



Does mentoring frequency matter? Effects on dropout rates and average grades among university students

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ABSTRACT

Mentoring programs are essential in supporting first-year university students by reducing dropout rates and enhancing grades. However, the optimal number of meetings has not been extensively explored. This article examines how the number of meetings influences outcomes across disciplines and demographics. Using a quasi-experimental approach with 9063 students (4 + meetings, $n = 3074$; ≤ 3 meetings, $n = 2958$; 0 meetings, $n = 3031$), who belonged to different areas of study, we analyzed dropout rates and grades through chi-square tests, phi statistics, ANOVA, and Bonferroni adjustments. Results indicate that more meetings generally lead to lower dropout rates and higher grades. However, exceptions exist in Science and Engineering, ≤ 3 meetings were as effective as 4 + meetings at reducing dropouts; while in Arts, Humanities, Social, and Legal Sciences, they were equally effective at improving grades. These findings suggest institutions can optimize mentoring strategies by tailoring programs to specific student needs, improving educational outcomes and fostering success.

Mentoring programs support first-year university students, reducing dropout rates and improving grades (Alonso et al., 2024; Crisp et al., 2020; Nuis et al., 2023). These programs pair newcomers with experienced students who offer guidance, support, and resources (Gehreke et al., 2024). Their impact extends to personal and professional growth while strengthening students' sense of belonging (Akinla et al., 2018, Gehreke et al., 2024; Kitutu et al., 2021).

Recent studies highlight the impact of frequent, meaningful interactions in mentoring programs on student outcomes. Yomtov et al. (2017) found that students wanted more one-on-one meetings, beyond the initial two: one for introductions and another for academic resource guidance. Stockkamp and Godshalk (2022) linked meeting frequency to mentor-mentee learning, noting that mentoring roles influenced this effect. Their study reported an average of two face-to-face meetings over four months. While some empirical research exists on the relationship between mentoring frequency and academic performance, a comprehensive understanding of the optimal frequency across diverse contexts

remains elusive.

Despite the established benefits (Mullen & Klimaitis, 2021), it is crucial to determine whether meeting four or more times leads to better outcomes than three or fewer. Alonso García et al. (2024) found that students with four or more meetings had lower dropout rates and higher grades, underscoring mentoring's impact while raising resource allocation concerns.

Resources in higher education are limited, and universities seek cost-effective strategies (Collier, 2023). While reducing mentoring session frequency may cut costs, investing in programs with more than four sessions proves valuable. Frequent mentoring lowers dropout rates and improves grades, benefiting both students and institutions financially and reputationally (Blankenship et al., 2020; Chiodi & Montes-Rojas, 2022; Foy & Keane, 2018).

Despite these advantages, the optimal number of sessions for effectiveness remains unclear. Existing literature offers limited understanding of how this optimal frequency of mentoring sessions might vary

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across different academic disciplines and diverse student demographics. Dropout rates and average grade may vary significantly by subject area (Chen, 2013; Tinto, 2015), making it essential to determine the ideal mentoring session frequency for different fields. Unique academic and social demands may shape mentoring effectiveness. Additionally, demographic and situational factors, such as gender, first career choice, and relocation for studies, warrant further research as they may influence mentoring outcomes (Etzel et al., 2018; Grineski et al., 2022; Yomtov et al., 2017).

Our study aims to bridge these significant gaps. The unique contribution of the current study lies in its comprehensive investigation into how the frequency of mentor-mentee meetings impacts student outcomes, specifically by considering the interplay of diverse academic disciplines and various demographic and situational factors. By examining consistency (or variation) across different study areas and student profiles, we aim to offer crucial insights for designing effective and tailored mentoring programs in higher education. Understanding these dynamics can enhance institutional support for students, potentially improving retention rates and academic success more effectively.

1. Literature Review

1.1. Peer Mentoring in University Settings

Mentoring is a process in which a more experienced person (the mentor) provides guidance and support to a less experienced person (the mentee) (Ivey & Dupré, 2022). Mentors share knowledge and skills to help mentees achieve goals and overcome challenges (Akinla et al., 2018). When done among peers, it is called peer-mentoring (Goodrich, 2021), a strategy universities use to help first-year students adapt. This approach fosters community, addresses student diversity, and benefits both mentors and mentees by strengthening institutional cohesion (Nuis et al., 2023; Yomtov et al., 2017).

Research consistently demonstrates the manifold benefits of peer mentoring programs, particularly during students' crucial first year at university. Yomtov et al. (2017) evaluated their mentoring program by comparing mentored and non-mentored students from biology, kinesiology, and psychology majors. Mentees reported a greater sense of belonging due to their mentors, who provided emotional, academic, and professional support. One of the most outstanding benefits of the program was the mentors' ability to offer emotional support and assistance in resolving personal problems. Etzel et al. (2018) focused on pharmacy students and found that mentoring alleviated stress during the transition to college, while boosting retention rates. Similarly, Maccabe and Fonseca (2021) evaluated their program within the engineering field and observed similar effects. The program proved to have a positive impact on transferable skills, communication, confidence, and students' sense of belonging, enhancing their learning process.

In summary, the strategy of peer mentoring in university settings emerges as a crucial resource to facilitate students' transition into university life. However, to implement these programs effectively, it is essential to have a well-structured peer mentoring model that is adaptable to the specific needs of the students and the institution.

1.2. Model of Peer Mentoring in University Settings

Mentoring programs in higher education can be classified as formal or informal based on how mentoring relationships begin and are structured. Formal mentoring involves structured programs organized by a third party, where mentors and mentees are paired—often without prior acquaintance—and clear goals are established at the outset. In contrast, informal mentoring develops spontaneously through mutual recognition and shared interests, without institutional organization (Cornelius et al., 2016; Fladerer et al., 2023).

This study focuses on formal mentoring models because their planned frameworks allow for clearer measurement of processes and

outcomes, enabling more reliable evaluation of mentoring effectiveness in higher education contexts. For instance, Cornelius et al. (2016) describe an academic mentoring program at an Australian university where students initially select three academic mentors but are ultimately assigned a single mentor to meet with three times per semester—twice within the first six weeks and once before exams—following a clearly organized schedule. Similarly, Fladerer et al. (2023) examine a peer mentoring program at a German university that pairs mentors and mentees based on shared values of self-improvement, with mandatory training and institutional oversight. Both programs involve intentional matching processes, defined goals, and structured interactions, distinguishing them from informal mentoring relationships that develop spontaneously.

For this study, the formal peer mentoring model developed by Alonso-García (2021) was chosen as the theoretical basis because it provides a structured framework for university mentoring programs and has been successfully applied before in Spanish universities, which is the context of this research. It emphasizes building trust through regular meetings, and identifies several initial variables related to mentoring (antecedents/input), which influence the mentors' behaviors during the sessions (process variables) and, consequently, the mentees' achievements (outcomes/output).

Input variables include individual, relational, and organizational aspects that determine the success of the mentoring program. These factors include student proactivity, mentor-student trust, and organizational support. Process variables focus on the development of the mentoring program, especially mentor-student meetings, which directly influence the mentor's behaviors during sessions and, in turn, mentee outcomes. Finally, outcome variables reflect the impacts of mentoring on different aspects, such as student integration, career satisfaction, and health.

Mentors undergo specialized training to develop the necessary competencies to effectively guide mentees. When matching mentors with mentees, factors such as area of study and the mentee's specific needs are considered to ensure effective collaboration (Alonso-García, 2021).

This model provides a framework for the ongoing training and support of mentors, ensuring that they can offer personalized and relevant guidance that contributes to the mentees' academic and personal success. By focusing on the relationship between input, process, and outcome variables, it aims to improve the quality of peer tutoring programs in university settings. A central aspect of this model is the frequency of meetings, although the optimal number of meetings required to maximize benefits has yet to be definitively established.

1.3. Frequency of Mentoring Meetings

Despite the extensive research on mentoring (over 221,766 articles indexed in Web of Science), we have barely found studies that specifically address the frequency of mentoring meetings on academic performance in universities (Blankenship et al., 2020; Chiodi & Montes-Rojas, 2022). We believe that the frequency of these sessions is crucial in establishing trust, providing continuous feedback, and supporting mentees' personal development. Regular meetings allow for timely feedback, helping students to address challenges before they become major obstacles (Stockkamp & Godshalk, 2022; Yomtov et al., 2017).

