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What predicts teacher professional collaboration? A servant leadership-based study in elementary schools

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ABSTRACT Although professional collaboration among teachers plays a critical role in enhancing school effectiveness and instructional quality, empirical studies that jointly examine the organizational and individual determinants of this collaboration remain limited. This study aimed to identify variables that significantly predict the likelihood of elementary school teachers engaging in professional collaboration. The study employed a quantitative, cross-sectional, and correlational survey design. The sample consisted of 310 teachers working in elementary schools in the city center of Siirt, selected through cluster sampling. Data were collected using the Servant Leadership Scale and the Professional Collaboration subscale. Binary logistic regression analysis was used to analyze the data. Results showed that school level, participation in professional activities, professional seniority, and principals' servant leadership behaviors significantly predicted teachers' likelihood of engaging in professional collaboration. In contrast, gender, marital status, educational status, length of time working with the school principal, and length of service at the school were not significant predictors. Overall, the findings highlight the role of servant leadership.

Keywords: *Binary logistic regression, Elementary schools, Servant leadership, Teacher professional collaboration*

Öğretmenlerin mesleki işbirliğini neler yordar? İlköğretim okullarında hizmetkâr liderlik temelli bir çalışma

ÖZ Öğretmenler arası mesleki işbirliği, okul etkililiği ve öğretim kalitesinin artırılmasında kritik bir rol oynamasına rağmen, bu işbirliğini belirleyen örgütsel ve bireysel değişkenlerin birlikte ele alındığı ampirik çalışmalar sınırlıdır. Bu araştırmanın amacı ilköğretim okullarında görev yapan öğretmenlerin mesleki işbirliği içinde olma olasılıklarının hangi değişkenler tarafından anlamlı biçimde yordandığının belirlenmesidir. Bu amaç doğrultusunda araştırma nicel, kesitsel ve ilişkisel tarama modelinde tasarlanmıştır. Araştırmanın örneklemini, Siirt il merkezindeki ilköğretim okullarında görev yapan ve küme örnekleme yöntemiyle seçilen 310 öğretmen oluşturmaktadır. Veriler, Hizmetkâr Liderlik Ölçeği ile Mesleki İşbirliği Alt Ölçeği aracılığıyla toplanmıştır. Verilerin analizinde binary lojistik regresyon analizi kullanılmıştır. Araştırma sonuçları okul kademesi, mesleki faaliyetlere katılım, mesleki kıdem ve okul müdürlerinin hizmetkâr liderlik davranışlarının öğretmenlerin mesleki işbirliği içinde olma olasılıklarını anlamlı biçimde yordadığını göstermiştir. Buna karşılık cinsiyet, medeni durum, öğrenim durumu, okul müdürüyle çalışma süresi ve okuldaki görev süresinin anlamlı bir yordayıcı olmadığı belirlenmiştir. Bulgular, öğretmen mesleki işbirliğinin güçlendirilmesinde hizmetkâr liderliğin merkezi bir rol oynadığını ortaya koymakta ve politika yapıcılara yönelik önemli uygulamaya dönük çıkarımlar sunmaktadır.

Anahtar Sözcükler: *Binary lojistik regresyon, Hizmetkâr liderlik, İlköğretim okulları, Öğretmen mesleki işbirliği*

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INTRODUCTION

Over the past twenty years, researchers have emphasized that teaching should not be carried out in isolation from others but rather through collaboration with colleagues (Child & Shaw, 2016; Mora-Ruano et al., 2019). Similarly, empirical research findings also point to the positive effects of teacher collaboration on schools and education (Pettersson & Ström, 2019; Reeves et al., 2017) and indicate that professional collaboration among teachers is an important requirement for successful teaching activities (Jackson & Bruegmann, 2009). On the other hand, professional collaborations established among teachers not only enhance their professional development but also improve the quality of education and overall success of the school (Goddard et al., 2007). This is because diverse and sustainable achievements in education depend more on collaboration among teachers than on their individual performance (Hargreaves & O'Connor, 2018). Additionally, collaboration among teachers ensures the continuity of teaching activities and practices, paving the way for healthy peer support and feedback among teachers (Kelchtermans, 2006). Therefore, teacher collaboration is considered one of the key determinants of improving teaching activities and education-focused work (Moolenaar et al., 2012).

Research (Beatty, 2000; Conley et al., 2004) shows that collaboration among teachers eliminates uncertainties related to teaching practices and protects teachers from difficulties. Similarly, teacher collaboration enhances teacher satisfaction and confidence (Johnson et al., 2012), teacher communication (Johnson, 2003), differentiated teaching practices (Hartwig & Schwabe, 2018), professional development (Burke, 2013; Puchner & Taylor, 2006), a positive school climate (Thapa et al., 2013), and teaching competence (Graham, 2007; Hattie, 2015). In this regard, teacher collaboration in schools is critical and important for improving teaching and school effectiveness (Organisation for Economic Co-operation and Development [OECD], 2020). The OECD's 2013 TALIS (Teaching and Learning International Survey) report also highlights the impact of resources allocated to teacher collaboration and professional collaboration on the high international assessment performance of countries such as Singapore, Canada, and Finland (OECD, 2014). However, despite the benefits and importance of teacher collaboration, establishing a collaborative mindset in schools remains a serious challenge (Vangrieken et al., 2015). Overcoming this challenge depends on understanding the factors that influence teacher collaboration (Cobb et al., 2020).

Although the variables associated with teacher collaboration in educational organizations vary, school administrators' leadership styles are among the most important factors influencing teachers' level of participation in collaboration (Angelle, 2010). Among leadership styles, servant leadership stands out as the leadership style that most supports collaboration among teachers and creates a collaborative school environment (Black, 2010; Liden et al., 2015). Servant leadership involves various behaviors such as empathy, listening, and social responsibility to support teachers' professional development and encourage collaboration (Eva et al., 2019). Furthermore, servant leadership helps increase participation in collaboration processes in schools by listening to teachers' problems and guiding them (Sendjaya et al., 2008). On the other hand, it is often emphasized that, in addition to servant leadership, school- and teacher-related variables also are significantly associated with teacher collaboration (Moolenaar et al., 2012; Puchner & Taylor, 2006). Research evidence showing that school- and teacher-related variables are associated with collaboration among teachers (Kelchtermans, 2006) also supports this conclusion.

Although the relationship between leadership styles and teacher collaboration has been examined in the literature (Hallinger & Heck, 2010), most of these studies focus on the general effects of leadership styles. The relationship between servant leadership and teacher collaboration has been addressed by a limited and small number of studies (Liden et al., 2014). Furthermore, studies investigating the effects of demographic variables on collaboration (Kelchtermans, 2006; Vangrieken et al., 2017) generally address these variables in isolation, ignoring the effect of leadership styles such as servant leadership on the relationship (Eva et al., 2019). Therefore, the present study addresses an important gap in the literature by examining how servant leadership is associated with teacher collaboration and how demographic variables are related to this process. Furthermore, by focusing on the associations between leadership styles and teacher collaboration, and how demographic variables relate to relationship, the

study provides findings that serve as a guide for educational administrators and policymakers. Thus, by examining the power of servant leadership in promoting collaboration and how teachers' demographic characteristics shape collaboration processes using binary logistic analysis, the research can make important contributions to leadership practices and teacher development. In this context, the research aims to examine whether servant leadership behaviors in elementary schools and certain variables (gender, marital status, school level, educational status, participation in professional activities, professional seniority, length of service with the school principal, and length of service at the school) significantly predict teachers' professional collaboration. In line with the main objective of the research, answers were sought to the following questions:

1. Do teachers' gender, marital status, school level, educational status, participation in professional activities, professional seniority, length of time working with the school principal, length of service at the school, and the servant leadership behaviors of school principals significantly predict teachers' likelihood of engaging in professional collaboration?

2. What is the order of importance regarding the predictive level of the predictor variables in the study (gender, marital status, school level, educational status, participation in professional activities, professional seniority, length of time working with the school principal, length of service at the school, and school principals' servant leadership behaviors)?

