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MOTIVATION TO TEACH AND AI ANXIETY AMONG TESOL STUDENT-TEACHERS WITH DEGREE-YEAR AND GENDER DIFFERENCES

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Abstract
Integrating Artificial Intelligence (AI) in language teaching may induce anxiety among educators. This quantitative study investigates the relationship between AI anxiety and teaching motivation among TESOL student-teachers, an area that remains under-researched. The participants were 146 student-teachers in a TESOL program with different degree-years and genders. Two questionnaires examined the relationship between two dependent variables, AI anxiety and motivation to teach, and two independent variables, degree-year and gender differences. The investigation of AI anxiety encompassed four factors: anxiety due to learning, job replacement, AI configuration, and sociotechnical blindness, while the motivation to teach two factors: intrinsic and extrinsic motivation. The analysis was conducted using Kruskal-Wallis, Mann-Whitney U, and correlational analysis, and the findings revealed moderate levels of AI anxiety and motivation to teach. A significant difference in "job replacement anxiety" and the degree-year indicated that student-teachers could have different levels of job replacement anxiety in different years. Female student-teachers had higher AI anxiety and motivation to teach than male candidates. The minor positive correlations (%7-8) between AI anxiety, particularly the sociotechnical blindness factor, and intrinsic motivation show that intrinsic motivation could determine the anxiety level; therefore, teacher educators could give particular attention to reducing the sociotechnical blindness.

Keywords: AI anxiety, motivation to teach, teacher education, TESOL

Introduction
Although originating in the 1960s (Doroudi, 2022), Artificial Intelligence (AI) applications have surged in prominence within education, especially in learning languages over the past few decades (Liang, Hwang, Chen & Darmawansah, 2023). AI shows promise in developing literacy and language abilities and in teaching new languages (Bozkurt, Xiao, Lambert, Pazurek, Crompton, Köseoglu, … Jandrić, 2023; Huang, Zou, Cheng, Chen & Xie, 2023). However, the effective use of AI in language education depends on teachers and learners embracing these technologies. AI anxiety, defined by Wang and Wang (2022) as "a general, emotional response of anxiety or fear that prevents an

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individual from interacting with AI" (p. 621), can hinder this acceptance. Therefore, successful integration of AI technologies can be achieved by revealing the AI anxiety levels of teachers and learners. Some of the recent studies aim to reveal practicing and student-teachers' ideas for AI integration into education and their AI anxiety levels (Ayanwale, Sanusi, Adelana, Aruleba, & Oyelere, 2022; Sütçü & Sütçü, 2023; Wang & Wang, 2022; Zhang, Schießl, Plößl, Hofmann & Gläser-Zikuda, 2023). The findings indicated that educators' comprehension of AI's utility significantly forecasts their behavioral inclination or desire to achieve the objectives of the AI curriculum at educational institutions (Ayanwale et al., 2022). The perceived ease of use and perceived usefulness of AI technologies by pre-service teachers predicted the intention to use AI (Zhang et al., 2023), and AI anxiety could have a direct influence on the intention to use (Wang & Wang, 2022). Moreover, the findings indicated gender-specific aspects of AI anxiety should be addressed as most of the student-teachers are female (Banerjee & Banerjee, 2023; Kaya, Aydin, Schepman, Rodway, Yetişensoy & Kaya, 2022; Zhang et al., 2023).

Apart from AI anxiety, motivation to teach is a significant emotional factor for effective teaching (Candan & Gencel, 2015). The findings of a recent study by Köksoy and Kutluer (2023) indicated how motivation to teach could affect the resilience and appreciation of student-teachers for the teaching profession. As both emotional factors, namely, motivation to teach and AI anxiety, are significant for teaching, this study aims to reveal if both are correlated. Furthermore, the research concept originated from the researcher's experience in the "Career Planning and Development" course with first-year English student-teachers. The candidates were required to construct a five-year career plan and present it to the researcher. The assignment indicated that they possessed low motivation to teach due to their opinions regarding the future of AI. The insights revealed were alarming, as over fifty percent of the student-teachers did not envision a future in the teaching profession as they thought AI would replace them. A comprehensive literature review indicated a lack of correlational studies investigating student-teachers' AI anxiety and motivation to teach. A literature review revealed a single study concerning the keywords 'motivation' and 'AI anxiety,' specifically addressing learning motivation (Wang, Wei, Lin, & Wang, 2022).

The researchers investigated students' learning motivations for AI technologies and their anxiety levels, and the findings suggested that anxiety related to AI learning adversely influences learning motives. In contrast, anxiety regarding AI job displacement positively increases extrinsic motivation (Wang et al., 2022). Baş and Baştuğ (2021) examined practicing teachers' motivation to teach and perception towards Information and Communication Technologies (ICT), and the findings revealed that the constructivist teaching-learning paradigm of teachers, together with their extrinsic teaching motivation, was substantially correlated with their perspectives of ICT in the teaching and learning process. The study concentrated on ICT broadly and excluded AI technologies, which are unfamiliar to many educators these days and may induce greater anxiety. There appear to be no other studies on student-teacher motivation to teach and AI anxiety levels.

This study attempts to clarify the levels of AI anxiety and teaching motivation among 146 English student-teachers in Türkiye and to investigate potential relationships between these two variables. Most student-teachers in Türkiye are female, and several studies indicate gender-specific dimensions of AI fear

(Banerjee & Banerjee, 2023; Kaya et al., 2022; Zhang et al., 2023). The study seeks to examine potential gender-specific differences in AI anxiety and motivation to educate, as well as their impact on the association between these two factors. Additionally, it seeks to investigate AI anxiety and motivation to teach as dependent variables, using university degree year as the independent variable, for which there appears to be a lack of existing studies. The study is particularly intriguing for teacher educators as it examines the relationship between AI anxiety and four factors, along with extrinsic and intrinsic motivation. Through the study, teacher educators might have insights into strategies to mitigate AI anxiety and enhance teaching motivation. Moreover, the independent variables of gender and degree-year might provide significant insights into various student-teacher profiles.

The study has the following three questions:

1. What is the level of English student-teachers' AI anxiety?
2. Do English student-teachers' AI anxiety differ by gender and year at university?
3. Is there a significant correlation between English student-teachers' AI anxiety and motivation to teach?