Empirical studies between the frequency of tutoring meetings and academic performance are scarce but really needed. For instance, Foy and Keane (2018) found that a peer mentoring program in biomedical sciences reduced dropout rates from 9 % to 3 % with five scheduled meetings, though attendance decreased over time. Despite fewer than 40 % of students attending all meetings, most found the program helpful, especially in the first semester. Blankenship et al. (2020) discovered that biweekly meetings had little effect on students' academic performance compared to those who did not receive mentoring, but weekly

meetings increased retention rates. Chiodi and Montes-Rojas (2022) detected that attending four sessions significantly improved grades and attendance compared to not having a mentor. These studies suggest that more frequent meetings offer stronger support and lower dropout rates. However, as there are specific mentoring programs for each area of study (Etzel et al., 2018; Maccabe & Fonseca, 2021; Yomtov et al., 2017), the optimal frequency of sessions may vary according to the different academic and social demands of each discipline.

Beyond frequency, other dimensions of mentoring warrant consideration. The content of mentoring sessions often includes academic guidance, career advice, and personal development support. Topics typically cover choosing academic pathways, addressing challenges, early career planning, and information about professional fields, complementing the guidance from academic advisors (Alonso-García, 2021; Chiodi & Montes-Rojas, 2022). Additionally, mentors provide support with time management, goal setting, and adjusting to university life (Cornelius, 2016). On the other hand, the personalities of mentors and mentees—such as communication styles and interpersonal compatibility—play a crucial role in shaping the quality of the mentoring relationship. A strong connection built on mutual understanding enhances trust and engagement, which are essential for positive outcomes (Cornelius, 2016; Fladerer, 2023). While this study focuses on mentoring frequency, acknowledging the importance of session content and personal factors reveals the complexity of mentoring dynamics and suggests valuable directions for future research.

In summary, the frequency of tutoring meetings is crucial in determining the success of mentoring programs. This article examines how meeting frequency affects outcomes such as academic performance and dropout rates, considering the influence of different academic fields and student demographics.

2. Research Questions and Hypotheses

We present now the research questions (RQ) and hypotheses (H) of the study:

RQ1: Are mentoring programs more effective at reducing dropouts and increasing average grades with four or more meetings compared to fewer or no sessions across all areas of knowledge?

H1a. First-year students who participate as mentees in a peer mentoring program and hold 4 or more meetings with their mentor show lower dropout than mentees who hold 3 or fewer meetings and those who do not have a mentor in all the areas of knowledge.

H1b. First-year students who participate as mentees in a peer mentoring program and hold 4 or more meetings with their mentor show a higher average grade than mentees who hold 3 or fewer meetings and those who do not have a mentor in all the areas of knowledge.

RQ2: Are mentoring programs with three or fewer meetings effective at reducing dropout and increasing average grade across all areas of knowledge?

H2a. First-year students who participate as mentees in a peer mentoring program and hold 3 or fewer meetings show lower dropout than those who do not have a mentor in all the areas of knowledge.

H2b. First-year students who participate as mentees in a peer mentoring program and hold 3 or fewer meetings show a higher average grade than those who do not have a mentor in all the areas of knowledge.

RQ3: Do these results occur regardless of gender, career choice ranking, or whether the student relocated from another region to study?

H3a. Hypotheses 1a and 2a are accepted regardless of gender, career choice ranking, and whether the student had to move from a different region to study.

H3b. Hypotheses 1b and 2b are accepted regardless of gender, career choice ranking, and whether the student had to move from a different

region to study.

3. Methods

3.1. Design

Based on Alonso-García et al. (2024), the research followed a post-positivist approach, acknowledging the challenge of achieving truth and committing to its pursuit (McMurtry, 2020). Due to the voluntary nature of participation in the mentoring program, randomization was not possible, leading to the use of a quasi-experimental design. All first-year students at the university had the opportunity to participate in the mentoring program. A matched control design was applied, using the university entrance score to select control participants with characteristics similar to those of the mentees in the experimental groups.

Three groups were chosen for comparison. Two groups received the mentoring intervention: Group 1 consisted of mentees who held four or more meetings with their mentors, and Group 2 included mentees who held three or fewer meetings with their mentors. It is important to note that participants in both Group 1 and Group 2 were self-selected, meaning their level of mentoring meeting attendance was a result of their own engagement choices within the program. These categorical divisions, while acknowledging prior research that identified significant differences between non-participants and those with four or more meetings (Alonso García et al., 2024; Chiodi & Montes-Rojas, 2022), were specifically chosen to explore how different frequency thresholds interact with academic disciplines and student demographics—a key distinction from earlier studies. The third group was a matched control group, comprising students who did not participate in the mentoring program. Data was collected after the intervention and compared between the groups to assess the treatment's effectiveness (Frey, 2018).

3.2. Participants

The sample comprised 9063 first-year undergraduate students from a Spanish university, with data collected over six academic years (from 2018/19–2023/24). Among these students, 66 % participated in a mentoring program. Of the mentees, 3074 (34 %) attended four or more meetings, while 2958 (33 %) attended three or fewer meetings. The remaining 34 % of the students did not participate in the mentoring program but had an equivalent academic profile than the treatment groups, in terms of academic year of enrollment, study plan, current course, admission option, and university entrance grade. The total sample size for our study was 9063 participants. We were able to collect complete data for all 9063 participants regarding their academic grades. However, when analyzing the data related to dropout rates, the number of participants for whom we had complete information decreased to 7333. This means that 1730 participants were excluded from the dropout analysis due to incomplete or missing data.

Of the sample, the mean age was 19 years, and the standard deviation was 2.65 years. Regarding their area of study, 25 % were from Arts, Humanities, Social, and Legal Sciences (AHSL), 29 % from Science and Engineering (S&E), and 46 % from Health Sciences (HS). These students represented a total of 21 different faculties, whose distribution by area of study can be consulted in Table 1a.

As shown in Table 1b, 71 % were female and 29 % were male, while 37 % of the students chose their career as their first option and 63 % selected it as their second or subsequent option. Of the total, 69 % had their family residence in Madrid, while 31 % resided in another region of Spain and had to move to study.

3.3. Context

Spanish universities face a significant challenge, as the highest dropout rate occurs in the first year, reaching 22 %, with the highest rates in Arts and Humanities at 28 %, followed by Engineering and

Table 1a
Sample by Area of Study and Number of Meetings.

Area of Study	4 or more meetings		3 or less meetings		0 meetings		Total by n° of meetings	
	n	%	n	%	n	%	n	%
Arts, Humanities, Social and Legal Sciences	637	21	1005	34	628	21	2270	25
Science and Engineering	924	30	829	28	912	30	2665	29
Health Sciences	1513	49	1124	38	1491	49	4128	46
Total	3074	34	2958	33	3031	34	9063	100

Table 1b
Sample by Gender, Career Choice, Family Residence and Number of Meetings.

Variables	4 or more meetings		3 or less meetings		0 meetings		Total by n° of meetings	
	n	%	n	%	n	%	n	%
<i>Gender</i>								
Men	642	26	594	25	839	34	2075	29
Women	1839	74	1778	75	1642	66	5259	71
<i>Career choice</i>								
First option	917	37	870	37	924	37	2711	37
Other options	1564	63	1502	63	1557	63	4623	63
<i>Family residence</i>								
Madrid	1761	71	1675	71	1628	66	5064	69
Another region	720	29	697	29	853	34	2270	
Total	2481	100	2372	100	2481	100	7334	100

Architecture at 25 %, Sciences at 23 %, Social and Legal Sciences at 21 %, and Health Sciences at 17 % (Ministerio de Ciencia, Innovación y Universidades, 2024).

To address this issue, the university under study offers a mentoring program to incoming first-year students. Mentors, experienced students from the same faculty and degree, meet with mentees for up to 7 one-hour sessions spaced about every 10 days. These meetings provide guidance on university resources, address expectations and concerns, and cover academic development topics (Alonso García et al., 2024). The first meeting introduces the program and mentees to their mentors, while subsequent meetings cover subjects, professors, grades, library resources, scholarships, and job opportunities. The final session concludes the program with an assessment of the experience.

In this university, 52,757 students enrolled in the 2022–2023 academic year (Ministerio de Universidades, 2023a). Considering the latest published data and the fact that degree programs currently last 4 years in Spain, the cohort from 2018 to 2022 had 58,304 enrolled students and 9977 graduates (Ministerio de Universidades, 2023a,b). This data underscores the importance of effective support mechanisms, such as the mentoring program, to improve student retention and success.

3.4. Measures

We extracted the variables for analysis from the Institutional Intelligence application, which gathers data from students at the selected university.