Servant Leadership and Teacher Professional Collaboration

The servant leadership approach introduced to the literature through Greenleaf's work refers to the leader being a servant in the organizational process (Singfiel, 2018). According to Greenleaf, servant leadership is the process of the leader first choosing to serve their subordinates and then leading them. A servant leader supports subordinates within the organization and focuses on meeting their needs (Greenleaf, 2002). According to Rieke et al. (2008), in the traditional understanding of leadership, the leader is at the top of the management pyramid and expects subordinates to comply with their directives; the servant leader reverses the management pyramid and places themselves at the bottom of this pyramid. While other leadership approaches focus first on the mission and then on empowering subordinates to achieve the organizational mission, servant leadership prioritizes developing the capabilities of subordinates, with a focus on the success of the organizational mission coming later (Gandolfi & Stone, 2018). Furthermore, servant leadership emphasizes humble and service-oriented behaviors by centering on the development of subordinates (van Dierendonck, 2011). Moreover, servant leaders contribute to the well-being and growth of their subordinates by serving them (Greenleaf, 2002). In these respects, servant leaders differ from other leadership approaches in terms of characteristics such as vision creation, honesty, empathy, service, staff empowerment, emotional healing, ethical behavior, and self-sacrifice (Baldonado, 2017). Understanding how servant leadership operates in practice requires situating it within its specific institutional and cultural context. In Türkiye, the educational system is characterized by a highly centralized administrative structure in which curricular decisions, personnel appointments, and school governance are largely regulated by the Ministry of National Education (MoNE) (Şişman, 2025). Within this framework, school principals are primarily positioned as bureaucratic agents of the central authority, expected to implement top-down directives rather than exercise autonomous pedagogical leadership (Recepoğlu & Kılınç, 2014). This structural configuration creates a notable tension for servant leadership, which is fundamentally premised on the leader's voluntary orientation toward the needs of followers and the decentralization of decision-making authority (van Dierendonck, 2011). Accordingly, Turkish school principals who adopt servant leadership behaviors may face systemic constraints that limit their capacity to fully enact its principles. Nevertheless, research suggests that even within hierarchical and bureaucratic systems, individual leaders retain meaningful agency in shaping the relational and motivational climate of their organizations (Balcı, 2008). In this regard, servant leadership in the Turkish educational context may be better understood not as a wholesale structural transformation, but as a set of relational micro-practices — including active listening, individualized support, and moral encouragement — that principals can deploy within the boundaries imposed by the formal system (van Dierendonck, 2011). This nuanced

understanding is particularly relevant to the present study, as it implies that even partial expressions of servant leadership may carry significant predictive power for teacher collaboration in contexts where full leadership autonomy is structurally constrained.

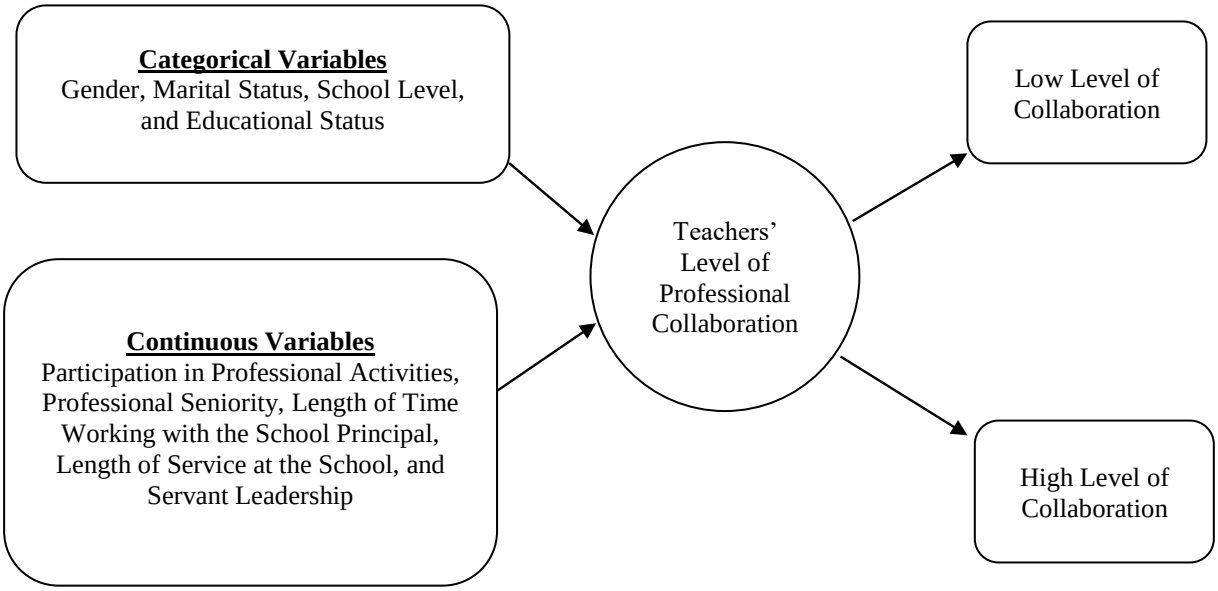
Teachers' professional collaboration is defined as activities in which teachers work together and exchange ideas to evaluate and analyze professional issues and reach a conclusion (García-Martínez et al., 2021). Teacher professional collaboration is also described as the process of teachers evaluating and designing all components related to teaching and learning among themselves (Meirink et al., 2010). However, teacher professional collaboration does not only mean teachers sharing their knowledge about the subject among themselves; it also means participating in professional development, being involved in decision-making processes, and solving common problems together (Vangrieken et al., 2015). Therefore, teacher collaboration is based on sociocultural learning theories. This is because sociocultural learning theories emphasize the social aspect of learning and claim that effective learning experiences are gained through knowledge sharing (Packer & Goicoechea, 2000). Teacher professional collaboration is also addressed in the context of Professional Learning Communities (PLCs), and professional learning communities contribute significantly to teachers' professional development with their structures that encourage collaboration (Brennan & Gorman, 2023).

The Effect of Servant Leadership and Some Variables on Teachers' Professional Collaboration

The literature contains studies indicating that professional collaboration among teachers is associated with student achievement (Dumay et al., 2013; Vangrieken et al., 2015). It has been reported that when professional collaboration among teachers is established, teachers' job satisfaction levels increase, and they exhibit more self-efficacy behaviors (OECD, 2013). Similarly, TALIS 2018 highlights that professional collaboration among teachers is one of the five main elements under the heading of professionalism in schools (OECD, 2019). Furthermore, it is stated that teachers who engage in professional collaboration have positive attitudes towards teaching (Mostafa & Pál, 2018). Therefore, collaboration among teachers has become an increasingly important topic in the literature because it enables teachers to gain experience about teaching processes and increase their activities within the school (Calle et al., 2022; Richit et al., 2024; Robutti et al., 2016) and ensure their professional development, making it an increasingly important topic in the literature (Xu & Pedder, 2015). The shift towards teacher professional collaboration has accelerated researchers' efforts to identify the variables that increase professional collaboration among teachers. For example, research into the relationship between leadership styles and teacher collaboration is consistent with this conclusion (Hallinger & Heck, 2010), as is research into the relationship between teacher collaboration and various other variables found in the literature, such as school innovation (Blömeke et al., 2021), teacher self-efficacy (Marshall & Rendall, 2020), and teacher collective innovation (Lin, 2022; Sun & Xia, 2018), as well as leadership styles, is consistent with this conclusion (Hallinger & Heck, 2010). Elliott (2021) states that servant leadership in educational organizations is positively associated with teachers' professional collaboration and that the servant leadership style is associated with a more effective collaboration environment through higher teachers' motivation and commitment. For a deeper theoretical understanding of this relationship, it is of considerable importance to examine the mechanisms through which leadership behaviors influence collaboration. In this regard, Meyer et al. (2025) longitudinally investigated how principal leadership practices support teacher collaboration and collective teacher efficacy, identifying significant associations between principals' establishment of collaboration-facilitating structures and teachers' perceptions of collective efficacy over time. Similarly, Persson et al. (2025), in a large-scale longitudinal study, demonstrated that principals' instructional leadership behaviors significantly predicted both teacher collaboration and student achievement, drawing attention to the temporal dynamics of the relationship between leadership, collaboration, and student outcomes. These findings reinforce the theoretical framework of the present study and point to a consistent body of international evidence underscoring the central role of principal leadership behaviors in shaping teacher collaboration. On the other hand, the literature has proven that teacher professional collaboration is also influenced by different variables such as age, gender, seniority, education level, and marital status (Kelchtermans, 2006; Vangrieken et al., 2017). Therefore, all these findings in the literature imply that

teacher professional collaboration may be influenced by various leadership approaches, such as servant leadership, and by individual or organizational variables. Accordingly, based on the research findings in the literature, the theoretical model to be tested in the study is presented in Figure 1.

