one. (P3)

The fourth recommendation, made by only a few participants, was linked to flexibility in the discipline being taught. The participants suggested that colleagues take into consideration the demands of the students themselves, e.g. providing extra time in exams or adapting the format of teaching resources. The faculty members recognised that offering these opportunities in their field is an obligation of their job, designing their classes in a way that all students can access the curriculum, participate, learn and succeed:

If a student demands something, it's because they need it. You have to pay attention to them, change exam dates, give them more time, use larger fonts on exam papers, provide additional material... (P8)

The last recommendation, also made by only a few participants ($N=4$), was to be more empathetic. The premise, which is closely related to the previous ones, is that, if faculty members were sensitised to disability, they would understand their students better, be more emotionally in touch with them and respond more appropriately to their needs:

I would tell them to try to put themselves in that person's shoes, to emotionally engage with students and treat them as they themselves would like to be treated. (P9)

## Discussion

Faculty members play a fundamental role in students' university trajectories (Zhang et al., 2010). This means that, depending on their sensitivity, knowledge and experience regarding inclusion, they can contribute, to a greater or lesser extent, to the success of students with disabilities (Martins et al., 2018; Taylor et al., 2020). While most research on STEM and disability or marginalised student in this field is focused on student perspectives (Da Silva et al., 2016; Ross & Yerrick, 2015; Secules et al., 2018) or analysed barriers linked to faculty or needs in relation to disability (Love et al., 2015; Minkara et al., 2015; Moon et al., 2011; Moriarty, 2007), this study explores the insights of faculty members who are characterised by their inclusiveness.

In contrast to previous works which state that faculty members can be a barrier to students (Martins et al., 2015; Osborne, 2019) or agents with a lack of openness about disability (Moriarty, 2007), in our study, the faculty members are facilitators of learning processes and believe in the abilities of all their students. For these reasons, we have learned that this study has a series of implications that can help not only to inform or train other faculty members in inclusive education, but also to provide insight into how to begin to develop more equitable teaching practices (Braun et al., 2018; Florian & Black-Hawkins, 2011). The first steps toward making a discipline more inclusive, the assessment of experiences with disability and recommendations to other colleagues can all help to mobilise more inclusive practices, cultures and policies throughout the entire university community.

One aspect that shared by the participants of this study is that they respect the pace and learning styles of all their students. Being approachable, making use of tutorials and trying to get to know their students are teaching strategies that facilitate the inclusion of students with disabilities at university. This idea is consistent with the findings reported by Secules (2018). Furthermore, when they know that they have a student with a disability taking their subject, they ask for help from the disability office and make the necessary reasonable adjustments (Da Silva et al., 2016; Minkara et al., 2015; Sandoval et al., 2021). Furthermore, bonding with students encourages them to trust faculty members and express their needs. It also enables the faculty to identify, in good time, those hidden disabilities which are often challenging to manage (Grimes et al., 2019; Lovett et al., 2015).

The participants in this study positively value their experiences of teaching students with disabilities. In particular, they valued the resilience and capabilities of these students (Moriña & Orozco, 2022; Minkara et al., 2015). Although they knew how to respond to their students' needs according to the type of disability in question, they felt that they needed further training to learn more about disability and inclusive education (Behling & Linder, 2017; Lorenzo-Lledó et al., 2020). In this sense, it would be advisable for universities to offer training, not only to develop an inclusive mindset and enable the faculty to know how to act in response to each type of disability, but also to ensure the progress and retention of students with disabilities at university. These findings are consistent with those

reported by Da Silva et al. (2016) or Moon et al. (2011), who argue that determining the measures to be implemented is one of the first steps that faculty members usually take when they have a student with a disability in the classroom. Therefore, training in inclusive education (regardless of the field to which they belong) cannot be an option; it should be compulsory and ongoing (Carballo et al., 2021).

Indeed, the results of the present study make it clear that one of the most frustrating experiences of the faculty was becoming aware of their lack of training. This may be due to the fact that these professionals make a concerted effort to do their job to the best of their abilities and feel a strong obligation to ensure that all their students learn (Gale et al., 2017). It would be advisable to create support groups among faculty members to enable them not only to share doubts and interests, but also to reflect on educational practice. Similarly, it is essential for experts in invisible disabilities to offer advice, action strategies and support to universities and their teaching staff, since there are studies which reveal that these are some of the most complex disabilities, which faculty members are least trained to handle (Grimes et al., 2019; Lovett et al., 2015).