Literature Review

As an essential emotional factor, AI anxiety signifies individuals' apprehension or worries regarding the potential dangers and negative consequences linked to the integration of AI across different societal domains (Li & Huang, 2020; Wang & Wang, 2022). The principal cause of AI anxiety could be apprehensions about the likely consequences of AI development and deployment, resulting in significant disruptions to security, employment, privacy, and personal autonomy. Research indicates that individuals are apprehensive that AI will jeopardize privacy rights (Elliott & Soifer, 2022), exacerbate socioeconomic inequality (Zajko, 2022), displace human employment (Abuselidze & Mamaladze, 2021; Dahlin, 2019), and pose a threat to human existence (Bonneau-Diesce & Chan, 2022). In education, the concept has been investigated for both students and teachers. Wang and Li (2022) explore the origins of AI concern among students and faculty in higher education, highlighting its effect on learning experiences. Selwyn (2019) examines diverse technology apprehensions within educational settings, particularly AI and its function in learning environments. All this research demonstrates the significant impact of AI anxiety on students and teachers across many educational contexts regarding integrating AI applications in teaching and learning.

To examine such an important emotional factor that people possess, Wang and Wang (2022) proposed four factors of AI anxiety. They created a scale that was utilized in this study for data collection. Job replacement anxiety, AI learning anxiety, sociotechnical blindness, and AI configuration anxiety are the four dimensions. Job replacement anxiety arises from the impending need to shift employment due to the pervasive use of AI technologies; sociotechnical blindness pertains to the apprehension stemming from insufficient information and experience, coupled with an unawareness that humans have developed AI for the benefit of society. AI configuration anxiety relates to the perceptions and structures of humanoid artificial intelligence. Conversely, AI learning anxiety concerns the apprehension associated with acquiring technology products developed in artificial

intelligence. This study utilized the four-dimensional scale, initially developed by Wang and Wang (2022) and translated into Turkish by Akkaya et al. (2021).

Wang and Wang (2022) claim that "anxiety perceptions associated with AI restrict or increase future behavioral intention" (p.622). Although revealing AI anxiety is significant for the widespread use of AI products in education, there are still few papers on its structure and etiology (Li & Huang, 2020). Particularly on AI anxiety levels of student-teachers, there are a limited number of studies (Çam, Çelik, Güntepe, & Durukan, 2021; Eyüp & Kayhan, 2023; Haseski, 2019). Banerjee and Banerjee (2023) investigated college teachers' anxiety toward AI and compared the participants according to their gender and teaching experience in years. The participants had moderate levels of AI anxiety, and no difference was revealed regarding gender and expertise. Eyüp and Kayhan (2023) studied AI anxiety levels and attitudes of student Turkish language teachers. The findings indicated that the optimistic and adverse stances of student-teachers' towards AI were moderate. The learning dimension of AI anxiety was below moderate; however, the dimensions of job replacement, sociotechnical blindness, and AI configuration were above moderate. Sütçü and Sütçü (2023) investigated the opinions and attitudes of English teachers about the integration of AI into education. The results revealed predominantly positive attitudes among teachers. However, they expressed apprehensions over the potential of AI to foster a preference for more manageable tasks among students, diminish their research skills, foster excessive reliance on AI, and facilitate an increase in academic dishonesty. Job replacement anxiety was also high among some participants.

Hopcan, Türkmen, and Polat (2023) investigated the AI anxiety of student-teachers from various education fields. They compared AI anxiety and attitudes among student-teachers of different ages, genders, and fields. The results indicated that the participants have no apprehension about obtaining knowledge about AI. However, they do show unease regarding the repercussions of AI on employment rates and social interactions. The findings suggested that men might be more willing to accept the possible advantages of technology, whereas women would be more wary and doubtful. Another study investigating AI anxiety and gender was by Zhang et al. (2023). The study had two primary objectives: firstly, to identify the characteristics that influence student-teachers' intentions to use AI applications, and secondly, to examine whether gender has any impact on these intentions. The results indicated that the student-teachers' propensity to utilize AI was mainly influenced by their perception of how easy it was to use and how useful it was. AI anxiety and perceived enjoyment significantly differed by gender. The findings were significant because this study also investigated whether there were substantial differences between male and female student-teachers. Ayanwale et al. (2022) studied AI anxiety and the behavioral intention of teachers to use AI techniques/products in their classes. The results indicated that AI anxiety might not predict teachers' intention to use AI in classrooms. It could mean that having AI anxiety might not directly affect behavioral intention to use AI. Most studies on AI anxiety seek to elucidate the anxiety levels of practicing teachers and students, with some considering gender as an independent variable. Further research is necessary, particularly for student-teachers in TESOL programs. There seem to be no existing studies examining degree-year differences as an independent variable, nor any correlational studies exploring the impact of AI anxiety on other emotional aspects.

Another significant emotional factor in teaching, "motivation," derives from the Latin term "*movere*," which signifies to act. It is essential for education and instruction. The Self-Determination Theory (SDT), proposed by Deci and Ryan in 1985, serves as a framework for understanding motivation (Deci & Ryan, 1985). The SDT posits that individuals are inherently motivated to achieve their objectives and ambitions. It underscores the importance of cultivating this motivation. "Motivation to teach" denotes the impetus driving educators in their instructional roles (Candan & Gencel, 2015). Kauffman, Yılmaz Soylu, and Duke (2011) developed a motivation to teach scale based on SDT, with two dimensions: intrinsic and extrinsic motivation. This study utilized the Turkish adaptation of the scale by Candan and Gencel (2015) to assess the motivation levels of TESOL student-teachers.