Figure 1.
Theoretical Model of the Study



METHODS

Research Model

This study, which aims to identify variables that predict the professional collaborations of teachers working in elementary education institutions, was designed as a quantitative cross-sectional study using a correlational survey model. The relationship between the variables of the study was examined using binary logistic regression analysis. Binary logistic regression is a regression analysis technique used to model the effect of predictor (independent) variables on these categories when the dependent variable has two categories (Field, 2017). In the current study, a cross-sectional research type correlational survey model and binary logistic regression analysis technique, which are appropriate for a quantitative approach, were preferred to examine the relationships between variables in a single time frame and to estimate the probabilities of the dependent variable. The independent variables of the study were the teachers' gender, marital status, the school level at which they work, their educational status, their participation in professional activities (such as in-service training, professional development conferences, and seminars), their professional seniority, their length of time working with the school principal, their length of service at the school, and the servant leadership behaviors of school principals. The dependent variable is the level of teachers' professional collaborations. Of the predictor variables, gender, marital status, school level, and educational status were analyzed as categorical variables; participation in professional activities, professional seniority, length of service with the school principal, length of service at the school, and school principals' servant leadership behaviors were analyzed as continuous variables. The dependent variable of the study, teachers' level of professional collaboration, was included in the analysis as a two-category variable ("low" and "high") using a two-stage cluster analysis method (see Figure 1).

Two-stage cluster analysis was employed to categorize the dependent variable for several methodological reasons. First, because the Professional Collaboration Subscale yields a continuous

score, dichotomization using an arbitrary cut-point (e.g., median split) would risk introducing bias and reducing statistical power (MacCallum et al., 2002). Two-stage cluster analysis, by contrast, is a data-driven approach that identifies natural groupings in the data without presupposing the number of clusters. The algorithm operates in two phases: it first pre-clusters the data using a sequential approach and then applies hierarchical methods to merge the pre-clusters, selecting the optimal solution based on the Bayesian Information Criterion (BIC) (Chiu et al., 2001). In the present study, the two-cluster solution was selected because it produced the lowest BIC value and a satisfactory silhouette coefficient (>0.50), indicating adequate within-cluster cohesion and between-cluster separation (Kaufman & Rousseeuw, 1990). The analysis was conducted using jamovi 2.4.11 software. This approach yielded two empirically grounded groups — low collaboration (n = 132, 42.6%) and high collaboration (n = 178, 57.4%) — which served as the binary outcome variable in the logistic regression analysis. This data-driven categorization approach is consistent with methodological recommendations for creating theoretically and empirically defensible dichotomous outcomes in binary logistic regression (Clatworthy et al., 2005). In addition, binary logistic regression was preferred over multiple linear regression for two methodological reasons. First, an examination of the distribution of professional collaboration scores revealed a distinct ceiling effect, as the scores were clearly concentrated at the upper end of the scale and exhibited a negatively skewed distribution. This pattern violates the assumptions of normality and homoscedasticity that underpin linear regression (Norman, 2010; Sullivan & Artino, 2013), thereby making it a less appropriate analytical choice for the current data. Second, the research questions are framed probabilistically—specifically, the study aims to examine which variables predict the probability of teachers belonging to the high or low collaboration group—and this framing aligns directly with the inferential logic of binary logistic regression rather than ordinary least squares regression (Hosmer et al., 2013).

Participants

The study involved teachers working in elementary education institutions in the provincial center of Siirt. The study included 1537 teachers working in elementary education institutions; the sample consisted of 310 teachers from 26 elementary education institutions selected using the cluster sampling method. Cluster sampling is a probability sampling method in which all clusters within the population have an equal chance of being selected. In cluster sampling, as the number of clusters increases, so does representativeness (Fowler, 2013). In the current study, elementary education institutions in the provincial center of Siirt were divided into two clusters: primary schools and middle schools. Thirteen schools were randomly selected from each of the primary school and middle school clusters, and data was collected from a total of 310 teachers. The cluster sampling method was preferred in this study because all clusters in the population have an equal chance of being selected, collecting data from clusters is more manageable, and it is appropriate in terms of time and cost during the data collection process. The sample size of 310 for the study was determined based on a 5% margin of error and a 95% confidence level. It is known in the literature that a sample size of 310 is sufficient for a 5% margin of error and a 95% confidence level for a population of 1537 (Cohen et al., 2007). Information about the sample group and the study is provided in Table 1.

As shown in Table 1, 159 (51.3%) of the teachers participating in the study were male, 151 (48.7%) were female; 102 (32.9%) were single, 208 (67.1%) were married; 162 (52.3%) worked in elementary schools, 148 (47.7%) worked in middle schools; 271 (87.4%) were bachelor's degree holders, 39 (12.6%) were postgraduate degree holders. The average participation of teachers in professional activities was 3.73 (SD = 2.55; Median = 3.00), the average professional seniority was 16.15 (SD = 9.02; Median = 18.00), the average length of service with the school principal was 2.40 (SD = 1.42; Median = 2.00), the average length of service at the school is 3.38 (SD = 2.65; Median = 2.00), and the average level of servant leadership behaviors is 4.58 (SD = 0.38; Median = 4.71). Of the participants, 132 (42.6%) perceived the level of professional collaboration among teachers as low, while 178 (57.4%) perceived it as high.

Table 1.
Demographic Characteristics of the Participants (n=310)

Variables	Category	n (%)	Mean	SD	Median
Gender	Male	159 (51.3)	-	-	-
	Female	151 (48.7)	-	-	-
Marital Status	Single	102 (32.9)	-	-	-
	Married	208 (67.1)	-	-	-
School Level	Elementary	162 (52.3)	-	-	-
	Middle School	148 (47.7)	-	-	-
Educational Status	Bachelor's Degree	271 (87.4)	-	-	-
	Graduate	39 (12.6)	-	-	-
Participation in Professional Activities	-	-	3.73	2.55	3.00
Professional Seniority	-	-	16.15	9.02	18.00
Length of Time Working with the School Principal	-	-	2.40	1.42	2.00
Length of Service at the School	-	-	3.38	2.65	2.00
Servant Leadership	-	-	4.58	0.38	4.71
Teachers' Level of Professional Collaboration	Low	132 (42.6)	-	-	-
	High	178 (57.4)	-	-	-

Note: SD = Standard Deviation, n = Number of Participants

Data Collection Tools

Servant Leadership Scale (SLS)

The short form of the Servant Leadership Scale, consisting of 7 items and a single dimension, developed by Liden et al. (2015) to measure school principals' servant leadership behaviors, was used. The short form of the SLS was adapted into Turkish by Kılıç and Aydın (2016). The SLS is a five-point Likert-type measurement tool ranging from 5 (strongly agree) to 1 (strongly disagree) (sample item: I can ask my manager for help when I have a personal problem). The validity and reliability analyses of the SLS were re-examined for the current study. In this context, the model fit of the study ($x^2/df = 2.63$; RMSEA = 0.073, SRMR = 0.041, CFI = 0.95, TLI = 0.92), Cronbach's Alpha reliability (α=0.77), and Composite Reliability (CR=0.78) values were found to be appropriate (Field, 2017).

Professional Collaboration Subscale (PCS)

The 8-item Professional Collaboration Subscale from the three-dimensional Teacher Leadership Culture Scale (TLCS) developed by Demir (2014) to measure professional collaboration among teachers was used. The PCS is a 5-point Likert-type scale (example item: Teachers in this school share teaching materials) with responses ranging from always (5), most of the time (4), sometimes (3), rarely (2), and never (1). The model fit of the PCS used in this study was good ($x^2/df = 1.98$; RMSEA = 0.056, SRMR = 0.041, CFI = 0.94, TLI = 0.91), Cronbach's Alpha reliability (α = 0.71), and Composite Reliability (CR = 0.72) values were found to be within appropriate ranges (Field, 2017).