The predictor variables were: 1) area of study, grouped into three categories (AHSLs, S&E, and HS); 2) gender (men and women), 3) the option in which the career was chosen (first option versus other options); 4) the place of origin (whether they lived in Madrid before starting their studies or resided in other regions and had to move to study). The gender data used in this study were provided by the university's administrative services, based on records at enrollment.

The criterion variables were: 1) permanence or dropout during the first year, a dichotomous variable indicating whether the student remains at the university during the first year or abandons (the student

dropped out if he/she did not enroll in any subject for at least one academic year); and 2) average grade, obtained in the first year.

3.5. Procedure

We established a collaboration agreement with the university's Institutional Intelligence Center to analyze the impact of mentoring on the students. Students who participated in the program and attended more than four meetings over the past four years were registered in the university's computer system. Their name, role in the program and the academic year in which they participated were included. This process adhered to the personal data protection regulations outlined in Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 (Reglamento, 2016), ensuring the protection of personal data and its free movement. Students provided and signed the informed consent form, acknowledging their rights to access, correct, and delete their data. The mentee records were linked to the database using an identification number, ensuring data anonymity. The Institutional Intelligence Center was responsible for the data.

Two groups (Group 1 and 2) were created, including the students who participated as mentees in the program across the relevant areas of knowledge, along with a Control group selected from the broader student population, to enable a nuanced investigation beyond previous general findings on mentoring effectiveness. The first group comprised students who had four or more meetings with their mentors, while the second group included those who attended three or less meetings. These categorical divisions, while acknowledging prior research that identified significant differences between non-participants and those with four or more meetings (Alonso García et al., 2024; Chiodi & Montes-Rojas, 2022), were specifically chosen to explore how different frequency thresholds interact with academic disciplines and student demographics – a key distinction from earlier studies. The enrollment database of the university was used to select the equivalent control group (the third group). For each mentee who attended four or more meetings, a student with the same characteristics was randomly selected as a control. This allowed us to establish essential baselines and examine whether the established benefits of high-frequency mentoring hold consistently or vary across specific academic disciplines and diverse student demographic profiles. The selection criteria included: academic year of enrollment, study plan, current course (first-year students), admission option (first or remaining), and the same university access grade (classified in the intervals "<5", "between ≥ 5 and ≤ 7 ", "between >7 and ≤ 10 ", " >10 "). The selection process was carried out using the Oracle programming language by the university's administrative services. The authors received the dataset already extracted and anonymized, based on the enrollment records.

3.6. Data analysis

We analyzed the data with the IBM SPSS v.29 statistical program.

First, to contrast hypotheses 1a, 2a, and 3a, the chi-square statistic (χ^2) was used for the contrast of proportions with two variables, one with two response categories (dropout and permanence) and another one with three (4 or more mentoring meetings, 3 or fewer meetings, and no mentoring meetings). The chi-square analysis was conducted after it was verified that all expected cell frequencies were greater than 5. This adherence to the conventional assumption ensured the validity and reliability of the statistical test, as expected cell counts below this threshold could have led to an unreliable approximation of the chi-square distribution.

To evaluate the effect size in this context, the phi statistic (ϕ) was calculated. Phi values were considered low if they were below .29, medium between .30 and .49, and high from .50 onwards (Cárdenas Castro & Arancibia Martini, 2014). Assumptions of the chi-square test, such as independence of observations and expected frequencies, were verified and met.

Second, we used the analysis of variance (two-way ANOVA) to calculate whether there were significant differences in academic ratings between the groups (hypotheses 1b, 2b, and 3b). Prior to performing the ANOVA, all necessary assumptions were evaluated. Independence of observations was ensured by study design. The normality of residuals was assessed through visual inspection of histograms and Q-Q plots, as well as the Kolmogorov–Smirnov test. Although results indicated some departure from normality, the large sample size ($N = 9063$) supports the robustness of ANOVA in light of the Central Limit Theorem. Levene’s test for homogeneity of variances was statistically significant ($F(8, 9054) = 17.17, p < .001$), indicating heteroscedasticity. To account for this violation, robust standard errors (HC3 method) were applied in all ANOVA and post hoc analyses. Additionally, to validate the results, the main analyses were replicated using the non-parametric Kruskal–Wallis test, which confirmed the significance and direction of the effects. Given this consistency, and considering the greater flexibility of ANOVA in examining interaction effects, we report ANOVA results in the present study. Post hoc comparisons were performed using Bonferroni adjustment, because it was the strongest of the post hoc tests and because we had unequal sample sizes. Eta squared values around.01 meant little effect, around.06 indicated a medium effect, and above.14 was considered a large effect (Cárdenas Castro & Arancibia Martini, 2014).

While we collected data on dropouts by gender, our primary analysis for H3a was conducted globally to address our specific research question.

4. Results

This section presents the outcomes divided into two sections: first, analyses related to the number of meetings and the dropout (hypotheses 1a, 2a, and 3a); and second, analyses related to the number of meetings and the average grade (hypotheses 1b, 2b, and 3b).

4.1. Number of Meetings and Dropout

Table 2 presents the chi-square analysis of dropout rates based on the number of meetings, revealing significant differences with low effect sizes ($\varphi \leq .29$). Dropout rates were lower for students who held 4 or more meetings (204 dropouts) compared to those with 3 or fewer meetings (255 dropouts) and those who did not meet at all (437 dropouts) ($\chi^2(2, N = 9063) = 109.05, p < .001$). These results confirm the first part of hypotheses 1a and 2a: mentees who held 4 or more meetings had lower dropout rates than those with fewer or no meetings (H1a), and mentees with 3 or fewer meetings also showed lower dropout than those without a mentor (H2a).

Table 2 examines whether dropout differences persisted across knowledge areas, depending on the number of meetings. Significant differences with low effect sizes ($\varphi \leq .29$) were found among the three groups in S&E (4 or more meetings: 79, 3 or less meetings: 96, no meetings: 164 ($\chi^2(2, N = 339) = 36.02, p < .001$). However, in AHLS and HS, dropout rates did not differ between those with 4 or more meetings and those with 3 or fewer (AHLS: 35 vs. 73 dropouts; HS: 90 vs. 86). No differences were found between mentees with 3 or fewer meetings and those without a mentor (AHLS: 73 vs. 101 dropouts; HS: 86 vs. 172). However, significant differences emerged between students with 4 or more meetings and those with no meetings (AHLS: $\chi^2(2, N = 209) = 52.02, p < .001$; HS: $\chi^2(2, N = 348) = 30.58, p < .001$). These results partially support hypotheses 1a and 2a: mentees with 4 or more meetings had lower dropout rates than those with fewer or no meetings across all areas and specifically in S&E. In AHLS and HS, meeting three or fewer times was not effective, as differences only appeared between those with 4 or more meetings and those with none (AHLS: $\chi^2(2, N = 209) = 52.02, p < .001$; HS: $\chi^2(2, N = 348) = 30.58, p < .001$).

Table 2 also presents the analysis for hypothesis 3a, examining whether hypotheses 1a and 2a hold across gender, study choice ranking,

Table 2
Dropout Based on the Number of Meetings, Area of Study, Gender, Career Choice and Family Residence.