As a dynamic emotional aspect for several educators, the motivation to teach may be influenced by contextual variables and recent advances (Deci & Ryan, 2000). Yet, there appears to be a lack of studies examining the relationship between motivation to teach and AI anxiety. The researcher's experience outlined in the introduction may connect the two factors. Most research concentrates on elucidating the motivational levels of practicing or student teachers about teaching. Bergmark and Andersson (2019) analyze the diverse motivational profiles of student-teachers and the impact of these profiles on their pedagogical choices. O'Neill and Stephenson (2016) examine the motivations of student-teachers and practicing teachers, offering insights into the aspects that affect their dedication to the profession. A study by Wang and Wang (2022) utilized the keywords 'motivation' and 'AI anxiety' to investigate the association between anxiety associated with AI and the behavior of those driven to learn. The results suggest that persons with significant apprehension over AI may benefit positively in the enhancement of their professional skills. These individuals are more inclined to have increased motivated learning behavior. Similarly, Wang et al. (2022) investigated students' AI learning behavior and how AI learning anxiety affects intrinsic/extrinsic learning motivations. The findings illustrate that while worries about AI job replacement benefit extrinsic motivation, anxiety regarding AI learning negatively influences learning motives (Hsu, Hsu & Lin, 2023). The study participants were the general student population, and they focused on motivation to learn rather than teaching. Baş and Baştug (2021) studied the relationships among perceptions towards ICT in class, teaching-learning conceptions, and teaching motivation. The outcomes highlighted a substantial relationship between instructors' views of ICT in the teaching and learning process and their constructivist teaching-learning conception and extrinsic teaching motivation. The motivation to teach was examined with ICT in general in the study.

As technology progressively enters educational settings, using AI in language instruction offers advantages and challenges. TESOL student-teachers are taking charge of integrating new tools that can improve their pedagogical approaches. The swift advancement of AI technologies may induce considerable anxiety concerning their effectiveness, ethical ramifications, and the possible replacement of traditional teaching practices. Most of the studies examined learning motivation. There appears to be a lack of a relationship between AI anxiety and motivation to teach for student-teachers. For that reason, this study has the potential to contribute to the field in that it aims to study AI anxiety and motivation to teach levels of TESOL

student-teachers, examines if there are differences in terms of gender and year at university and if there is a correlation between AI anxiety and motivation to teach. The results of this study may have broader ramifications for teacher education programs. By comprehending the impact of anxiety regarding AI on motivation to teach, teacher educators and policymakers can formulate measures to cultivate resilience and flexibility in prospective teachers. Köksoy and Kutluer (2023) indicated how motivation to teach could affect the resilience and appreciation of student-teachers for the teaching profession. The correlations between AI anxiety and motivation to teach, if there are any, might also affect the resilience and gratitude of the profession.

Method

The study employed a quantitative research design, and data was collected through two scales to answer the three research questions.

Participants

The study included a total of 153 student-teachers who were enrolled in the English Language Teaching program at a state institution in Turkey. Of the 153 participants, 55 were from the first year, 43 were from the second year, 33 were from the third year, and 22 were from the fourth year. Excluding the missing values, 65 participants were male, and 78 were female. The researcher had classes with all participants from different years at university; therefore, the convenience sampling method was used. Some limitations of the convenience sampling method include lack of representativeness, sampling bias, increased error variability, and constraints on generalization (Cohen, Mainon & Morrison, 2007). The AI anxiety scale had 16 items, and the motivation to teach scale had 12 items. The item numbers and the number of participants could decrease the lack of representativeness and increase error variability. Furthermore, ready scales with reliability and validity checks were used. Using quantitative tools reduced the bias, and the number of participants for each independent variable was enough for generalization. However, more studies with more participants could give more insights into the subject studied. Demographic information was collected for gender and the year at university, as they were the variables in the study.

Data collection

Two scales (Kauffman et al., 2011; Wang & Wang, 2022) were used to answer the research questions. Both scales were adapted to Turkish by researchers (Akkaya, Özkan & Özkan, 2021; Candan & Gencel, 2015). The Turkish versions were used to prevent ambiguities.

The "Artificial Intelligence Anxiety Scale," developed by Wang and Wang (2022) and translated into Turkish by Akkaya et al. (2021) was used to investigate AI anxiety. One hundred forty-seven undergraduate students taking educational psychology courses at a large US university participated in this study. Language validity, construct validity, and reliability analysis of the scale were examined, and exploratory factor analysis and confirmatory factor analysis of the translated version were conducted by Akkaya et al. (2021). Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed to determine the construct validity of the Scale (KMO: 0.892, χ^2:2847.749; p = .000). Accordingly,

the four-factor structure of the AI Anxiety Scale was confirmed. The scale consists of 16 items and four dimensions. The four dimensions are AI learning anxiety, job replacement anxiety, sociotechnical blindness anxiety, and AI configuration anxiety.

Kauffman et al. (2011) initially prepared the "Motivation to Teach Scale," which was translated into Turkish by Candan and Gencel (2015). The translated version was used to collect data. There are 12 items on the scale, seven of which measure intrinsic motivation and five of which measure extrinsic motivation. The questionnaire uses a 6-point Likert scale. The reliability and validity checks of the translated version were implemented with 342 student-teachers, and the scale's Cronbach Alpha, internal consistency coefficient, was found to be 0.92. The analysis revealed that the translated version of the Scale is reliable and valid.

The reliability analysis was conducted for this study with responses from 153 participants, and the Cronbach Alpha value was found to be 0.88, a score indicating reliability. For validity, Pearson Correlation analysis was conducted for each participant's response to the items, and as Table 1 shows below, all items were valid with medium and mostly large effect sizes.

Table 1. Validity of each item in both scales

AI Anxiety Scale	Pearson Correlation	N	Sig. (2-tailed)
Item 1	.378**	153	.000
Item 2	.469**	153	.000
Item 3	.449**	153	.000
Item 4	.375**	152	.000
Item 5	.437**	152	.000
Item 6	.590**	153	.000
Item 7	.624**	151	.000
Item 8	.461**	153	.000
Item 9	.615**	152	.000
Item 10	.563**	152	.000
Item 11	.579**	153	.000
Item 12	.631**	152	.000
Item 13	.544**	152	.000
Item 14	.654**	152	.000
Item 15	.644**	152	.000
Item 16	.594**	152	.000
Motivation to Teach Scale			
Item 17	.299**	151	.000
Item 18	.549**	153	.000
Item 19	.337**	152	.000
Item 20	.268**	153	.001
Item 21	.550**	152	.000
Item 22	.461**	152	.000
Item 23	.369**	153	.000
Item 24	.546**	153	.000
Item 25	.527**	152	.000
Item 26	.593**	153	.000
Item 27	.562**	152	.000
Item 28	.251**	153	.002

Table 1 demonstrates that all items were valid. Both scales were compiled into a single page and distributed as printed handouts. The demographic data that existed in the questionnaire comprised gender and university degree year, serving as the independent variables in the study.