Data Collection and Analysis

Prior to data collection, ethical approval was obtained from the Ethics Committee of Siirt University (Decision date: 29.08.2024, Session No: 907; Official document date and number: 26.09.2024-7624). Subsequently, the scales were prepared online via Google Forms and distributed to teachers working in elementary schools via WhatsApp for completion. Informed consent was obtained from participants after explaining the purpose and content of the study and that it did not pose any risks. The principles of voluntariness and confidentiality were strictly adhered to at every stage of the study, and participants were informed that they could withdraw from the study at any time without providing a reason. The average time to complete the scales was 12 minutes. Various procedural measures were implemented in the study to reduce common method bias. First, participants were clearly informed of the principles of voluntariness and confidentiality; it was stated that they could withdraw from the study at any stage without providing a reason. This practice is important for reducing concerns about social desirability

(Podsakoff et al., 2003). Second, the scales were completed anonymously; it was clearly stated to participants that their responses could not be individually identified. Third, data were collected via an online platform, and it is known that this method reduces social desirability pressure compared to face-to-face data collection (Tourangeau & Yan, 2007). Additionally, Harman's single-factor test (Harman, 1967) was applied to statistically assess common method bias. In this test, items related to all variables were subjected to exploratory factor analysis together. The variance explained by the first factor identified in the analysis was found to be 31%. Since this value remained below 50%, it was assessed that common-method bias does not pose a serious threat to the findings (Podsakoff et al., 2003). Scale data underwent preliminary checks before analysis. In this context, since the scale data was collected online, no missing data was observed. After determining that there was no missing data in the scales, the following assumptions were examined for binary logistic analysis:

Categorization of the Dependent Variable

Prior to the binary logistic regression analysis, the continuous professional collaboration scores were transformed into a two-category variable using two-stage cluster analysis. Two-stage cluster analysis is an exploratory procedure that uses a distance measure to pre-cluster cases and then applies hierarchical methods to determine the optimal cluster solution based on BIC values (Chiu et al., 2001). The silhouette measure of cohesion and separation was used to evaluate cluster quality, with values above 0.50 considered acceptable (Kaufman & Rousseeuw, 1990). The analysis yielded a two-cluster solution with satisfactory fit, classifying 132 teachers (42.6%) as low collaboration and 178 teachers (57.4%) as high collaboration. All two-stage cluster analyses were conducted using jamovi 2.4.11.

Sample Size

In logistic regression analysis, it is stated that the sample size must be at least 100 to test the significance of the contribution of the research variables to the model (Harrell, 2015). Since the sample size of the study was 310, it can be said that the study had a sufficient sample size.

Absence of Missing Values

Missing values can affect the results of the research model and reduce the validity of the analyses. Therefore, it is important that there are no missing values in the research data (Little & Rubin, 2019). Since the research data was collected online, no missing values were encountered.

Linearity

In logistic regression analysis, there must be a linear relationship between the continuous predictor variables and the logit transformation of the dependent variable. One of the tests that reveals this relationship is the Box-Tidwell test (Hosmer et al., 2013). The Box-Tidwell test results showed that the p-values for the significance levels of all interaction terms were greater than 0.05 ($p > 0.05$). This result of the study indicates that there is a linear relationship between the continuous predictor variables and the logit transformation of the predicted variable (Field, 2017) and that the linearity assumption of the study is satisfied.

Multicollinearity Problem

In logistic regression analyses, there should not be a high level of correlation between predictor variables. In the multicollinearity problem, the correlation value between variables must be less than 0.80 (Hair et al., 2010). The study found that the correlation value between variables was less than 0.80. Tolerance and VIF (variance inflation factor) values were also examined to check whether there was a multicollinearity problem among the predictor variables in the study. A Tolerance value above 0.20 and a VIF value below 10 indicate that there is no multicollinearity problem between the variables (O'Brien, 2007). Accordingly, the Tolerance and VIF values between the predictor variables are given in Table 2.

Table 2.
Tolerance and VIF Values for The Predictor Variables

Variables	Tolerance	VIF
Gender	0.893	1.12
Marital Status	0.896	1.12
School Level	0.847	1.18
Educational Status	0.949	1.05
Participation in Professional Activities	0.929	1.08
Professional Seniority	0.915	1.09
Length of Time Working with the School Principal	0.930	1.08
Length of Service at the School	0.924	1.08
Servant Leadership	0.889	1.13

As shown in Table 2, the Tolerance values of the predictor variables being greater than 0.20 and the VIF values being less than 10 prove that the multicollinearity assumption is met in the study.

Absence of Outliers

Outliers in logistic regression prevent the research results from being accurate. Therefore, the research data in logistic regression must be free of outliers (Hosmer et al., 2013). As a result of the outlier analysis in the study, 8 data points with Z scores outside the range of -3 and +3 were deleted. Thus, the suitability of the data in terms of outliers was ensured.

Participant and Data Independence

In logistic regression analysis, each participant should participate in the study independently of other participants, and data should be obtained only from individuals in one group (Cohen et al., 2003). In this study, each participant participated independently of other participants, and data was obtained only from individuals in one group. The assumptions of participant and data independence were met through the sampling design. Participants were selected from different schools using a cluster sampling method, and no teacher appeared more than once in the dataset. Data were collected via a one-time, anonymous survey; the study design did not include repeated measures or a nested dependency structure.

Sensitivity Analysis: Multiple Linear Regression

To assess the robustness of the binary logistic regression findings, a sensitivity analysis was conducted using multiple linear regression, in which teachers' professional collaboration scores were treated as a continuous dependent variable. The same set of predictor variables was included in the model. The overall model was statistically significant ($p < 0.05$). This indicates that the predictor variables collectively explain a significant portion of the variance in professional collaboration scores. Consistent with the results of the binary logistic regression, school level, participation in professional activities, professional seniority, and servant leadership emerged as significant predictors of professional collaboration ($p < 0.05$). In contrast, gender, marital status, educational status, length of time working with the school principal, and length of service at the school were not significant predictor variables ($p > 0.05$). The alignment of findings across both analytical approaches supports the robustness and reliability of the study's results.

As seen, all assumptions in the study were met, and it was decided to use binary logistic regression analysis for data analysis. All analyses related to the study were obtained using the jamovi 2.4.11 and Mplus 8.3 statistical programs. Furthermore, the study data were evaluated at a 0.05 significance level.

Ethical Approval

Ethical approval was obtained from the Siirt University Research Ethics Committee prior to data collection (Decision date: 29.08.2024, Session No: 907; Official document date and number:

26.09.2024-7624). Informed consent was obtained from all participants, and confidentiality and anonymity were ensured. Participants were informed of their right to withdraw at any stage, and necessary precautions were taken to prevent any harm.

FINDINGS

Binary logistic regression analysis was applied to identify variables associated with the professional collaborations of teachers working in elementary education institutions. In this regard, the results related to model fit were first examined. The model fit results of the study are presented in Table 3.

Table 3.
Model Fit Results of The Study

						Overall Model Test		
Deviance	AIC*	BIC*	R^2_{McF}	R^2_{CS}	R^2_N	x^2	df	p
283	303	340	0.331	0.363	0.488	140	9	<.001

Note: * AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, Deviance = Deviance

As shown in Table 3, the predictor variables related to the model significantly predict the likelihood of teachers engaging in professional collaboration ($x^2_{(9)} = 140$, $p < .001$). Teachers' gender, marital status, school level, educational status, participation in professional activities, professional seniority, length of service with the school principal, length of service at the school, and school principals' servant leadership behaviors comprise the model's McFadden's R^2 ($R^2_{(McF)}$), 36.3% according to Cox & Snell's R^2 ($R^2_{(CS)}$), and 48.8% according to Negelkerke's R^2 ($R^2_{(N)}$) (Nagelkerke, 1991).

The results given in Table 3 are the results obtained by evaluating all predictor variables together. The Omnibus test results, which show whether there is a meaningful predictor variable for the predicted variable by taking each predictor variable separately into the initial model, are shown in Table 4.

Table 4.
Omnibus Test Results

Predictor Variables	x^2	df	p
Gender	0.0556	1	0.814
Marital Status	2.246	1	0.134
School Level	63.778	1	0.012*
Educational Status	0.1252	1	0.723
Participation in Professional Activities	97.542	1	0.002*
Professional Seniority	57.004	1	0.017*
Length of Time Working with the School Principal	0.1420	1	0.706
Length of Service at the School	14.410	1	0.230
Servant Leadership	1179.310	1	0.000*

Note: *p < 0.05

According to the Omnibus test result given in Table 4, when the x2 values calculated for each predictor variable are examined, school level ($p = 0.012 < 0.05$), participation in professional activities ($p = 0.002 < 0.05$), professional seniority ($p = 0.017 < 0.05$), and servant leadership ($p = 0.000 < 0.05$) significantly differ from the initial model when included in the initial model. However, the predictor variables of gender ($p = 0.814 > 0.05$), marital status ($p = 0.134 > 0.05$), educational status ($p = 0.723 > 0.05$), length of time working with the school principal ($p = 0.706 > 0.05$), and length of service at the school ($p = 0.230 > 0.05$) did not show a significant difference between the intended model and the initial model when included in the initial model.