Area or Study	Variables	N	4 or more meetings		3 or less meetings		0 meetings		χ^2	φ	
			n	%	n	%	n	%			
Arts, Humanities, Social and Legal Sciences	Gender	Men	451	10 ^{a,b}	9.4	14 ^b	8.2	29 ^a	16.7	6.70*	.12
		Women	1513	25 ^a	5.8	59 ^a	8.3	72 ^b	19.7	47.6***	.18
	Career choice	First option	757	18 ^a	5.5	36 ^a	6.5	52 ^b	16.0	28.92***	.16
		Another option	1207	17 ^a	8.0	37 ^a	11.2	49 ^b	22.7	23.00***	.17
	Family residence	Madrid	1412	23 ^a	6.0	52 ^a	7.9	71 ^b	19.2	43.64***	.18
		Another region	552	12 ^a	7.7	21 ^a	9.3	30 ^b	17.5	9.46**	.13
Total		1964	35 ^a	6.5	73 ^a	8.3	101 ^b	18.7	52.02***	.16	
Science and Engineering	Gender	Men	974	28 ^a	8.6	46 ^b	17.8	97 ^b	24.9	32.92***	.18
		Women	1059	51 ^a	12.9	50 ^{a,b}	15.2	67 ^b	20.1	7.16*	.03
	First option	First option	800	35 ^a	7.8	44 ^{a,b}	12.9	84 ^b	18.9	23.67***	.14
		Another option	1233	44 ^a	15.9	52 ^{a,b}	21.2	80 ^b	28.8	13.56***	.13
	Family residence	Madrid	1399	55 ^a	10.7	66 ^b	16.2	93 ^b	19.4	14.71***	.10
		Another region	634	24 ^a	11.4	30 ^a	16.8	71 ^b	29.1	23.83***	.19
Total		2033	79 ^a	10.9	96 ^b	16.4	164 ^c	22.7	36.02***	.13	
Health Sciences	Gender	Men	650	12 ^a	5.7	16 ^{a,b}	9.7	40 ^b	14.5	9.86**	.01
		Women	2687	78 ^a	7.7	70 ^a	9.5	132 ^b	14.0	21.5***	.09
	Career choice	First option	1154	37 ^a	4.7	37 ^{a,b}	6.1	74 ^b	9.4	15.58***	.08
		Another option	2183	53 ^a	12.4	49 ^{a,b}	16.7	98 ^b	22.7	16.05***	.11
	Family residence	Madrid	2253	62 ^a	7.2	54 ^a	8.9	103 ^b	13.2	17.70***	.09
		Another region	1084	28 ^a	7.9	32 ^a	10.9	69 ^b	15.8	11.77**	.01
Total		3337	90 ^a	7.4	86 ^a	9.5	172 ^b	14.1	30.58***	.10	
Total	Gender	Men	2075	50 ^a	7.8	76 ^c	12.8	166 ^b	19.8	44.42***	.15
		Women	5259	154 ^a	8.4	179 ^a	10.1	271 ^b	16.5	61.71***	.11
	Career choice	First option	2711	90 ^a	5.8	117 ^a	7.8	210 ^b	13.5	60.96***	.12
		Another option	4623	114 ^a	12.4	138 ^a	15.9	227 ^b	24.6	49.47***	.14
	Family residence	Madrid	5064	140 ^a	8.0	172 ^a	10.3	267 ^b	16.4	63.01***	.11
		Another region	1718	64 ^a	8.9	83 ^a	11.9	170 ^b	19.9	43.15**	.14
Total		7334	204 ^a	8.2	255 ^c	11.4	437 ^b	17.6	109.05***	.12	

Note. Superscript letters (a, b) indicate significant differences between column proportions within each row (based on post-hoc comparisons for Chi-square tests, $p < .05$). Proportions sharing the same letter do not differ significantly. A proportion labeled with ‘a,b’ is not significantly different from groups labeled with either ‘a’ or ‘b’.

N = total size per group; n = number of students who dropped out.

* $p < .05$, ** $p < .01$, *** $p < .001$.

and relocation status. Since hypotheses 1a and 2a were only partially accepted, hypothesis 3a could not be confirmed. The results related to H3a are presented in the following paragraphs.

When analyzing gender across all areas of knowledge, significant differences with low effect sizes ($\varphi \leq .29$) were found among men who held 4 or more meetings, those who held 3 or fewer meetings, and those who did not meet (50, 76, and 166 dropouts, respectively; $\chi^2(2, N = 896) = 44.42, p < .001$). Among women, no differences were found between those who held 3 or fewer meetings and those who did not meet (179 and 271 dropouts, respectively). However, women who held 4 or more meetings had significantly lower dropout rates than those who did not meet (154 vs. 271 dropouts; $\chi^2(2, N = 896) = 61.71, p < .001$). This suggests that mentoring had a positive impact on women who actively participated in the program, holding 4 or more meetings; while for men the fact of holding any meeting had a positive impact (although the more meetings, the higher the impact). When gender was analyzed within each area of knowledge, some differences emerged, but no consistent pattern was observed.

Regarding career choice, no significant differences in dropout rates were found between students who held 4 or more meetings and those who held 3 or fewer meetings, whether they had chosen their studies as their first option (90 vs. 117 dropouts) or another option (114 vs. 138 dropouts). However, significant differences were found between students who held 3 or fewer meetings and those who did not meet, and between students who held 4 or more meetings and those who did not meet, with low effect sizes ($\varphi \leq .12$) (First option: $\chi^2(2, N = 417) = 60.96, p < .001$; Another option: $\chi^2(2, N = 479) = 49.47, p < .001$). These results suggest that having any number of meetings was effective in reducing dropout, regardless of whether students had selected their studies as their first choice or not.

Regarding students' region of origin (which implied they had to move their residence to study), similar patterns emerged. No significant differences in dropout rates were found between students from Madrid and other regions who held 4 or more meetings (140 vs. 64 dropouts) and those who held 3 or fewer meetings (172 vs. 83 dropouts). In contrast, significant differences were observed between students who held 3 or fewer meetings and those who did not meet (Madrid: 267 vs. 170 dropouts). Likewise, significant differences with low effect sizes were found between students who held 4 or more meetings and those who did not meet (Madrid: $\chi^2(2, N = 579) = 63.01, p < .001, \varphi \leq .11$; other regions: $\chi^2(2, N = 317) = 43.15, p < .01, \varphi \leq .14$). These findings suggest that meeting three or fewer times was effective regardless of whether the student had to move from other regions to study or not.

These findings are visually illustrated in Fig. 1.

4.2. Number of Meetings and Average Grade

Average grade was analyzed with a 3 (number of meetings: 4 or more, 3 or less, and 0 meetings) x 3 (area of knowledge: AHSL, S&E, and HS) between-subjects ANOVA. Descriptive statistics for the dependent variable were calculated for each of the conditions. Levene's test for homogeneity of variances was significant ($p < .001$), indicating heteroscedasticity. Consequently, the analyses of variance and parameter estimation were conducted using robust standard errors (HC3 method), ensuring the validity of the statistical inferences. The mean and standard deviation for the groups and areas of knowledge are presented in Table 3. The main effect of number of meetings on average grade was significant, $F(2, 9054) = 77.80, p < .001$, partial $\eta^2 = .02, P = 1$, and the main effect of area of knowledge on average grade was also significant, $F(2, 9063) = 77.87, p < .001$, partial $\eta^2 = .02, P = 1$. There was a significant interaction between number of meetings and area of knowledge, $F(4, 9063) = 5.71, p < .001$, partial $\eta^2 < .01, P = .98$, suggesting that the effect of the area of knowledge on the average grade varied across groups.

Table 3
Average Grade Based on Number of Meetings and Area of Knowledge.

N of meetings	Area of knowledge	n	M	SD
4 or more meetings	Arts, Humanities, Social and Legal Sciences	637	7.22	1.25
	Science and Engineering	924	6.88	1.41
	Health Sciences	1513	7.05	1.23
	Total	3074	7.04	1.29
3 or less meetings	Arts, Humanities, Social and Legal Sciences	1005	7.21	1.29
	Science and Engineering	829	6.50	1.55
	Health Sciences	1124	6.79	1.37
	Total	2958	6.85	1.42
0 meetings	Arts, Humanities, Social and Legal Sciences	628	6.76	1.54
	Science and Engineering	912	6.29	1.66
	Health Sciences	1491	6.67	1.47
	Total	3031	6.57	1.56
Total	Arts, Humanities, Social and Legal Sciences	2270	7.09	1.37
	Science and Engineering	2665	6.56	1.56
	Health Sciences	4128	6.84	1.37
	Total	9063	6.82	1.44

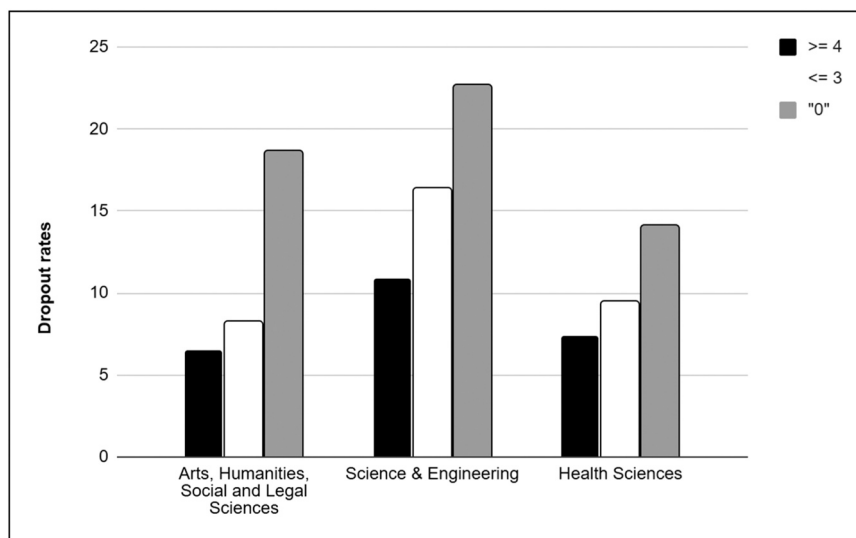


Fig. 1. Dropout Rates Grade Based on Number of Meetings and Area of Knowledge.