The experiences of the participants with students with disabilities had such an impact on them that they saw them as an opportunity to improve both professionally (learning to design with everyone in mind or to be more empathetic) and personally (Moriña & Orozco, 2022; Minkara et al., 2015).

Regarding recommendations, these faculty members advise other colleagues to make use of tutorials as spaces to establish adequate student communication and to learn about student needs (Secules et al., 2018). They also recommend that students be treated naturally and empathetically, as equal members of the class (Moriña, 2019). Although the faculty members' awareness may increase, their beliefs are not being reflected in inclusive practices. For this reason, faculty members are also advised to organise emotional education workshops with the participation of students with disabilities, giving them an opportunity to express how they prefer to learn and be treated in class.

Moreover, disability offices stand out as essential facilitators (Da Silva et al., 2016; Minkara et al., 2015) and faculty members recommend that other colleagues contact them when they learn they will be teaching students with disabilities. Our findings in this sense were not consistent with those reported by Scanlon et al. (2018), who found that faculty members were unaware of this service. It is important to highlight this finding, since the participants of our study not only had a good attitude, but were also well-informed about the services offered by their university and saw themselves as facilitators for students with disabilities (Moriña & Orozco, 2022). To make universities more inclusive, faculty members should be informed of this service at the start of every academic year, being told clearly what it consists in and how it can help both them and students with disabilities. Moreover, this affective strategy is a significant and novel contribution, since it contradicts studies on STEM that report a negative attitude and a lack of sensitivity among faculty members (Da Silva et al., 2016; Kurth et al., 2020; Moon et al., 2011).

The participants in our study also recommend other faculty to keep a flexible teaching. This contribution could be linked to the commitment that universities should have to the universal design for learning (UDL) approach, which allows

for the existence of a diversity of formats and reasonable adjustments in the teaching–learning process. This variety of possibilities and adaptations benefits not only students with disabilities, but the entire student body (Ferreira & Lawrie, 2019; Sandoval et al., 2021; Scanlon et al., 2018). In our study, the participants stated that they tried to be proactive, thinking and planning multiple forms of expression, representation and engagement. Thus, they acted on the basis of the social model of disability (Oliver, 1988; Blume et al., 2014). In contrast to the conclusions drawn by Da Silva et al. (2016), Moon et al. (2011) and Lewis and Fisher (2014), our study suggests that faculty members do know how to make adjustments and adapt their subject.

## Limitations and Further Research

The first limitation relates to the need to broaden the context in which the research is carried out. In future studies, it would be advisable to include universities from other countries in order to explore similarities and differences.

It would be interesting to hear the voices of students with disabilities and those of inclusive faculty members together, in order to compare the information collected. However, since the results presented in this paper are part of a larger study, we have decided to incorporate only the voice of inclusive faculty members.

Future studies should also consider the possibility of designing, implementing and evaluating awareness-raising and training programmes for STEM faculty. These training courses could also be aimed at teaching staff working in any field, serving as workshops for rethinking syllabi and generating best practices for inclusion.

## Conclusions

In this study, STEM faculty members who were nominated by their students with disabilities as being inclusive show that responding in an appropriate way is not a matter of giving some students special treatment but rather a matter of rights, attitude and training. For these participants, not only is it vital to have high expectations and to trust and believe in the abilities of all their students, but they also recognise and design their lessons on the principle that high-quality teaching and learning processes benefit everyone.

In conclusion, the experiences of these inclusive faculty members should prompt HE institutions to recognise and value those professionals who are not only excellent in research, but also outstanding professionals who care about and contribute to the success of all their students. It is possible that some faculty members who have not been selected by their students with disabilities may fulfil some of the practices mentioned in this paper (e.g. empathy). However, with this study, we aimed to highlight faculty members selected by their students with disabilities, what these professionals did and how they contributed to an inclusive experience. This nomination ensures that the faculty members of our study not only believe in inclusive

strategies, but also carry them out. These narratives provide guidelines for faculty members to move from rhetoric to action.

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