Data analysis

After collecting data from 153 people, a Shapiro-Wilk test was performed to evaluate the normality of the data. The findings indicated that the distributions of the motivation to teach and AI anxiety scales exhibited non-normality. Consequent to this finding, non-parametric analytical techniques were employed in SPSS 22 to elucidate the motivation to teach and AI anxiety and investigate the correlations between gender and university year. Cohen et al. (2007) propose that non-parametric options may yield more accurate results than parametric analytic approaches when used on data that does not conform to a normal distribution.

Firstly, descriptive analyses for demographic information and scales were conducted to reveal central tendencies. Through central tendencies, motivation to teach and AI anxiety levels of the participants were revealed for the whole scales and each dimension. After obtaining central tendencies, a non-parametric Mann-Whitney U test was performed to investigate the relationship between gender and scales. Mann-Whitney U is the non-parametric alternative of t-tests, and it is used to test non-interval differences between two independent groups measured (Kalaycı, 2016). The relationship between the year at university and the central tendencies from the scales was investigated using a non-parametric Kruskal-Wallis test. It is the non-parametric alternative of one-way ANOVA, allowing comparisons for three or more groups with continuous variables (Kalaycı, 2016). Finally, correlational analysis was performed to investigate whether statistically significant correlations existed between the AI anxiety scale dimensions and the motivation to teach scale. The analysis revealed the Pearson correlation coefficient scores, the significance of each item, and potential relationships.

Ethical issues

This study has Alanya Alaaddin Keykubat University, Scientific Research Ethics Committee in Social and Human Sciences approval (Ref No: 2023/20). All subjects gave their informed consent for inclusion before they participated in the study. They were fully informed about the purpose of the study, how the data would be stored. Anonymity of the participants were ensured through giving each participant a number rather than revealing their names. All the data was kept by the researcher in the cloud file of Alanya Alaaddin Keykubat University, where the research was conducted, and in the personal computer of the researcher with numbers assigned to each questionnaire collected from the participants.

Findings and Discussion

Findings

The findings are presented in the following order: the central tendencies from whole AI anxiety and motivation to teach scales, central tendencies of each dimension in the scales, comparative analyses of demographic information and scales, and lastly, correlational analysis.

Table 2. AI Anxiety and motivation to teach scales

		Motivation to Teach	AI Anxiety
N	Valid	146	147
	Missing	7	6
Mean		41.62	45.34
Median		43	46
Std. Deviation		11.55	12.94

As evident in Table 2, the maximum score from the Motivation to Teach Scale was 72, and the minimum was 12. There were no negatively coded items in the questionnaire, and out of 153 participants, when the missing values were excluded, 146 valid scales were analyzed. The mean was relatively low ($\bar{x}$= 41.62), considering the maximum score and standard deviation (SD= 11.55). It may signal that the student-teachers in the study had a moderate level of motivation to teach. The maximum score from the AI anxiety scale was 80, and the minimum was 16. From the results by considering mean ($\bar{x}$= 45.34) and standard deviation (SD= 12.94), it could be concluded that student-teachers had varying levels of AI anxiety; however, they had moderate AI anxiety.

Table 3. Dimensions of AI anxiety and motivation to teach scales

	N	Min.	Max.	Mean	Std. Deviation
Learning Anxiety	151	5	25	9.15	3.92
Job Replacement	150	4	20	13.33	4.39
Sociotechnical Blindness	151	4	20	13.78	3.75
AI Configuration	152	3	15	9.01	4.14
Intrinsic Motivation	149	7	42	23.95	7.91
Extrinsic Motivation	150	5	30	17.72	5.01

Table 3 indicates that student-teachers had low anxiety about learning AI and related technologies ($\bar{x}$=9.15). The finding could suggest that there might be a few affective barriers to integrating AI into teacher education and that student-teachers could be willing to learn. Central tendencies in the table above indicate that the biggest reason for student-teachers' AI anxiety might be their AI configuration anxiety. The participants might not have enough experience or have negative perceptions of the future of AI technology, as the mean and standard deviation scores are considered ($\bar{x}$=9.01, SD=4.14). The maximum score of the dimension is 15, and the mean is 9.01, which indicates a proportionally high mean score with the second-highest standard deviation. The analysis showed that participants could have negative constructs about AI with variations in responses, and these negative constructs could cause anxiety. The highest mean with the highest standard deviation ($\bar{x}$= 3.09, SD= 1.45) was for item 14, "I find humanoid AI techniques/products (e.g., humanoid robots) scary." The finding underscores the

necessity of providing opportunities for student-teachers to use AI in teacher education programs. Sociotechnical blindness could be high among the participants, as the mean and standard deviation indicate ($\bar{x}$=13.78, SD=3.75). Proportionally high mean scores and low standard deviation indicated that there was not much variation in the responses. These negative constructs of learners need to be changed in teacher education programs to use related technologies effectively. The highest mean ($\bar{x}$= 4.08, SD= 1.34) was for the item "I am concerned that an AI technique/product could be misused." The findings of both sociotechnical blindness and AI configuration anxiety dimensions suggest that some activities must be organized in teacher education programs to change student-teachers' constructs about AI and to overcome sociotechnical blindness. Another factor that caused anxiety about AI was the job replacement due to AI. The mean was proportionally high ($\bar{x}$=13.33), and the standard deviation was the highest in the AI anxiety scale (SD= 4.39), which could indicate variation in participants' responses. A similar mean in sociotechnical blindness and job replacement might suggest that the two dimensions might be related to each other, and sociotechnical blindness could cause anxiety due to the necessity to change jobs. The factor's highest mean ($\bar{x}$=3.54) was item 9, "I am worried that AI techniques/products will take away someone's profession."