For a detailed interpretation of the main effects and interaction, the model parameter estimates with robust standard errors are presented in Table 4, showing the specific contribution of each category compared to their respective reference categories ('0 meetings' for the number of meetings and 'Health Sciences' for the field of study).

The model parameter estimates provide a detailed understanding of the observed effects. Compared to students who did not participate in any mentoring meetings ('0 meetings'), those who attended 4 or more meetings achieved a significantly higher average academic grade ($B = .387, t = 7.832, p < .001, 95\% \text{ CI } [.290, .484]$). This finding supports Hypothesis H1b. Similarly, students who attended 3 or fewer meetings also demonstrated a significantly higher average grade than the group with no meetings ($B = .124, t = 2.218, p = .027, 95\% \text{ CI } [.014, .233]$), thus providing support for Hypothesis H2b. When compared to students in HS (reference category), average grades for students in AHLS did not differ significantly ($B = .091, t = 1.255, p = .210, 95\% \text{ CI } [-.051, .233]$). However, students in S&E showed significantly lower average grades than those in HS ($B = -.379, t = -5.653, p < .001, 95\% \text{ CI } [-.510, -.247]$). A significant interaction between number of meetings and area of study was found, indicating that the effect of mentoring frequency on academic performance varies depending on the field of study, confirming the moderating effect proposed in Hypothesis H3b. Relative to the baseline effect in HS, the benefit of attending 4 or more meetings was not significantly different in AHLS ($B = .075, t = .801, p = .423, 95\% \text{ CI } [-.108, .257]$). However, in S&E, the effect of attending 4 or more meetings was significantly stronger ($B = .202, t = 2.315, p = .021, 95\% \text{ CI } [.031, .373]$), suggesting an additional advantage in this field. For students attending 3 or fewer meetings, a significantly greater interaction effect was observed in AHLS ($B = .324, t = 3.506, p < .001, 95\% \text{ CI } [.143, .506]$), implying an incremental benefit in this area. The effect of attending 3 or fewer meetings was not significantly different in S&E ($B = .090, t = .948, p = .343, 95\% \text{ CI } [-.096, .277]$).

Table 4
Parameter Estimates with Robust Standard Errors for Predicting Average Academic Grades.

Parameter	B	Robust Standard Error	t	Sig.	95 % Confidence Interval	
					Lower bound	Upper bound
Intercept (0 meetings & Health Sciences)	6.667	.038	175.433	< .001	6593	6,74
Number of meetings						
4 or more meetings	.387	.049	7.832	< .001	.290	.484
3 or less meetings	.124	.056	2.218	.027	.014	.233
Area of study						
Arts, Humanities, Social and Legal Sciences	.091	.072	1.255	.210	-.051	.233
Science and Engineering	-.379	.067	-5.653	< .001	-.510	-.247
Interaction (Number of meetings * Area of study)						
4 or more meetings * AHLS	.075	.093	.801	.423	-.108	.257
4 or more meetings * S&E	.202	.087	2.315	.021	.031	.373
3 or less meetings * AHLS	.324	.092	3.506	< .001	.143	.506
3 or less meetings * S&E	.090	.095	.948	.343	-.096	.277

CI [-.096, .277]).

Post hoc analysis with a Bonferroni adjustment revealed that mentees who held 4 or more meetings got significantly higher grades ($n = 3074, M = 7.04, SD = 1.29$) than those who held 3 or fewer meetings ($n = 2958, M = 6.85, SD = 1.42, p < .001$) and those with no meetings ($n = 3031, M = 6.57, SD = 1.56, p < .001$). Regarding areas of knowledge, grades were significantly higher in AHLS ($n = 2270, M = 7.09, SD = 1.37$) followed by HS ($n = 4128, M = 6.84, SD = 1.37, p < .001$) and S&E ($n = 2665, M = 6.56, SD = 1.56, p < .001$). When analyzed by area of knowledge, significant differences were found in S&E (4 or more meetings $n = 924, M = 6.88, SD = 1.41$; 3 or fewer $n = 829, M = 6.50, SD = 1.55, p < .001$; 0 meetings $n = 912, M = 6.29, SD = 1.66, p < .001$) and HS (4 or more $n = 1513, M = 7.05, SD = 1.23$; 3 or fewer $n = 1124, M = 6.79, SD = 1.37, p < .001$; 0 meetings $n = 1491, M = 6.67, SD = 1.47, p < .001$). In AHLS, the difference in the average grade was significant between mentees who held 3 or less meetings and those with no meetings ($p < .001$), but not between those who held 4 or more meetings and those who held 3 or less (AHLS: 4 or more meetings $n = 637, M = 7.22, SD = 1.25$; 3 or less meetings $n = 1005, M = 7.21, SD = 1.29, p = 1.00$; 0 meetings $n = 628, M = 6.76, SD = 1.54, p < .001$). In contrast, a significant difference was found between mentees who attended four or more meetings and those with no meetings ($p < .001$).

These findings support most of hypothesis 1b, confirming that mentees who held 4 or more meetings had higher grades than those with fewer or no meetings. These differences appeared in all areas of knowledge, except for AHLS, where no differences were found between mentees who attended 4 or more meetings and those with 3 or less meetings.

Additionally, mentees who held 3 or fewer meetings got significantly higher grades ($n = 2958, M = 6.85, SD = 1.42$) than mentees who had no meetings ($n = 3031, M = 6.57, SD = 1.56, p < .001$). When analyzed by area of knowledge, significant differences were found in AHLS (3 or fewer meetings, $n = 1005, M = 7.21, SD = 1.29$, 0 meetings, $n = 628, M = 6.76, SD = 1.54, p < .001$) and S&E (3 or fewer meetings, $n = 829, M = 6.50, SD = 1.55$; 0 meetings, $n = 912, M = 6.29, SD = 1.66, p < .001$) but not in HS (3 or fewer meetings, $n = 1124, M = 6.79, SD = 1.37$; 0 meetings, $n = 1491, M = 6.67, SD = 1.47, p = .08$). These results partially support hypothesis 2b, suggesting that first-year students who participated as mentees and held 3 or fewer meetings showed a higher average grade than those without a mentor in all the areas of knowledge. Although differences were observed across the three areas, no significant differences in average grade were found between mentees who held 3 or fewer meetings and those who had no meetings in HS. Fig. 2 provides a visual representation of these findings.

Hypotheses H1b and H2b proposed that the effect of the number of mentoring meetings would be consistent across all academic disciplines. Hypothesis H3b extended this reasoning to additional demographic variables, examining whether the patterns observed for H1b and H2b would hold regardless of gender, career choice ranking, and whether the student had to relocate for their studies. To explore this, additional analyses were conducted using one-way ANOVAs on the number of meetings within each subgroup of these demographic variables, again applying robust standard errors for parameter estimation. Descriptive statistics for these comparisons are detailed in Table 5. The model parameter estimates provide a detailed understanding of the observed effects.