After determining that the general assumptions of the study and the model fit results were statistically appropriate, the level of significance of the predictor variables on the predicted variable was examined

using binary logistic regression analysis. In this context, the results of the binary logistic regression analysis of the study are presented in Table 5.

Table 5.
Results of The Binary Logistic Regression Analysis of The Study

Variables	b	SE	Z	p	Exp (B) Odds Ratio	95% Confidence Interval	
						Lower Bound	Upper Limit
Constant	-20.3195	2.4996	-8.129	0.000	1.50e-9	1.12e-11	2.01e-7
Gender							
Female – Male**	-0.0737	0.3126	-0.236	0.814	0.929	0.503	1.714
Marital Status							
Married – Single**	-0.4929	0.3315	-1.487	0.137	0.611	0.319	1.170
School Level							
Middle School – Elementary School**	0.8014	0.3218	2.490	0.013*	2.229	1.186	4.188
Educational Status							
Graduate – Undergraduate**	-0.1687	0.4753	-0.355	0.723	0.845	0.333	2.144
Participation in Professional Activities	0.1871	0.0623	3.004	0.003*	1.206	1.067	1.362
Professional Seniority	-0.0396	0.0169	-2.349	0.019*	0.961	0.930	0.993
Length of Time Working with the School Principal	0.0411	0.1092	0.376	0.707	1.042	0.841	1.291
Length of Service at the School	0.0701	0.0590	1.188	0.235	1.073	0.955	1.204
Servant Leadership	4.4188	0.5260	8.400	0.000*	82.994	29.600	232.704

Note: *p < 0.05; **Reference Category; SE = Standard Error; b = Estimate; Exp (B) Odds Ratio = Probability Ratio

Based on the odds ratio values reported in Table 5, middle school teachers are 2.229 times more likely to engage in professional collaboration than elementary school teachers, compared to their counterparts in elementary schools. For the continuous predictor variables, the odds ratios are interpreted as follows, with each "one-unit increase" clarified in terms of the actual measurement scale of the respective variable.

Participation in professional activities was measured as the total number of professional development activities (e.g., in-service training sessions, conferences, and seminars) in which a teacher had participated (M = 3.73, SD = 2.55). A one-unit increase in this variable corresponds to participation in one additional professional activity. Each such additional activity was associated with a 1.206-fold increase in the odds of a teacher being in the high professional collaboration group (OR = 1.206, 95% CI [1.067, 1.362]). In practical terms, a teacher who has participated in five professional activities is estimated to have approximately 1.49 times higher odds of being in the high collaboration group compared to a teacher who has participated in two activities. Professional seniority was measured in years of teaching experience (M = 16.15 years, SD = 9.02). A one-unit increase corresponds to one additional year of teaching experience. Each additional year of seniority was associated with a 0.961-fold decrease in the odds of belonging to the high collaboration group (OR = 0.961, 95% CI [0.930, 0.993]), indicating that more experienced teachers are somewhat less likely to engage in professional collaboration. To illustrate, a teacher with 20 years of experience has approximately 0.852 times the odds of being in the high collaboration group compared to a teacher with 16 years of experience.

Servant leadership was measured using a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree), yielding a mean score of 4.58 (SD = 0.38) in the present sample. A one-unit increase corresponds to a one-point increase on this scale —for example, moving from a score of 3 (neutral) to a score of 4 (agree). Each one-point increase in servant leadership score was associated with an 82.994-fold increase in the odds of the teacher being in the high collaboration group (OR = 82.994, 95% CI [29.600, 232.704]). Although this odds ratio appears exceptionally large, it should be interpreted in light of the restricted variability in servant leadership scores observed in the present sample (SD = 0.38), which

means that a full one-point difference on the scale represents a relatively large shift relative to the observed distribution. In practical terms, a one standard deviation increase in servant leadership score (approximately 0.38 points) is associated with a roughly 10.57-fold increase in the odds of high collaboration, underscoring the substantive role of servant leadership in predicting professional collaboration.

It should be noted that the exceptionally large odds ratio observed for servant leadership (OR = 82.994, 95% CI [29.600, 232.704]) is partly attributable to the restricted variance of servant leadership scores in the present sample (M = 4.58, SD = 0.38), which caused a full one-unit increase on the scale to represent an unusually large shift in the observed distribution. To provide a more meaningful effect size estimate, the standardized odds ratio was computed by multiplying the regression coefficient by the standard deviation of servant leadership scores: e^(4.4188 × 0.38) ≈ 5.36. This indicates that a one standard deviation increase in servant leadership score is associated with approximately a 5.36-fold increase in the odds of belonging to the high collaboration group, a more interpretable and contextually meaningful effect size. Additionally, to rule out the possibility of a quasi-complete separation artifact, the analysis was re-run using Firth's penalized logistic regression (Firth, 1993; Heinze & Schemper, 2002), which is specifically designed to produce stable estimates when separation may be present. The Firth-adjusted results confirmed that servant leadership remained a statistically significant and substantively strong predictor of professional collaboration, and the pattern of findings for all other significant predictors (school level, participation in professional activities, and professional seniority) remained unchanged. These convergent results support the robustness and validity of the study's conclusions

The relative order of importance of the variables with a significant predictive effect in the research model is servant leadership (Odds Ratio = 82.994), school level (Odds Ratio = 2.229), participation in professional activities (Odds Ratio = 1.206), and professional seniority (Odds Ratio = 0.961). According to the results of the study, the logistic regression model to be established is as follows (SCHL = School Level, PPA = Participation in Professional Activities, PS = Professional Seniority, SL = Servant Leadership):

$$p = \frac{1}{1 + e^{-[-20.3195 + (0.8014 \times SCHL) + (0.1871 \times PPA) - (0.0396 \times PS) + (4.4188 \times SL)]}}$$

The classification prediction results of the study were also checked. Accordingly, the classification prediction results of the study are given in Table 6.

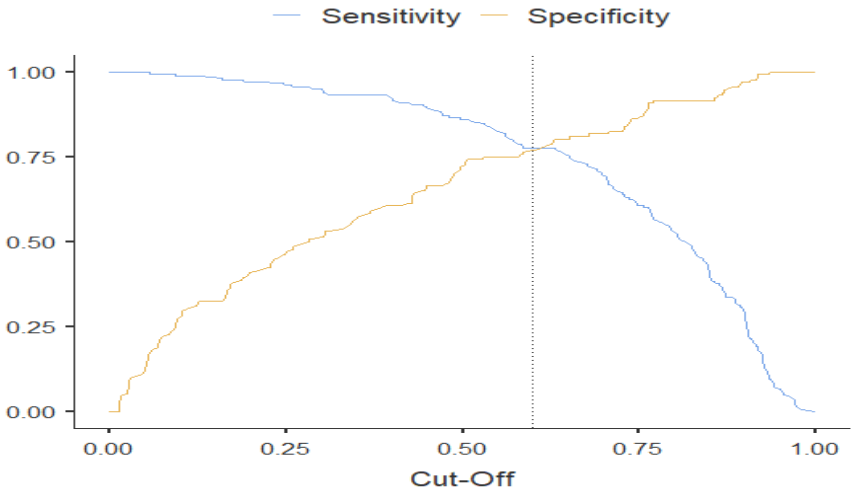
Table 6.
Classification Prediction Results of The Study

Observed	Predicted		Accuracy Level (%)
	Low	High	
Low	102	30	77.3
High	40	138	77.5

Note: The cutoff point was set at 0.60.

Table 6 shows that 102 teachers at the low level and 138 teachers at the high level were correctly classified. On the other hand, 30 teachers at the low level were incorrectly classified as high, and 40 teachers who were actually high were incorrectly classified as low. Accordingly, the classification results show that the correct classification rate for low-level teachers is 77.3% and the correct classification rate for high-level teachers is 77.5%. The graphical representation of the classification predictions made with a cutoff point of 0.60 is shown in Figure 2.