Data about motivation to teach was collected with two dimensions: extrinsic and intrinsic motivation. It is evident in Table 3 that student-teachers could have low intrinsic and extrinsic motivation (extrinsic, $\bar{x}$=17.72, SD = 5.01; intrinsic, $\bar{x}$= 23.95, SD =7.91). In items for intrinsic motivation, there were more varied responses, as the standard deviation indicated. The items for motivation to teach Scale had a 6-point Likert-Scale. For intrinsic motivation, the highest mean ($\bar{x}$= 4.04, SD= 1.63) was for item 11, "Teaching is a reward itself." The mean seemed high; however, a high standard deviation indicated various responses. Most participants might consider teaching as a rewarding job despite multiple responses. The lowest mean scores were for item 2, "I cannot think of a more enjoyable career than teaching" ($\bar{x}$= 2.69, SD= 1.64), and item 12, "I just want to teach for the sake of teaching" ($\bar{x}$= 2.86, SD= 1.55). The findings could indicate that participants might not have chosen the profession for the joy it provided, and they might have other priorities, such as financial or other issues. The highest mean for extrinsic motivation was item 7: "I chose to teach because the opportunities it provides are good" ($\bar{x}$= 3.83). Participants might be extrinsically motivated due to the opportunities that the teaching profession provides. The lowest score was for item 4: "I chose teaching because a teaching degree would allow me to find a job almost anywhere" ($\bar{x}$= 3.13). Most student-teachers might not hope to find a job quickly with a teaching degree.

A 6-point Likert scale was used in the motivation to teach scale. The distribution of mean scores between 2.69 as the lowest and 4.08 as the highest for extrinsic and intrinsic motivation could indicate that participant student-teachers had low motivation to teach intrinsically and extrinsically.

The relationship between year and AI anxiety and motivation to teach scales

Due to the non-normal distribution of the data, the Kruskal-Wallis test was conducted to compare the year at university and scores from both scales.

Table 4. AI anxiety, motivation to teach scales, and year at university

	AI Learning Anxiety	AI Anxiety Job replacement	AI Anxiety Sociotechnical Blindness	AI Configuration anxiety	Intrinsic Motivation	Extrinsic Motivation
Chi-Square	2.426	7.913	4.173	3.516	1.785	2.829
Df.	3	3	3	3	3	3
Asymp. Sig.	.489	.048	.243	.319	.618	.618

As evident in Table 4, job replacement, the mean scores of the first year ($\bar{x}$=77.01), second year ($\bar{x}$= 84.12), third year ($\bar{x}$= 70.73), and fourth year ($\bar{x}$=51.95) indicated a statistically significant difference. Student-teachers in the second year had the highest job replacement anxiety, followed by the first year. The peak mean score in the second year diminished gradually in the third and fourth years. Last year-students had the lowest mean score for it. The biggest cause of this statistically significant difference was Item 8: "I am afraid that if I start using AI techniques/products, I will become dependent on them and lose some of my reasoning skills." (p= .002). The mean scores of the first-year candidates ($\bar{x}$=74.61), second-year ($\bar{x}$=94.93), third-year ($\bar{x}$=66.38), and fourth-year ($\bar{x}$=55.00) differed significantly from each other. Using AI every time could cause a loss in reasoning skills, which was apparent in the participants' responses. Especially in the second year, the student-teachers in the study had the highest anxiety due to the loss of reasoning skills because of AI usage. Gradually, it diminished towards the fourth year. As Table 4 indicates, motivation to teach did not show a statistically significant difference.

The relationship between gender and AI anxiety, and motivation to teach scales

The relationship between gender and scores from scales was analyzed using the Mann Whitney-U Test as the data was not normally distributed.

Table 5. AI anxiety, motivation to teach scales, and gender

	Total Motivation to Teach	Total AI Anxiety
Mann-Whitney U	1693.50	1194
Wilcoxon W	3584.50	3147
Z	-2.601	-4.977
Asymp. Sig. (2-tailed)	.009	.000

The analysis in Table 5 revealed a statistically significant difference between the two scales and gender. In the motivation to teach Scale, the mean score of female student-teachers ($\bar{x}$=76.42) was higher than the male candidates ($\bar{x}$=58.76) statistically significantly. The mean indicated that female student-teachers had higher motivation to teach. Moreover, female student-teachers had higher levels of AI anxiety ($\bar{x}$=84.79) than male candidates ($\bar{x}$=50.76). The findings of the analysis indicated that gender could be a determining factor in motivation to teach and AI anxiety.

Table 6. Dimensions of AI anxiety, motivation to teach scales and gender

	Learning Anxiety	Job replacement	Sociotechnical Blindness	Configuration anxiety	Int. Mot.	Ext. Mot.
Mann-Whitney U	1528	1418	1722	1357	1872.50	1832
Wilcoxon W	3673	3434	3802	3437	3763.50	3977
Z	-4.046	-4.236	-3.188	-4.717	-2.152	-2.536
Asymp. Sig. (2-tailed)	.000	.000	.001	.000	.031	.011

As demonstrated in Table 6, female student-teachers had statistically significantly higher mean scores in all dimensions of the AI anxiety scale. The most significant difference between the groups was in the AI configuration anxiety dimension. It could indicate that female candidates could have more negative beliefs about AI. In all three items for the AI configuration anxiety dimension, female participants had higher mean scores with a distinction ($\bar{x}$=86.15-53.64 / 85.58 – 54.34 / 85.54 – 54.38). From the findings, it can be concluded that female student-teachers could be more anxious about the future of AI and the teaching profession.

The motivation for teaching varied considerably between female and male student-teachers. Female candidates were more intrinsically motivated ($\bar{x}$=76.49) than male candidates ($\bar{x}$=61.70). The statistically significant difference was slightly higher in extrinsic motivation ($\bar{x}$=78.57-61.18). There were 12 items on the scale, and four items (items 2,5,6,8) had statistically significant differences. Three items are about intrinsic motivation, whereas one is about extrinsic motivation. It could indicate that female student-teachers were more intrinsically motivated. The biggest statistically significant differences were found in item 2, "I cannot think of a more enjoyable career than teaching" ($\bar{x}$=81.50- 60.60; p >.002), and item 5, "I get excited when I share my decision to become a teacher with others" ($\bar{x}$=79.04 - 62.31, p > .014). The other item about intrinsic motivation with a significant difference was item 6, "I chose to teach because I would be respected in society as a teacher" ($\bar{x}$=77.78- 63.84; p >.041). The only item for extrinsic motivation that showed a statistically significant difference was item 8, "I want to teach just to enjoy teaching" ($\bar{x}$=78.13 - 64.64; p > .049). The item is related to intrinsic motivation because only teachers with high intrinsic motivation can enjoy teaching. These four items caused a statistically significant difference in all motivation to teach scale between genders.