The analysis by gender showed that differences in the average grade based on the number of meetings occurred for both men, $F(2, 2049) = 33.26, p < .001, \eta^2 = .03, P = 1$, and women, $F(2, 5219) = 29.91, p < .001, \eta^2 = .01, P = 1$. Post hoc analysis with a Bonferroni adjustment revealed significant differences in the average grade based on the number of meetings occurred for men for no meetings (4 or more meetings, $n = 106, M = 7.17, SD = 1.46$; 3 or less meetings, $n = 171, M = 6.86, SD = 1.41$; 0 meetings, $n = 169, M = 6.37, SD = 1.76, p < .001$) and women (4 or more meetings, $n = 434, M = 7.13, SD = 1.15, p < .001$; 3 or less meetings, $n = 711, M = 6.99, SD = 1.31, p < .001$; 0 meetings,

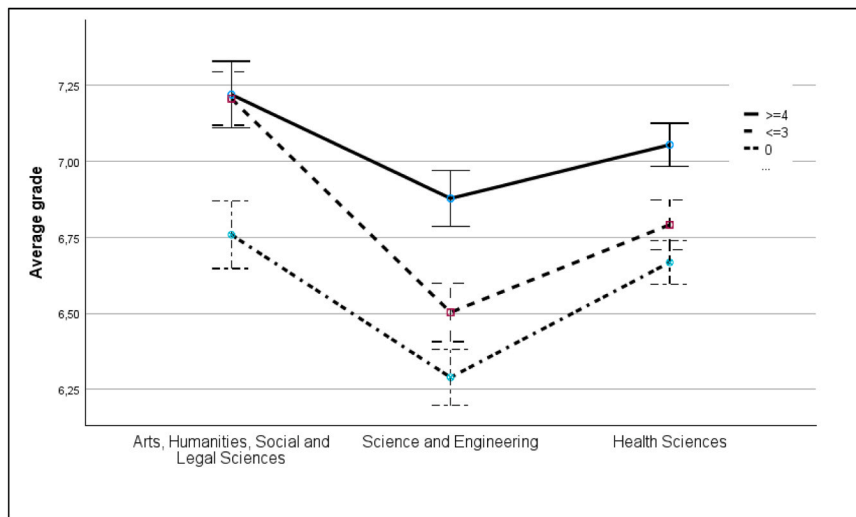


Fig. 2. Average Grade Based on Number of Meetings and Area of Knowledge.

Table 5
Average Score Based on the Number of Meetings, Area of Study, Gender, Career Choice and Family Residence.

Area of Study	Variables	4 or more meetings			3 or less meetings			0 meetings			
		n	M	SD	n	M	SD	n	M	SD	
Arts, Humanities, Social and Legal Sciences	Gender	Men	106	7.17	1.46	171	6.86	1.41	169	6.37	1.76
		Women	434	7.31	1.15	711	6.99	1.31	363	7.01	1.34
	Career choice	First option	328	7.48	1.14	552	7.38	1.16	324	6.98	1.45
		Another option	212	6.98	1.26	330	6.92	1.30	208	6.54	1.57
	Family residence	Madrid	384	7.27	1.15	657	7.18	1.24	362	6.83	1.49
		Another region	156	7.32	1.37	225	7.29	1.20	170	6.75	1.56
Science and Engineering	Gender	Men	327	7.09	1.36	257	6.76	1.52	383	6.42	1.69
		Women	396	6.89	1.34	328	6.54	1.33	331	6.44	1.39
	Career choice	First option	328	7.17	1.29	552	6.75	1.49	324	6.54	1.60
		Another option	277	6.67	1.40	291	6.48	1.31	275	6.25	1.48
	Family residence	Madrid	512	7.06	1.34	406	6.80	1.35	478	6.54	1.57
		Another region	211	6.77	1.38	179	6.26	1.50	236	6.20	1.52
Health Sciences	Gender	Men	209	7.25	1.19	165	7.05	1.21	271	6.68	1.36
		Women	1008	7.14	1.10	731	6.86	1.35	926	6.81	1.30
	Career choice	First option	789	7.32	1.11	605	7.07	1.33	774	9.94	1.31
		Another option	428	6.86	1.05	291	6.53	1.24	423	6.50	1.27
	Family residence	Madrid	864	7.23	1.08	606	6.99	1.30	769	6.83	1.49
		Another region	353	6.99	1.18	290	6.69	1.37	428	6.69	1.36
Total	Gender	Men	1513	7.05	1.23	1124	6.79	1.37	1491	6.57	1.47
		Women	642	7.17	1.46	593	6.86	1.41	823	6.49	1.61
	Career choice	First option	1838	7.13	1.17	1770	6.99	1.31	1620	6.78	1.34
		Another option	1563	7.31	1.18	1497	7.12	1.33	1536	6.83	1.44
	Family residence	Madrid	917	6.83	1.22	866	6.66	1.29	907	6.43	1.41
		Another region	1760	7.19	1.18	1669	7.02	1.30	1609	6.75	1.43
Total	Total	720	7.00	1.29	694	6.78	1.41	834	6.56	1.47	
Total	Total	3074	7.03	1.29	2958	6.85	1.42	3031	6.57	1.56	

$n = 363, M=7.01, SD=1.34, p < .001$).

The analyses based on career choice ranking and whether the student had to relocate for studies (Table 5) showed that differences were also found for both students who chose their studies as their first option, $F(2, 4587) = 51.52, p < .001, \eta^2 = .02, P = 1$, and those who chose it as a second or later option, $F(2, 2681) = 20.40, p < .001, \eta^2 = .02, P = 1$. Post hoc comparisons using Bonferroni correction revealed that the differences in the average grade based on the number of meetings remained for both: the students who chose their studies as their first choice (4 or more meetings $n = 328, M = 7.48, SD = 1.14$; 3 or less meetings $n = 552, M = 7.38, SD = 1.16, p < .001$; 0 meetings $n = 324, M = 6.98, SD = 1.45, p < .001$), and the students who chose them as another option (4 or more meetings $n = 212, M = 6.98, SD = 1.26$; 3 or less meetings $n = 330, M = 6.92, SD = 1.30, p < .05$; 0 meetings $n = 208, M = 6.54, SD = 1.57,$

$p < .001$).

Additionally, the differences remained when students were originally from Madrid, $F(2, 5029) = 46.63, p < .001, \eta^2 = .02, P = 1$, or were from other regions and had to move to Madrid to study, $F(2, 2239) = 21.12, p < .001, \eta^2 = .02, P = 1$. Post hoc comparisons using Bonferroni correction revealed that the differences in the average grade based on the number of meetings persisted for both groups: the students who were originally from Madrid (4 or more meetings $n = 384, M = 7.27, SD = 1.15$; 3 or less meetings $n = 657, M = 7.18, SD = 1.24, p < .001$; 0 meetings $n = 362, M = 6.83, SD = 1.49, p < .001$), and the students who moved to Madrid to study (4 or more meetings $n = 156, M = 7.32, SD = 1.37$; 3 or less meetings $n = 225, M = 7.29, SD = 1.20, p < .01$; 0 meetings $n = 170, M = 6.75, SD = 1.56, p < .001$).

In summary, although the significant interaction between the

number of meetings and the area of study indicates that the effects proposed in H1b and H2b are not identical across all academic fields, the subgroup analyses by demographic variables suggest that the positive impact of mentoring on average academic grades generally persists. This implies that Hypotheses H1b and H2b can be accepted, with important qualifications related to the area of study. Moreover, the consistency of these patterns across subgroups defined by gender, career choice ranking, and place of residence contributes to a better understanding of Hypothesis H3b.

5. Discussion

This study explored the crucial role of meeting frequency in reducing dropout rates and improving academic performance, focusing on its effectiveness across different academic disciplines and student demographics. Drawing on prior literature and theoretical perspectives on mentoring effectiveness (Alonso-García, 2021; Blankenship et al., 2020; Chiodi & Montes-Rojas, 2022; Foy & Keane, 2018), we hypothesized that holding 4 or more meetings was more effective in reducing dropout and increasing academic performance compared to three or fewer meetings, and that the latter was more beneficial than no meetings. We also expected this pattern to hold across all areas of knowledge, regardless of some demographics (gender, career choice ranking, and whether the student had to relocate for their studies). The results were presented based on two main outcomes: dropout and average grades. In the following sections, we will discuss possible explanations for these findings, emphasizing how the mentoring program can foster academic improvement.

5.1. Dropout

Our results partially supported hypotheses 1a and 2a, showing that mentees had lower dropout rates with more frequent meetings. This trend was particularly strong in the S&E area, where any support yielded significant effects, but more frequent meetings led to greater impact. However, AHSLs and HS showed significant differences only between those who had 4 meetings and those who had none. This suggests that while mentorship is beneficial, brief engagement (3 or fewer meetings) is less effective. These results support previous recommendations, as regular and continuous frequency of meetings could allow for more consistent outcomes (Stockkamp & Godshalk, 2022; Yomtov et al., 2017). Our results align with those of Alonso García et al. (2024), as 4 or more meetings reduced the dropouts. We also support Foy and Keane (2018) and Blankenship et al. (2020), who found that more frequent meetings improved retention. Given that the optimal frequency may vary by discipline (Etzel et al., 2018; Maccabe & Fonseca, 2021), future research should consider academic areas when evaluating the impact of mentoring.