Figure 2.
Graph of Classification Predictions Made with a Cutoff Point of 0.60 Probability



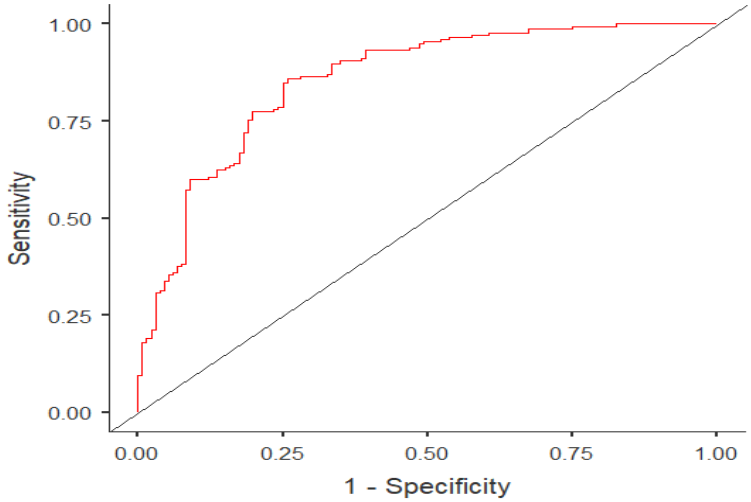
The classification results of the study were also obtained using the ROC (Receiver Operating Characteristic) curve. The classification prediction results obtained using the ROC curve method are given in Table 7 and Figure 3.

Table 7.
Classification Prediction Results Obtained Using The ROC Curve Method

Accuracy	Specificity	Sensitivity	AUC (Area Under the Curve)
0.774	0.773	0.775	0.856

Note: The cutoff point was set at 0.60.

Figure 3.
Graphical Representation of Classification Prediction Results Obtained Using the ROC Curve



As can be seen from Table 7 and Figure 3, the accuracy rate of the classification results obtained using the ROC curve method is 77.4%. The AUC value, which indicates the size of the area under the curve, was calculated as 85.6%. An AUC value approaching 1 is considered an indicator of the classification performed (Fawcett, 2006). In addition, according to the specificity value, it can be understood that the ROC curve correctly classified teachers with a low level of 77.3%; according to the sensitivity value, it correctly classified teachers with a high level of 77.5%.

DISCUSSION AND CONCLUSION

The first significant finding of the study is that the school level was found to significantly predict the likelihood of teachers engaging in professional collaboration. This finding suggests that the school level may be a determining factor in teacher professional collaboration. Previous research findings have similarly demonstrated that school types are associated with teacher professional collaboration (Schuster et al., 2021). Additionally, Vangrieken et al. (2016) emphasized in their study that collaboration in teacher teams may vary according to educational level and school level, while Ronfeldt et al. (2015) highlighted that teacher collaboration at teaching levels may have positive effects on student achievement. Hargreaves (1994) and Ronfeldt et al. (2015) state that higher levels of collaboration in middle schools are related to students' developmental needs arising from adolescence and the sharing of expertise among teachers. In Türkiye, centralized and competitive exams such as the Elementary and Secondary Education Institutions Scholarship Exam and the High School Transition Exam, especially at the middle school level, may have influenced middle school teachers to provide more academic and social guidance to students and to collaborate more with each other. Research conducted in the Turkish context also makes important contributions to understanding the relationship between principal leadership and school effectiveness. Banoğlu et al. (2026) examined school principals' networking preferences in instructional and administrative advice-seeking relations using inferential social network analysis, revealing that principals actively utilise social networks both in accessing information and in making instructional decisions. This finding suggests that the nature of the interaction principals establish with teachers may be a determining factor in professional collaboration processes. Cansoy et al. (2025) examined the barriers to effective instructional supervision practices faced by school principals within a centralised educational system, reporting that various institutional and structural challenges impede principals' fulfilment of their instructional leadership roles in centralised systems such as that of Türkiye. Similarly, Deniz and Erdener (2020) investigated the instructional supervision behaviors of school administrators from teachers' perspectives and emphasised that principals' levels of instructional support play a determining role in shaping teacher professional development and collaboration patterns. These findings are of particular relevance for situating the present study's findings regarding the role of servant leadership in teacher collaboration within the centralised educational context of Türkiye.

Another finding of the study is that teachers' participation in professional activities is a significant predictor of teacher professional collaboration. This finding is consistent with previous studies that support the idea that professional development activities create opportunities for joint work and collaboration among teachers (Shavard, 2021; Vangrieken et al., 2017). Professional activities related to teachers enable them to develop their pedagogical skills, learn new teaching strategies, and share their professional knowledge with colleagues (Desimone, 2009). Similarly, Thurlings and den Brok (2017) reported in their meta-analysis study on the impact of teacher professional development activities on learning outcomes that participation in professional development activities is associated with higher teacher knowledge, teacher skills, and student learning. On the other hand, it is stated that participation in professional activities has positive effects not only on teachers but also on student achievement (Didion et al., 2020).

The study found that professional seniority significantly predicts teacher collaboration. According to this finding, as teachers' professional seniority increases, their collaboration with other teachers decreases. This finding is theoretically counterintuitive, as accumulated professional experience might reasonably be expected to enrich rather than diminish collaborative engagement, and warrants analytical treatment beyond merely citing confirmatory references. Within the structural context of the Turkish educational system, frequent administrative reassignments of school principals may disrupt the relational continuity that is a precondition for sustained collaborative culture, leading experienced teachers to develop professional self-sufficiency as an adaptive response to structural instability (Cansoy et al., 2025). Deniz (2025) proposes a dynamic model in which teachers negotiate the boundaries of principal authority across different professional domains. Within this framework, experienced teachers — having developed a stronger sense of professional autonomy — may define a narrower zone of

acceptance for externally initiated collaboration, thereby reducing their participation in formally structured collaborative activities. Deniz and Demirkasımoğlu (2025), in a comparative cross-cultural study, similarly identified authority negotiation as a key variable shaping the relationship between principal leadership behaviors and teachers' professional engagement, suggesting that the seniority–collaboration relationship is not merely a function of individual preference but is structurally and culturally mediated. The literature also indicates that teachers with greater professional seniority prefer individual work over collaboration with other teachers. For example, Kelchtermans (2006) states that teachers with greater professional seniority participate less in collaboration, instead adopting approaches based on their individual experience and knowledge. Zwart et al. (2009) explain the low tendency of teachers with more seniority to engage in professional collaboration by their development of independent strategies over the years and their perception that collaboration is unnecessary. Similarly, Ghaith and Yaghi (1997) indicate that as teachers gain experience, they become more reluctant to adopt new teaching practices and show resistance. In contrast, teachers with less seniority may engage in more collaboration to compensate for their lack of experience and enhance their professional development (Lortie, 2020; Vangrieken et al., 2015). The greater involvement of new teachers in collaboration can also be explained by Albert Bandura's (1977) social learning theory. According to social learning theory, teachers who are new to the job interact with their colleagues and seek to increase their knowledge and skills. An alternative theoretical explanation, however, may be found in career stage theory (Huberman, 1989) and the expert-novice literature. From this perspective, senior teachers may collaborate less not because of a disposition toward isolation or resistance to change, but because they are insufficiently utilized in structured mentoring or instructional coaching roles within their schools (Hargreaves & Fullan, 2012). In other words, the reduced collaboration of veteran teachers may reflect a systemic failure to leverage their expertise rather than an individual motivational deficit. Future studies are encouraged to examine the mechanisms underlying this relationship by distinguishing between voluntary disengagement from collaboration and structural exclusion from collaborative opportunities.

One of the most important findings of the study is that school principals' servant leadership behaviors are a significant predictor of teachers' professional collaboration. This finding implies that school principals' servant leadership behaviors are associated with stronger teacher collaboration and is consistent with the finding that leadership approaches demonstrated in schools are positively correlated with teachers' professional collaboration (Angelle, 2010). In the servant leadership approach, the leader places himself at the bottom of the management pyramid, thereby gaining the love and trust of his subordinates (Rieke et al., 2008). The servant leadership approach, which centers on humble and service-oriented behaviors, also differs from other leadership approaches in terms of its characteristics such as staff empowerment and selflessness (Baldonado, 2017). Therefore, the servant leadership approach is considered one of the effective leadership styles in creating collaborative school environments (Liden et al., 2015). Similarly, the fact that servant leadership encompasses various behaviors such as empathy, listening, and social responsibility also increases collaboration among teachers (Eva et al., 2019). Sendjaya et al. (2008) state that servant leadership facilitates the formation of collaboration processes in schools because it involves listening to subordinates' problems and providing guidance. Some researchers (e.g., Greenleaf, 2002; Liden et al., 2014) also explain the realization of professional collaboration in schools by servant leadership responding to needs and developments. Nevertheless, it is important to acknowledge that the magnitude of the odds ratio for servant leadership should be interpreted with caution due to the restricted variability of servant leadership scores in the present sample. The standardized effect size estimate (OR $\approx$ 5.36 per one standard deviation increase) and the Firth-adjusted analysis both confirm the substantive and statistically robust nature of this finding, while also underscoring the need for future studies to recruit samples with greater variability in servant leadership perceptions.