The analysis of the scales indicated a statistically significant difference in nearly all dimensions between male and female student-teachers. Female student-teachers could be more anxious about AI and the future of the teaching profession, mainly due to their AI configuration. However, female candidates were more motivated to teach both intrinsically and extrinsically. In intrinsic motivation, statistically significant differences indicated that female candidates could be more motivated. The findings could suggest that a certain level of AI anxiety could increase teaching motivation, or teachers with higher motivation could have higher AI anxiety.

Correlational analysis of AI anxiety and motivation to teach scales

A Pearson correlation analysis was performed using SPSS 22 to determine if there was a statistically significant link between AI anxiety and motivation to teach measures. The study unveiled some relationships, as shown in Table 7 below.

Table 7. Correlational analysis of scales and dimensions

		Intrinsic Motivation	Extrinsic Motivation	Motivation to Teach
AI Learning Anxiety	Pearson Correlation	,101	-,006	,061
	Sig. (2-tailed)	,221	,940	,465
	N	147	148	144
AI Anxiety Job replacement	Pearson Correlation	.177*	,077	,142
	Sig. (2-tailed)	,033	,351	,090
	N	146	147	143
AI Anxiety Sociotechnical Blindness	Pearson Correlation	.277**	,157	.252**
	Sig. (2-tailed)	,001	,056	,002
	N	147	148	144
AI configuration anxiety	Pearson Correlation	.194*	,094	.169*
	Sig. (2-tailed)	,018	,256	,042
	N	148	149	145
AI Anxiety	Pearson Correlation	.251**	,110	.212*
	Sig. (2-tailed)	,002	,188	,012
	N	143	144	140

The correlational analysis findings suggest a potential relationship between AI anxiety and motivation to teach, namely intrinsic motivation. Sociotechnical blindness correlates with intrinsic motivation and motivation to teach in general. It could mean that "wrong assumptions about the future of AI applications due to unfamiliarity with the potential advantages and thinking only in a pessimistic way" (Wang & Wang, 2022) can be high with teachers with high intrinsic motivation and high motivation to teach in general. Smaller positive correlations were found between AI anxiety for job replacement and AI configuration anxiety and intrinsic motivation. AI configuration anxiety and AI Anxiety, in general, are also correlated with motivation to teach. However, the strength of the relationship is negligible in all correlations (Cohen, 1988, p. 79-81). The highest positive correlation was found between sociotechnical blindness and intrinsic motivation; however, the correlation shares % 7.67 of their variance. A similar correlation variance was found with the items with a significant correlation at 0.01 level (%6.35 - % 6.30). The effect sizes of all correlations were small (r = 0.2 - 0.5).

The correlational analysis table in Appendix 1 indicates that almost all items from the AI anxiety scale correspond with items from the motivation to teach scale, namely within the dimensions of "sociotechnical blindness" and "intrinsic motivation." A positive correlation existed among all these items. It may indicate that student-teachers possessing elevated motivation to teach could exhibit significant sociotechnical blindness or conversely. Another aspect of the AI anxiety scale was "job replacement," which showed a correlation with two intrinsic motivation factors. Student-teachers' apprehensions over the potential replacement of educators by AI technology may impact their intrinsic motivation. The effect size

of the correlations was minor, with r scores ranging from .200 to .300. Each connected item shares between 7% and 8% of their variation.

Discussion

The data collected answered the first research question, "What is the level of English student-teachers' teaching motivation?" by revealing that 153 TESOL student-teachers have a moderate motivation to teach intrinsically and extrinsically. The findings of the AI anxiety scale showed that the participant student-teachers have moderate anxiety for AI, which is a common finding in other studies with student (Eyüp & Kayhan, 2023) and practicing teachers (Banerjee & Banerjee, 2023; Huertas-Abril & Palacios-Hidalgo, 2023; Sütçü & Sütçü, 2023). Incorporating AI-related activities into teacher education programs may be advantageous for awareness and practice because recognizing teachers' lack of knowledge as a barrier is the first step in securing AI's widespread adoption in classrooms (Ayanwale et al., 2022). The participants had proportionally low levels of learning anxiety for AI, which could mean they might be willing to learn (Lam et al., 2023). The lowest mean in AI learning anxiety underscores that AI anxiety may affect professional skill development positively, as individuals with a high degree of AI anxiety tend to have a higher degree of motivated learning behavior (Piniel & Cszier, 2013).

Most AI anxiety could be due to negative AI configuration and sociotechnical blindness, which might be related to a lack of knowledge and practice for AI technologies (Johnson & Verdicchio, 2017). Participant student-teachers had moderate AI anxiety, mainly due to negative constructs and sociotechnical blindness; however, they might be willing to learn as the learning dimension of the scale had a low mean score. Integrating AI techniques/products in teacher education programs must aim to change student-teachers' negative constructs and overcome sociotechnical blindness.

The results showed that a candidate's year in college may not be an essential determinant of AI use and motivation to teach. Only one statistically significant difference was found in the "job replacement" dimension of the anxiety scale, and no significant motivational difference was found. Some studies suggest that job replacement can significantly contribute to AI anxiety (Abuselidze & Mamaladze, 2021; Başer, Altuntaş, S, Kolcu & Özceylan, 2021; Lemay, Basnet & Doleck, 2020; Li & Huang, 2020). AI anxiety was found at the peak levels and diminished towards the last year at university. The item that had various responses and caused the difference was, "I am afraid that if I start using AI techniques/products, I will become dependent on them and lose some of my reasoning skills." The finding could mean that student-teachers might worry about being too dependent on AI techniques/products and losing their reasoning skills. The same finding was found in the study by Sütçü and Sütçü (2023), which investigated the attitudes and opinions of practicing English teachers towards AI. In the third year, students have classes for technology integration into language classes, and they learn and practice AI techniques/products. The findings demonstrate the significance of these classes in that AI anxiety decreased towards the end of the teaching degree, and candidates might learn how to use AI technology without being heavily dependent on it and losing reasoning skills. The finding highlights the imperative of offering student-teachers the opportunity to acquire and apply AI skills in educational contexts.