With hypothesis 3a, we drew on prior research (Alonso García et al., 2024; Gehreke et al., 2024) to propose that reductions in dropout rates and increases in average grade would happen regardless of gender, career choice order, or whether students had to move for study. However, since hypotheses 1a and 2a were only partially supported, our results could not fully support hypothesis 3a. Even so, the mentoring program positively impacts men, even with fewer meetings, while it only benefited women who attended 4 or more meetings. Gender differences were not consistent across areas of knowledge. Attending up to three meetings did not appear to yield meaningful effects, regardless of the student's ranking or whether they had to relocate, but clear differences emerged when comparing students who did not participate at all with those who engaged in three or fewer meetings, and more notably with those who attended four or more sessions. These results suggest that fewer meetings were ineffective across all variables, while 4 or more meetings had a more consistent positive impact, as seen in previous studies (Alonso García et al., 2024; Chiodi & Montes-Rojas, 2022). Future research should explore the optimal number of meetings, as

effectiveness may vary depending on whether it is 4 or more, and how frequency influences outcomes.

5.2. Average Grade

Our results supported most of hypothesis 1b, which proposed that first-year students who participated as mentees in a peer mentoring program and held 4 or more meetings with their mentor would have higher average grades than mentees who held 3 or fewer meetings and those who had no mentor. These differences were observed across most areas of knowledge, except in AHSLs, where no differences were found between mentees who held 4 or more meetings and those who held 3 or less meetings. We interpreted these findings to suggest that 4 or more meetings are generally more effective in increasing average grades, particularly in S&E and HS. However, in AHSLs, both 4 or more meetings and 3 or fewer meetings seemed equally effective. These findings align with Alonso García et al. (2024), who found that a program with 4 or more meetings positively impacted average grades.

Additionally, our results partially supported hypothesis 2b, which stated that mentees who held 3 or fewer meetings would have higher average grade than those without a mentor in all areas of knowledge. While the difference was significant overall, it was not significant in HS, where no difference was found between mentees with 3 or fewer meetings and those without mentoring. We interpreted these results to indicate that 3 or fewer meetings are more effective than no meetings in general, and particularly in S&E and AHSLs, but not in HS. These findings contradict those of Blankenship et al. (2020), who found minimal effects of biweekly meetings on academic performance, but aligns with Chiodi and Montes-Rojas (2022), who noted a positive impact on academic performance and attendance with full participation in a mentoring program. We recommend future research to explore these contradictions and consider additional variables that may influence academic outcomes.

Because hypotheses 1b and 2b were only partially accepted, hypothesis 3b could not be accepted. However, the analyses provided interesting results. Gender differences in average grade based on the number of meetings occurred for both men and women. Additionally, significant differences in average grades persisted when considering career choice ranking. These differences persisted for both students who chose their study program as their first option and those who selected it later. Finally, the differences remained for both students originally from Madrid and those who moved to Madrid to study.

These findings deepen in the results found by Alonso García et al. (2024), adding demographic variables (gender, career choice, and region of origin) into the analysis of how mentoring influences average grades, besides the areas of knowledge. Future research should explore how these effects are influenced by other variables, such as students' sense of belonging (Gehreke et al., 2024; Kitutu et al., 2021).

5.3. Contributions to the Literature

Our study contributes to the literature by deepening in the understudied field of the effectiveness of the number and frequency of meetings on critical outcomes for higher education institutions (e.g., reducing dropouts and increasing academic performance). Based on the Model of Peer Mentoring in University Settings (Alonso-García, 2021), we tested some of the outcomes after the implementation of a theorized mentoring model, which included the establishment of strong, trusting relationships between mentors and mentees through regular and structured meetings. We considered several initial variables related to mentoring (antecedents/input), which influenced the mentors' behaviors during the sessions (process variables) and, consequently, resulted in the mentees' achievements (outcomes/output). More research should contribute to exploring other outcomes of the model, such as the sense of belonging and personal and professional development (Gehreke et al., 2024; Kitutu et al., 2021).

5.4. Contributions and Recommendations to the Practice

Our research provides insights for institutions seeking to optimize mentoring strategies by examining the frequency of meetings and their impact on student outcomes. By considering indicators like dropout rates and academic performance, institutions can better assess the effectiveness of their programs. Our study underscores the importance of considering the number of meetings as a crucial variable when designing and implementing mentoring initiatives.

Based on our findings, we recommend tailored program designs aligned with institutional goals. To reduce dropouts, programs with at least four meetings are advisable (Blankenship et al., 2020; Foy & Keane, 2018; Stockkamp & Godshalk, 2022; Yomtov et al., 2017). In the case of S&E disciplines, three meetings may still be effective. For improving average grades, a minimum of four meetings is recommended (especially in S&E and HS) (Alonso García et al., 2024; Chiodi & Montes-Rojas, 2022), though in AHSLs, a program with three meetings may be equally effective.

In conclusion, universities aiming for a high-quality and effective mentoring programs should prioritize at least four meetings, as this approach has shown greater overall success. However, as noted, exceptions exist based on the specific context and goals of the program.

6. Limitations

Among the study's limitations, we highlight the students' initial motivation. Since participation was voluntary, randomization was not possible, and a quasi-experimental approach was used. Despite efforts to match the control and experimental groups, differences in motivation and related characteristics may have influenced the results. Mentees might have been more motivated than controls, and mentees who attended more meetings might have been more motivated than mentees who attended fewer meetings (Alonso García et al., 2021; 2024). Future research should address this limitation by randomly assigning students who express interest in the program to both experimental and control groups to ensure equal incentives. Additionally, we acknowledge potential motivational differences between the two experimental groups (Group 1 and Group 2) as a possible confounding factor for observed outcomes in dropout and grades. While our quasi-experimental design with matching aimed to mitigate selection bias by ensuring comparability on key academic and demographic variables, we recognize that unmeasured motivational factors could still play a role (Creswell & Creswell, 2017). Future research could explore this aspect further, potentially through qualitative methods to assess intrinsic motivation levels for program engagement.

A second limitation concerns the generalizability of the estimated effects. Although quasi-experimental designs are typically internally valid (Frey, 2018), it is unclear whether the results apply to other populations (Gehreke et al., 2024; Yomtov et al., 2017). To address this, future studies should replicate the research at other Spanish universities and internationally to assess whether the findings are context-specific or have broader applicability.

Third, the minor effect size may be the study's third drawback, but it is in line with findings from other research (Alonso-García et al., 2024). Academic achievement or permanence may be influenced by mentoring, but only in conjunction with other factors that warrant careful investigation.

Fourth, the groups' gender composition (29 % men and 71 % women) differed slightly from the institution's overall distribution (37 % men and 63 % women) (UCM, 2024). Although future research might duplicate the gender balance of the groups to match the overall student demographics at the institution, we prioritized analyzing a larger sample over achieving complete gender homogeneity.

Finally, while our study's design limited our ability to conduct detailed subgroup analyses for variables such as gender, degree programme, and region of origin, we recognize the importance of these

factors in understanding the broader context of our findings. We believe that future research should focus on these aspects to gain a more nuanced understanding of their influence on the studied phenomena. Therefore, we recommend that subsequent studies be specifically designed to include a detailed examination of these variables. This would enable a more granular analysis, helping to uncover potential differences and patterns that were not discernible within the scope of our global-level investigation.

7. Conclusion

This study explored the role of meeting frequency in reducing dropout rates and improving academic performance, addressing its effectiveness across academic disciplines and student demographics. This analysis is valuable for higher education institutions, which need evidence-based insights to inform program design and decision-making.

Main results showed differences for dropout and average grade. While dropout decreased to a higher extent with more rather than fewer meetings, average grade increased to a higher extent with more rather than fewer meetings; however, fewer meetings were still effective. Some exceptions to the rule were found, such as 3 or fewer meetings being as effective as 4 or more meetings at reducing the dropouts in S&E, and as effective at increasing the average grade in AHSLs. These results build on Alonso-García's model (2021) and deepened in results obtained by Alonso García et al. (2024) by adding the number of meetings to the analysis of mentoring outcomes.

Aside from the limitations and future research insights, as a general guideline, universities looking to implement a high-quality and effective mentoring program should prioritize programs with 4 or more meetings for more effective results, while recognizing exceptions in certain disciplines.

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Author statement

None

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Miguel A. Alonso García: Writing – review & editing, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Aitana González Ortiz de Zárate:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Irene Aliagas:** Writing – review & editing, Writing – original draft, Methodology. **Gómez-Flechoso M^a Ángeles:** Project administration.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used the Gemini tool in order to improve the language and the overall readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of Competing Interest

No potential conflict of interest was reported by the authors.