Beyond the methodological explanation offered above, the servant leadership finding also invites theoretical interpretation through the zone of acceptance framework. Deniz (2025) argues that teachers actively negotiate the extent to which they accept and internalise leadership behaviors within different domains of their professional practice. In contexts where servant leadership is perceived as highly supportive — as reflected in the elevated mean scores in the present sample — teachers may

substantially expand their zone of acceptance, producing a markedly stronger association between leadership perceptions and collaborative behavior. This interpretation suggests that the large odds ratio, while partly a scaling artifact, may also reflect a genuine alignment between servant leadership culture and teachers' willingness to collaborate. Deniz and Demirkasımoğlu (2025) further demonstrate that cultural and institutional context significantly moderates teachers' professional dispositions, reinforcing the need to interpret the present findings within the specific organisational context of Turkish elementary schools. This finding is also consistent with recent international research demonstrating that principal leadership practices serve a facilitative function in supporting teacher collaboration. Meyer et al. (2025), in a longitudinal design, showed that principals' structural practices for facilitating collaboration significantly strengthened teachers' collective efficacy perceptions over time, emphasising that the continuity and consistency of leadership behaviors are determinative in this relationship. Persson et al. (2025), in a large-scale longitudinal study examining the effects of instructional leadership on teacher collaboration and student achievement, demonstrated that principals' instructional leadership behaviors predicted teacher collaboration both directly and indirectly through student achievement. These findings indicate that the relationship between leadership and collaboration is grounded not only in cross-sectional data but also in the dynamics of change over time. Within this framework, while the findings of the present study demonstrate that servant leadership behaviors are associated with teacher collaboration, the mechanisms through which this relationship operates — including variables such as school climate, trust, and collective efficacy — remain to be addressed in future research employing longitudinal designs.

Theoretical Implications

The finding that structural variables such as school level are associated with teacher collaboration may contribute theoretically to the literature by helping to understand how schools' organizational and cultural structures shape collaboration dynamics. Furthermore, the positive association between teachers' participation in professional activities and teacher collaboration can also be seen as an important reflection of professional development and networking theories. On the other hand, the effect of professional seniority on teacher collaboration can be examined in the context of the general conclusions of theories such as social learning, experiential learning, and organizational learning, which focus on the relationship between experience and collective work habits. The finding that the servant leadership behaviors exhibited by school principals are a significant predictor of the likelihood of teachers' professional collaboration is an important implication in terms of leadership theories, suggesting a meaningful associational relationship that warrants further investigation through longitudinal or experimental designs. On the other hand, rather than directly testing the mediating and moderating mechanisms in the relationship between servant leadership and teacher collaboration, the present study examined this relationship at the level of predictor variables. Whether variables such as trust climate, school climate, and collective teacher efficacy serve as mediators in this relationship, and whether servant leadership interacts with professional seniority or school level to influence collaboration in different ways, emerge as important theoretical questions for future research. Addressing these questions requires the use of more comprehensive analytical frameworks such as the longitudinal and multilevel designs adopted in Meyer et al. (2025) and Persson et al. (2025). In the Turkish context, drawing on the findings of Cansoy et al. (2025) and Banoğlu et al. (2026), investigating how a centralised educational system shapes the relationship between principal leadership and teacher collaboration has the potential to make distinctive contributions to the field.

Practical Implications

The current study can offer various practical implications as it reveals the variables associated with teachers' collaboration. In this context, given that the school level is a meaningful predictor of teacher collaboration, it can be suggested that policymakers prioritize inter-level collaboration to understand and develop collaboration practices among teachers at different school levels. Thus, teachers working in different types and levels can share information and cooperate with each other. The study found that participation in professional activities is associated with higher teacher collaboration. Therefore, making

professional development programs and activities accessible to teachers may be associated with higher collaboration among teachers. In addition, professional seniority was found to significantly predict teachers' tendency to collaborate. Therefore, organizing events where teachers with different experiences can come together can strengthen collaboration among teachers.

Limitations of the Study and Recommendations for Future Research

The research results must be evaluated within certain limitations. In this regard, the research is limited to teachers working in elementary schools in the provincial center of Siirt. The absence of teachers working in other provinces or regions in the research may prevent the generalization of the research results. The research can be repeated with a wider participation of teachers working in other provinces or regions. As the research was designed as a cross-sectional study, it was not possible to track developments and changes in teachers' professional collaboration. Therefore, designing the research longitudinally could provide a better understanding of the effects of variables on teachers' collaboration over time. The scales used in the research may also cause self-report-based social desirability bias. Future research could increase participant diversity and use more objective criteria and tools for observing the behaviors to be measured. A further limitation concerns the risk of common method bias (Podsakoff et al., 2003). Since both the independent variables (including servant leadership) and the dependent variable (professional collaboration) were collected from the same source — classroom teachers — using self-report measures at the same point in time, the associations observed in this study may be partially inflated by shared method variance. In particular, teachers who hold favorable perceptions of their principal's leadership behaviors may be predisposed to report higher levels of collaborative practice, independent of their actual behavior. Future studies are encouraged to address this limitation by collecting data on professional collaboration from multiple sources — such as peer nominations, administrator observations, or school records — or by employing a time-lagged design in which the independent and dependent variables are measured at separate time points. Although the sensitivity analysis using multiple linear regression confirmed the consistency of the findings across analytical approaches, the binary categorization of the dependent variable through two-stage cluster analysis remains a methodological limitation of the present study. Future research is encouraged to treat professional collaboration as a continuous variable and to employ regression-based approaches that preserve the full distributional information of the outcome measure. Furthermore, the restricted variance of servant leadership scores (SD = 0.38 on a 5-point scale) resulted in an exceptionally large odds ratio estimate for this variable, which may limit the precision of the effect size interpretation. Future studies should aim to include samples with greater variability in servant leadership perceptions to obtain more stable parameter estimates. An additional limitation concerns the online data collection procedure. Although the use of Google Forms distributed via WhatsApp enabled efficient and wide-reaching data collection, this approach may have introduced self-selection bias. Teachers who are more technologically proficient, younger, or more professionally active may have been more likely to respond, potentially resulting in a sample that does not fully represent the broader population of elementary school teachers. While the cluster sampling design and the universal invitation extended to all teachers within the selected schools partially mitigate this concern, future studies are encouraged to employ mixed-mode data collection strategies-combining online and paper-based administration-to reduce the risk of self-selection bias and enhance the representativeness of the sample (Dillman et al., 2014). Although the scales assess conceptually and operationally distinct constructs at different levels of analysis — principal behavior versus teacher collaborative practice — future studies are encouraged to employ confirmatory factor analysis or multi-trait multi-method designs to more rigorously establish the discriminant validity of the two measures and to rule out the possibility of construct redundancy. Finally, the present study was unable to directly examine the mechanisms mediating the relationship between servant leadership and teacher collaboration — such as school climate, trust, and collective efficacy — nor the potential moderating interactions (servant leadership × professional seniority; servant leadership × school level). This constitutes an important methodological constraint that limits the theoretical explanatory power of the study. Future research is encouraged to examine the relationship between principal leadership and teacher collaboration within the framework of longitudinal designs and multilevel models, and to extend this inquiry to encompass the institutional and structural factors

specific to Türkiye's centralised educational context that shape this relationship (Cansoy et al., 2025; Deniz & Erdener, 2020).

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TÜRKÇE GENİŞLETİLMİŞ ÖZET

Öğretmenler arası mesleki işbirliği, çağdaş eğitim sistemlerinde okul etkililiğinin artırılması, öğretim süreçlerinin niteliğinin geliştirilmesi ve öğrenci öğrenmelerinin desteklenmesi açısından temel bir unsur olarak kabul edilmektedir (Mora-Ruano vd., 2019; Pettersson ve Ström, 2019). Öğretmenlerin meslektaşlarıyla bilgi ve deneyim paylaşımında bulunmaları, öğretim uygulamalarını birlikte planlamaları ve karşılaşılan sorunlara ortak çözümler üretmeleri, okulun öğrenen bir örgüt hâline gelmesine önemli katkılar sağlamaktadır (Kelchtermans, 2006). Bu yönüyle öğretmen mesleki işbirliği, bireysel mesleki gelişimin yanı sıra okulun kurumsal kapasitesini güçlendiren, öğretimde sürekliliği sağlayan ve sürdürülebilir okul gelişimini mümkün kılan bir yapı olarak değerlendirilmektedir (Goddard vd., 2007). Buna rağmen alanyazında (örneğin: Hallinger ve Heck, 2010; Liden vd., 2014) öğretmen mesleki işbirliğini etkileyen bireysel ve örgütsel değişkenlerin birlikte ele alındığı ampirik çalışmaların sınırlı olduğu görülmektedir. Özellikle okul yöneticilerinin liderlik yaklaşımlarının öğretmenlerin mesleki işbirliği eğilimleri üzerindeki etkisinin, demografik ve mesleki değişkenlerle birlikte incelendiği araştırmalara duyulan ihtiyaç devam etmektedir (Eva vd., 2019).