Banerjee and Banerjee (2023) studied the relationship among practicing teachers' AI anxiety, gender, and teaching experience over the years, and they found no statistically significant difference. This study revealed that the gender of student-teachers might determine AI anxiety and motivation to teach. In the whole scale and each dimension, female student-teachers had higher scores with statistically significant differences. Another study investigating gender differences and AI anxiety was by Zhang et al. (2023). The study had similar findings and revealed that AI anxiety and perceived enjoyment were significantly higher with female student-teachers. Hopcan et al. (2023) studied AI anxiety among student-teachers from various fields. They found that while male candidates are more likely to be adopters of new technologies, female candidates may exhibit greater caution, skepticism, and anxiety. In this study's motivation to teach scale, female candidates had significantly higher scores than male candidates, signifying that female candidates might be more intrinsically and extrinsically motivated to teach; however, they might have a higher AI anxiety. In Zhang's study, it was found that job replacement anxiety positively impacts extrinsic learning motivation. This study found a positive relationship between AI anxiety and motivation to teach, especially with female student-teachers. The most significant difference was in the AI configuration anxiety dimension, which could mean that female candidates might have more negative constructs about AI (Hopcan et al., 2023). Despite the negative constructs and anxiety, AI learning and motivation to teach were significantly higher among female student-teachers, which underscores the suggestion by Wang and Wang (2022) that AI anxiety can increase motivated learning behavior. In a teacher education program with many female student-teachers, it might be significant to design AI activities accordingly.

The correlational analysis revealed a statistically significant positive correlation between total AI anxiety and intrinsic motivation. It means that student-teachers with high intrinsic motivation may tend to develop more AI anxiety or vice versa, as suggested by other studies (Baş & Baştuğ, 2023; Wang & Wang, 2022; Zhang et al., 2023). The motivation to teach was found to be positively correlated with AI anxiety due to sociotechnical blindness. It could mean that highly motivated student-teachers might have sociotechnical blindness; that is, they might be pessimistic about the future of AI technologies due to a lack of practice or knowledge. It could mean that to educate teachers with a high motivation to teach, explicit instruction about AI technologies/products and using them might be necessary for teacher education programs (Sanusi, Ayanwale & Tolorunke, 2024). Teacher educators must realize that sociotechnical blindness and AI anxiety, in general, may affect particularly intrinsic motivation to teach (Xia et al., 2022). However, it must be added that although some statistically significant positive correlations were found between AI anxiety / intrinsic motivation and motivation to teach / sociotechnical blindness, the significance of the correlation is minor when correlation coefficient scores are considered (r = .20-.30). Each correlation shares between %6.5 and %7.8 of their variance.

Conclusion

The study's findings indicated that the participant student-teachers exhibited moderate levels of AI anxiety and motivation to teach, addressing the first research question on the extent of AI anxiety among English student-teachers. The majority

of AI-related anxiety stemmed from AI configuration and sociotechnical blindness. Sociotechnical blindness refers to the anxiety arising from inadequate information and experience and a lack of awareness that humans have created AI for societal benefit. AI configuration anxiety pertains to the perceptions and frameworks surrounding humanoid artificial intelligence. Given that these two reasons increase AI anxiety among student-teachers, offering training to enhance their familiarity might be essential.

The correlational analysis for the third research question: "Is there a significant correlation between AI anxiety and the motivation to teach among English student-teachers?" demonstrated a statistically significant positive correlation between AI anxiety and intrinsic motivation. The effect size of the connection was small (r = .200 - .300) and accounted for 7% - 8% of their variation. A statistically significant positive correlation was identified between teaching motivation and AI anxiety attributed to sociotechnical blindness, suggesting that reducing sociotechnical blindness is essential for preparing highly motivated language teachers.

The results of the first and third research questions could indicate that student-teachers must recognize that individuals have developed AI technologies and products for the benefit of humanity and have an optimistic outlook on future applications of these AI innovations. Teacher educators and programs are responsible for ensuring that student-teachers recognize these truths. Consequently, methodologies for employing AI applications in educational contexts could be taught and practiced through workshops conducted by academic institutions. Instead of prohibiting the use of AI applications in educational programs, ethical and practical applications should be demonstrated to student-teachers.

The second research question in the study was, "Do English student-teachers' AI anxiety differ by gender and academic year?" The results demonstrated that AI anxiety and teaching motivation did not differ statistically based on the degree year. AI anxiety reached its highest point in the second year and diminished during the final year of the teaching degree. In their third year, the student-teachers in the program undertake courses such as "Digitalizing Language Classrooms" and "Technology-enhanced Language Teaching." The finding may underscore the importance of these courses as students' AI anxiety diminished in the final year. However, this remains a supposition, as no data was gathered to confirm its veracity. Further research can facilitate its examination. Significantly, job replacement anxiety showed a statistically meaningful difference in the second year. AI courses could be incorporated into educational curricula from the first year, as student-teachers may experience anxiety around the subject.

Gender was another independent variable in the second study question. There were statistically significant differences in AI anxiety and motivation to teach based on gender across the two measures and their respective aspects. Female student-teachers may exhibit greater motivation to teach and have elevated AI anxiety. The aforementioned considerations should be given more significance if the student-teachers are female, as their worries may be superior to their male counterparts.

Limitations

The study exclusively gathered quantitative data using two scales. A more extensive investigation incorporating qualitative research may be required for more

profound data analysis. Comprehensive data may be necessary to examine the link between correlated items. Limited research exists regarding the AI anxiety experienced by student-teachers. Consequently, additional research may be undertaken, including student-teachers from diverse cultural origins across multiple situations and with increased participant numbers. Additionally, research utilizing the same variables may be conducted after implementing a training program or workshop to assess its impact on those variables.