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Data Availability Statement

Data and scripts for reproducing the analyses have been made available at the Open Science Framework website: https://osf.io/cdj5a/?view_only=042acd4e75e9479eb7ff4649a39ead9b

References

- Akinla, O., Hagan, P., & Atiomo, W. (2018). Correction to: A systematic review of the literature describing the outcomes of near-peer mentoring programs for first year medical students. *BMC Medical Education*, 18(1), 167. <https://doi.org/10.1186/s12909-018-1273-4>
- Alonso-García, M. A. (2021). Propuesta de modelo de mentoría entre iguales en entornos universitarios. *Revista Electrónica Educare*, 25(1), 1–17. <https://doi.org/10.15359/ree.25-1.19>
- Alonso García, M. A., González-Ortiz-de-Zárate, A., Gómez-Flechoso, M.Á., & López, M. C. (2024). Effectiveness of a Peer Mentoring on University Dropout and Academic Performance. *Psicología Educativa*, 30(1), 29–37. <https://doi.org/10.5093/psed2024a5>
- Blankenship, B. B., Canning, P. C., & Deasy, P. (2020). Does Our Peer Mentoring Program Help? Effects on Probation Students' Academic Possible Selves, GPA, and Retention. *Journal of Organizational Psychology*, 20(3), 91–101. <https://doi.org/10.33423/jop.v20i3.2942>
- Cárdenas Castro, J. M., & Arancibia Martini, H. (2014). Potencia estadística y cálculo del tamaño del efecto en G*Power: complementos a las pruebas de significación estadística y su aplicación en Psicología. *Salud Sociedad*, 5(2), 210–244. <https://doi.org/10.22199/s07187475.2014.0002.00006>
- Chen, X. (2013). STEM attrition: college students' paths into and out of STEM fields. *National Center for Education Statistics*.
- Chiodi, V., & Montes-Rojas, G. (2022). Mentoring as a dose treatment: frequency matters—Evidence from a French mentoring programme. *Labour*, 36(2), 145–166. <https://doi.org/10.1111/labr.12219>
- Collier, P. J. (2023). *Developing effective student peer mentoring programs: A practitioner's guide to program design, delivery, evaluation, and training*. Routledge.
- Cornelius, V., Wood, L., & Lai, J. (2016). Implementation and evaluation of a formal academic-peer-mentoring programme in higher education. *Active Learning in Higher Education*, 17(3), 193–205. <https://doi.org/10.1177/1469787416654796>
- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Crisp, D. A., Rickwood, D., Martin, B., & Byrom, N. (2020). Implementing a peer support program for improving university student wellbeing: The experience of program facilitators. *Australian Journal of Education*, 64(2), 113–126. <https://doi.org/10.1177/0004944120910498>
- Etzel, A. M., Alqifari, S. F., Shields, K. M., Wang, Y., & Bileck, N. B. (2018). Impact of student-to-student peer mentoring program in first year of pharmacy program. *Currents in Pharmacy Teaching and Learning*, 10(6), 762–770. <https://doi.org/10.1016/j.cptl.2018.03.009>
- Fladerer, M. P., Drozdowski, S., Hauser, A., Lerner, E., Kuonath, A., & Frey, D. (2023). Matching by value congruence for high-quality mentoring: evidence from a student peer mentoring program. *Studies in Higher Education*, 48(12), 1937–1951. <https://doi.org/10.1080/03075079.2023.2217441>
- Foy, C., & Keane, A. (2018). Introduction of a peer mentoring scheme within biomedical sciences education—easing the transition to university life. *Journal of Further and Higher Education*, 42(6), 733–741. <https://doi.org/10.1080/0309877X.2017.1311994>
- Frey, B. (2018). *The SAGE encyclopedia of educational research, measurement, and evaluation*. SAGE Publications, Inc. <https://doi.org/10.4135/9781506326139>
- Gehreke, L., Schilling, H., & Kauffeld, S. (2024). Effectiveness of peer mentoring in the study entry phase: A systematic review. *Review of Education*, 12(1). <https://doi.org/10.1002/rev3.3462>
- Goodrich, A. (2021). Online peer mentoring and remote learning. *Music Education Research*, 23(2), 256–269. <https://doi.org/10.1080/14613808.2021.1898575>
- Grineski, S. E., Morales, D. X., Collins, T. W., Nadybal, S., & Trego, S. (2022). A US National Study of Barriers to Science Training Experienced by Undergraduate Students during COVID-19. *International Journal of Environmental Research and Public Health*, 19(11). <https://doi.org/10.3390/ijerph19116534>
- Ivey, G. W., & Dupré, K. E. (2022). Workplace mentorship: A critical review. *Journal of Career Development*, 49(3), 714–729. <https://doi.org/10.1177/0894845320957737>
- Kitutu, J. M., Mahmoud, K. F. M., & Fradkin, D. (2021). Utilization of peer advisement course among first year students: A pilot study exploring students and their perceptions. *Nurse Education Today*, 105(October 2020), Article 105022. <https://doi.org/10.1016/j.nedt.2021.105022>
- Maccabe, R., & Fonseca, T. D. (2021). Lightbulb' moments in higher education: peer-to-peer support in engineering education. *Mentoring and Tutoring: Partnership in Learning*, 29(4), 453–470. <https://doi.org/10.1080/13611267.2021.1952393>
- McMurtry, A. (2020). Relief for the exhausted post-positivist: New epistemological choices transcend positivism, relativism, and even post-positivism. *Canadian Medical Education Journal*, 11(6), 197–198. <https://doi.org/10.36834/cmj.71217>
- Ministerio de Universidades. (2023a). UNIVBASE: Matriculados por nivel de estudio, sexo y rama de enseñanza (curso 2022-2023). Ministerio Delelott Universidades. (https://estadisticas.universidades.gob.es/jaxiPx/Tabla.htm?path=/Universitaria/Alumnado/EEU_2023/Serie/TotalSUE/10/&file=HIS_Mat_TotalSUE_Rama_Univ.px&type=pcaxis&L=0).
- Ministerio de Universidades. (2023b). UNIVBASE Egresados por nivel de estudio, sexo y rama de enseñanza (curso 2022-2023). Ministerio Delelott Universidades. (https://estadisticas.universidades.gob.es/jaxiPx/Tabla.htm?path=/Universitaria/Alumnado/EEU_2023/Serie/TotalSUE/10/&file=HIS_Egr_TotalSUE_Rama_Univ.px&type=pcaxis&L=0).
- Ministerio de Ciencia, Innovación y Universidades. (2024). Datos y cifras del Sistema Universitario Español Publicación 2023-2024. *Catálogo General Delelott publicaciones Delelott Louisiana Administración General del Estado*. (https://www.universidades.gob.es/wp-content/uploads/2024/05/SIU_DatosCifras2024.pdf).
- Mullen, C. A., & Klimaitis, C. C. (2021). Defining mentoring: a literature review of issues, types, and applications. *Annals of the New York Academy of Sciences*, 1483(1), 19–35. <https://doi.org/10.1111/nyas.14176>
- Nuis, W., Segers, M., & Beusaert, S. (2023). Conceptualizing mentoring in higher education: A systematic literature review. *Educational Research Review*, 41(October), Article 100565. <https://doi.org/10.1016/j.edurev.2023.100565>
- Reglamento (UE) 2016/679 del Parlamento Europeo y del Consejo, de 27 de abril de 2016, relativo a la protección de las personas físicas en lo que respecta al tratamiento de datos personales y a la libre circulación de estos datos, y por el que se deroga la Directiva 95/46/CE (Reglamento General de Protección de Datos) [Reglamento General de Protección de Datos]. Diario Oficial de la Unión Europea, L 119, 4 de mayo de 2016.
- Stockkamp, M., & Godshalk, V. M. (2022). Mutual learning in peer mentoring: effects on mentors and protégés. *Mentoring and Tutoring: Partnership in Learning*, 30(2), 164–183. <https://doi.org/10.1080/13611267.2022.2057100>
- Tinto, V. (2015). Through the eyes of students. *Journal of College Student Retention: Research, Theory Practice*, 19(3), 254–269. <https://doi.org/10.1177/1521025115621917>
- Yomtov, D., Plunkett, S. W., Efrat, R., & Marin, A. G. (2017). Can Peer Mentors Improve First-Year Experiences of University Students? *Journal of College Student Retention: Research, Theory and Practice*, 19(1), 25–44. <https://doi.org/10.1177/1521025115611398>

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