Öğretmen mesleki işbirliği; öğretmenlerin mesleki konuları değerlendirmek, öğretim uygulamalarını geliştirmek ve ortak hedefler doğrultusunda hareket etmek amacıyla birlikte çalışmaları sürecini kapsamaktadır (García-Martínez vd., 2021). Bu süreç öğretmenler arasında güvene dayalı ilişkilerin kurulmasını, açık iletişimin gelişmesini ve kolektif sorumluluk anlayışının güçlenmesini desteklemektedir (Meirink vd., 2010). Öğretmenler arası işbirliğinin güçlü olduğu okullarda öğretim uygulamalarının daha tutarlı hâle geldiği, öğretmenlerin mesleki yeterliklerinin arttığı ve okul ikliminin olumlu yönde geliştiği belirtilmektedir (Blömeke vd., 2021; Vangrieken vd., 2015). Bununla birlikte öğretmen mesleki işbirliğinin oluşmasında sadece öğretmenlerin bireysel özellikleri değil, okulun örgütsel yapısı ve okul yöneticilerinin benimsediği liderlik anlayışı da belirleyici bir rol oynamaktadır (Baldonado, 2017; Gandolfi ve Stone, 2018). Bu bağlamda okul yöneticilerinin öğretmenleri destekleyen, katılımcılığı teşvik eden ve işbirliğine dayalı bir ortam oluşturan liderlik davranışları sergilemeleri önem kazanmaktadır.

Liderlik yaklaşımları arasında hizmetkâr liderlik, öğretmen mesleki işbirliğini destekleyen en önemli liderlik tarzlarından biri olarak öne çıkmaktadır (Greenleaf, 2002). Hizmetkâr liderlik, liderin öncelikle çalışanlara hizmet etmeyi benimsemesi, onların ihtiyaçlarını gözetmesi ve gelişimlerini desteklemesi esasına dayanmaktadır. Bu liderlik anlayışında lider, gücü paylaşmayı, empati kurmayı, dinlemeyi ve çalışanları güçlendirmeyi ön planda tutmaktadır (van Dierendonck, 2011). Okul müdürlerinin hizmetkâr liderlik davranışları sergilemesi, öğretmenlerin kendilerini değerli hissetmelerine, yönetime güven duymalarına ve okul süreçlerine daha aktif katılım göstermelerine olanak tanımaktadır (Lin, 2022; Sun ve Xia, 2018; Vangrieken vd., 2017). Bu durum öğretmenler arasında işbirliğine dayalı ilişkilerin güçlenmesini ve mesleki paylaşımın artmasını destekleyebilir. Dolayısıyla öğretmen mesleki işbirliğinin çok boyutlu bir bakış açısıyla ele alınması gerektiği söylenebilir.

Bu araştırmanın amacı ilköğretim okullarında görev yapan öğretmenlerin mesleki işbirliği içinde olma olasılıklarının hangi bireysel ve örgütsel değişkenler tarafından anlamlı biçimde yordandığını belirlemektir. Bu kapsamda öğretmenlerin cinsiyetleri, medeni durumları, görev yaptıkları okul kademesi, öğrenim durumları, mesleki faaliyetlere katılım düzeyleri, mesleki kıdemleri, okul müdürüyle çalışma süreleri, okuldaki görev süreleri ve okul müdürlerinin hizmetkâr liderlik davranışları birlikte ele alınmıştır. Araştırma, öğretmen mesleki işbirliğini etkileyen değişkenleri aynı analiz modeli içerisinde inceleyerek alanyazındaki önemli bir boşluğu doldurmayı amaçlamaktadır.

Araştırma nicel yaklaşıma dayalı olarak kesitsel ve ilişkisel tarama modelinde tasarlanmıştır. Araştırmanın örneklemini, Siirt il merkezindeki ilköğretim (ilkokul ve ortaokul) okullarında görev yapan ve küme örnekleme yöntemiyle seçilen toplam 310 öğretmen oluşturmaktadır. Veriler, okul müdürlerinin hizmetkâr liderlik davranışlarını ölçmek amacıyla Hizmetkâr Liderlik Ölçeği ile öğretmenlerin mesleki işbirliği düzeylerini belirlemek amacıyla Mesleki İşbirliği Alt Ölçeği kullanılarak

toplanmıştır. Öğretmenlerin mesleki işbirliği düzeyleri, iki aşamalı kümeleme analizi sonucunda "düşük" ve "yüksek" olmak üzere iki kategoride ele alınmıştır. Verilerin analizinde ikili (binary) lojistik regresyon analizi kullanılmış; analiz öncesinde örneklem büyüklüğü yeterliliği, doğrusallık, çoklu bağlantı ve uç değer varsayımları test edilerek verilerin analize uygunluğu sağlanmıştır.

Araştırma bulguları, kurulan lojistik regresyon modelinin istatistiksel olarak anlamlı olduğunu ve öğretmenlerin mesleki işbirliği içinde olma olasılıklarını açıklamada güçlü bir uyum gösterdiğini ortaya koymuştur. Analiz sonuçlarına göre okul kademesi, mesleki faaliyetlere katılım, mesleki kıdem ve okul müdürlerinin hizmetkâr liderlik davranışları öğretmenlerin mesleki işbirliği içinde olma olasılıklarını anlamlı biçimde yordamaktadır. Ortaokullarda görev yapan öğretmenlerin, ilkokullarda görev yapan öğretmenlere kıyasla mesleki işbirliği içinde olma olasılıklarının daha yüksek olduğu belirlenmiştir. Bunun yanı sıra öğretmenlerin mesleki faaliyetlere katılım düzeyleri arttıkça mesleki işbirliği olasılıklarının da arttığı görülmüştür. Mesleki kıdem değişkeni açısından ise kıdem arttıkça öğretmenlerin mesleki işbirliği içinde olma olasılıklarının azaldığı tespit edilmiştir. Bu durum, deneyimli öğretmenlerin zamanla daha bağımsız çalışma eğilimi geliştirmeleriyle ilişkilendirilebilir.

Araştırmanın en dikkat çekici bulgusu, okul müdürlerinin hizmetkâr liderlik davranışlarının öğretmenlerin mesleki işbirliği içinde olma olasılıklarını son derece güçlü bir biçimde yordamasıdır. Hizmetkâr liderlik algısındaki artışın, öğretmenlerin mesleki işbirliği içinde olma olasılığını diğer tüm değişkenlere kıyasla çok daha yüksek düzeyde artırdığı görülmüştür. Buna karşılık cinsiyet, medeni durum, öğrenim durumu, okul müdürüyle çalışma süresi ve okuldaki görev süresi değişkenlerinin öğretmenlerin mesleki işbirliği içinde olma olasılıklarını anlamlı biçimde yordamadığı belirlenmiştir. Bu sonuç öğretmen mesleki işbirliğinin demografik özelliklerden ziyade liderlik anlayışı ve mesleki bağlamla daha güçlü biçimde ilişkili olduğunu göstermektedir.

Bu araştırma öğretmen mesleki işbirliğinin geliştirilmesinde okul yöneticilerinin sergiledikleri hizmetkâr liderlik davranışlarının merkezi bir rol oynadığını ortaya koymaktadır. Sonuçlar, okullarda işbirliğine dayalı bir kültür oluşturulmasında liderlik uygulamalarının belirleyici olduğunu göstermekte ve öğretmenlerin mesleki faaliyetlere katılımlarının desteklenmesinin işbirliği süreçlerini güçlendirebileceğine işaret etmektedir. Araştırma sonuçları, okul yöneticileri ve politika yapıcılar için öğretmen mesleki işbirliğini artırmaya yönelik önemli kuramsal ve uygulamaya dönük çıkarımlar sunmaktadır. Ayrıca farklı okul kademeleri ve kıdem düzeyleri dikkate alınarak öğretmenler arasında işbirliğini destekleyen yapıların oluşturulması, okullarda daha etkili ve sürdürülebilir bir işbirliği kültürünün gelişmesine katkı sağlayabilir.