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Appendix

The correlational analyses of each item in AI anxiety and motivation to teach scales

		1. Ext. Mot.	2. Int. Mot.	3.Ext. Mot.	4.Ext. Mot.	5.Int. Mot.	6.Int. Mot.	7.Ext. Mot.	8.Ext. Mot.	9.Int. Mot.	10.Int. Mot.	11.Int. Mot.	12.Int. Mot.
1. Learning	Pearson Correlation	,000	,137	-,005	-,154	,067	,000	-,056	,141	,056	,083	,039	-,014
	Sig. (2-tailed)	,996	,090	,948	,058	,415	,996	,490	,083	,490	,310	,630	,867
	N	151	153	152	153	152	152	153	153	152	153	152	153
2. Learning	Pearson Correlation	,029	,114	,027	-,084	,035	,060	-,053	,101	,072	,146	,031	,142
	Sig. (2-tailed)	,727	,159	,741	,304	,665	,465	,518	,216	,378	,072	,705	,081
	N	151	153	152	153	152	152	153	153	152	153	152	153
3. Learning	Pearson Correlation	-,040	,080	-,055	-,052	,090	,040	-,009	,123	,070	.168*	,056	,013
	Sig. (2-tailed)	,627	,326	,500	,526	,272	,621	,915	,131	,389	,038	,491	,869
	N	151	153	152	153	152	152	153	153	152	153	152	153
4. Learning	Pearson Correlation	-,049	,006	,050	-,052	-,008	-,031	-,079	,064	,036	,028	,000	,080
	Sig. (2-tailed)	,552	,943	,540	,524	,919	,705	,336	,434	,660	,736	,999	,327
	N	150	152	151	152	151	151	152	152	151	152	151	152
5. Learning	Pearson Correlation	,015	,085	,006	,036	,030	,038	-,071	,030	-,005	,026	-,069	,062
	Sig. (2-tailed)	,854	,296	,940	,659	,714	,643	,387	,710	,955	,752	,401	,451
	N	150	152	151	152	151	151	152	152	151	152	151	152
6.Job replacement	Pearson Correlation	,063	,152	-,019	,050	.178*	,117	-,010	,133	,064	,130	.172*	-,042
	Sig. (2-tailed)	,439	,061	,820	,543	,028	,150	,899	,100	,435	,109	,034	,607
	N	151	153	152	153	152	152	153	153	152	153	152	153
7.Job replacement	Pearson Correlation	,098	,156	-,041	,068	,146	-,017	-,042	,125	,119	**.226****	**.256****	,047
	Sig. (2-tailed)	,235	,055	,614	,406	,074	,834	,607	,127	,149	**,005**	**,002**	,564
	N	149	151	150	151	150	150	151	151	150	**151**	**150**	151
8.Job replacement	Pearson Correlation	,018	,049	-,132	,099	,044	,034	,004	,026	-,029	,086	,092	-,124
	Sig. (2-tailed)	,830	,544	,105	,223	,590	,681	,963	,750	,726	,288	,258	,127
	N	151	153	152	153	152	152	153	153	152	153	152	153
	Pearson Correlation	,054	.162*	,062	,147	,157	,086	,059	,126	,110	,138	,142	,072

		1. Ext. Mot.	2. Int. Mot.	3.Ext. Mot.	4.Ext. Mot.	5.Int. Mot.	6.Int. Mot.	7.Ext. Mot.	8.Ext. Mot.	9.Int. Mot.	10.Int. Mot.	11.Int. Mot.	12.Int. Mot.
9.Job replacement	Sig. (2-tailed)	,509	,046	,448	,071	,054	,292	,467	,123	,178	,089	,081	,375
	N	150	152	151	152	151	151	152	152	151	152	151	152
10.Sociotechnical blindness	Pearson Correlation	,035	,125	,003	-,007	.182*	,014	,004	**.253****	**.280****	**.265****	**.250****	,069
	Sig. (2-tailed)	,671	,124	,975	,935	,025	,863	,964	**,002**	**,001**	**,001**	**,002**	,401
	N	150	152	151	152	151	151	152	**152**	**151**	**152**	**151**	152
11. Sociotechnical blindness	Pearson Correlation	-,031	.198*	-,006	,085	.201*	,091	-,008	.165*	,107	**.248****	**.276****	,037
	Sig. (2-tailed)	,709	,014	,940	,298	,013	,265	,919	,042	,188	**,002**	**,001**	,652
	N	151	153	152	153	152	152	153	153	152	**153**	**152**	153
12. Sociotechnical blindness	Pearson Correlation	,123	.164*	,129	**.226****	**.209****	,140	,119	,144	,146	**.267****	**.260****	,058
	Sig. (2-tailed)	,135	,043	,114	**,005**	**,010**	,087	,144	,076	,074	**,001**	**,001**	,477
	N	150	152	151	**152**	**151**	151	152	152	151	**152**	**151**	152
13. Sociotechnical blindness	Pearson Correlation	,024	,039	-,029	,084	,145	,071	,099	,112	,117	.170*	**.288****	-,039
	Sig. (2-tailed)	,769	,634	,721	,304	,075	,389	,223	,170	,154	,036	**,000**	,637
	N	150	152	151	152	151	151	152	152	151	152	**151**	152
14.AI configuration anxiety	Pearson Correlation	,139	,155	,037	,070	.162*	,057	,033	,093	,139	.183*	,123	-,007
	Sig. (2-tailed)	,090	,057	,656	,392	,048	,490	,686	,257	,088	,024	,133	,929
	N	150	152	151	152	151	151	152	152	151	152	151	152
15.AI configuration anxiety	Pearson Correlation	,095	.185*	,029	,111	.167*	,121	,034	,061	,116	.180*	,135	,036
	Sig. (2-tailed)	,246	,023	,725	,174	,040	,139	,680	,456	,158	,027	,098	,657
	N	150	152	151	152	151	151	152	152	151	152	151	152
16.AI configuration anxiety	Pearson Correlation	,058	,113	,022	,115	,116	,086	,000	,043	,079	,145	,079	-,022
	Sig. (2-tailed)	,484	,164	,790	,159	,155	,293	,999	,601	,334	,075	,335	,787
	N	150	152	151	152	151	151	152	152	151	152	151	152